

Earth Cloud, Aerosol and Radiation Explorer: 1st RESEARCH ANNOUNCEMENT (Validation)

Issued: August 28, 2012

Proposals Due: November 19, 2012

**Earth Observation Research Center
Japan Aerospace Exploration Agency**

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1. Introduction

1.1. About the Research Announcement

In this first Earth Cloud, Aerosol and Radiation Explorer (EarthCARE) Research Announcement (Validation) (RA), the Japan Aerospace Exploration Agency (JAXA) is calling for research proposals that contribute to the validation of JAXA EarthCARE Standard and Research Products. The JAXA EarthCARE/CPR project has configured the mission success criteria (Table 1) based on the mission requirements. For the success of the mission, JAXA is required to deliver EarthCARE products of a quality and reliability that satisfy these criteria, through the validation activities. A detailed technical description of the validation activity is given in Section 2.

The EarthCARE mission is scheduled to launch in Japanese Fiscal Year (JFY) 2015. This RA covers 2-year research period beginning in JFY 2013.

1.2. Targets of EarthCARE and Mission Success Criteria

The objectives of the EarthCARE mission are to evaluate the radiative forcing of clouds and aerosols, which are great uncertainties in climate change prediction, and to observe the interactions between clouds and aerosols. EarthCARE defines the success criteria as outputs that clarify the baselines of mission accomplishment. In addition, EarthCARE defines the list of the products and their accuracy criteria (Table 2). This RA invites research to confirm these targets through collaboration with JAXA. Detailed technical descriptions for research topics will be described in the next chapter.

Table 1. JAXA EarthCARE/CPR Project Success Criteria

Minimum Success (Decision : at the end of Commissioning and Cal/Val Phase evaluation : at 6 months from launch)	Full Success (Decision : at the end of planned operation evaluation : at 3 years from launch)	Extra Success (Decision : at the end of planned operation evaluation: at 3 years from launch)
<ul style="list-style-type: none"> • Complete Commissioning and Cal/Val Phase and publish an image data of the observed vertical cloud profile* 	<ul style="list-style-type: none"> • Accomplish with the standard accuracy requirement of CPR-only standard product and produce a dataset which covers over 90% of nominal operation for more than 2 years** • Capable to release more than one research product of CPR • Accomplish with the standard accuracy requirement of a synergy product 	<ul style="list-style-type: none"> • Accomplish with the target accuracy requirement of a CPR standard product , OR • Accomplish with the target accuracy requirement of a synergy product***, OR • Capable to use with data of other satellites, with good integrity

* In Commissioning and Cal/Val Phase, the confirmation of the CPR flight hardware and the ground processing are conducted. Uncorrected absolute value (i.e. relative value) of consecutive Level1 (quicklook) data that last more than one orbit is defined as an image to be published for the minimum success.

** The requirements of the satellite attitude accuracies are to be accomplished for Doppler products.

*** On the premise that the performance requirements of ESA sensors are satisfied for synergy products.

Table 2. JAXA EarthCARE/CPR Product List

Standard L1b, L2a and L2b Products

Sensor(s)	Processing Level	Product Name	Primary Parameters	Resolution		Release Accuracy	Standard Accuracy	Target Accuracy	Total Volume (V/orbit)
				Horizontal	Vertical				
CPR	L1b	CPR one-sensor Received Echo Power Products and Doppler Product	Received Echo Power	0.5km	0.1km	< 4.7dB	< 2.7dB	-	340MB
			Radar Reflective Factor		< 4.7dB	< 2.7dB	< 2.7dB		
			Surface Radar Cross Section		-	-	-		
			Doppler Velocity		0.1km	-	< 1m/s (Doppler Vel.)	< 0.2m/s (Doppler Vel.)	
			Covariance of Pulse Pair						
			Spectrum Width						
CPR	L2a	CPR one-sensor Echo Product	Integrated Radar Reflective Factor/Integrated Doppler Velocity/Gas Correction Factor	① 1km ② 10km	① 0.1km ② 0.5km	-	< 1m/s (Integrated Doppler Vel.)	< 0.2m/s (Integrated Doppler Vel.)	300MB
CPR	L2a	CPR one-sensor Cloud Products	Cloud Mask	① 1km ② 10km	① 0.1km ② 0.5km	± 30%	± 10%	± 5%	550MB
			Cloud Particle Type			± 100%	± 50%	± 20%	
			Radar Reflective Factor with attenuation correction	1km	0.1km	< 7.6dB	< 5.7dB	< 4.5dB	
			Reff./LWC/IWC			-	± 100% (LWC)	± 50% (LWC)	
			Optical Thickness			-	± 100%	± 50%	
MSI	L2a	MSI one-sensor Cloud Products	Cloud Flag/Cloud Phase	0.5km	-	± 15% Ocean ± 20% Land	± 15%	± 10%	630MB
			Optical Thickness of Liquid Cloud			± 10%	± 100% (converting to LWP)	± 50% (converting to LWP)	
			Reff. of Liquid Cloud			± 30%			
			Cloud Top Temp./Pressure/Altitude			± 1K (CTT)	± 3K (CTT)	± 1.5K (CTT)	
ATLID	L2a	ATLID one-sensor Cloud Products	Feature Mask	0.2km/1km 10km	0.1km	± 100%	± 40%	± 10%	1200MB
			Target Mask	1km 10km		± 100%	± 40%	± 10%	
			Aerosol Extinction Coeff./Backscat. Coeff./Lidar Ratio/Dep. Ratio	10km		± 60% / ± 90%, ± 150% / ± 150%	± 40% / ± 70%, ± 110% / ± 130%	± 20% / ± 50%, ± 70% / ± 100%	
			Cloud Extinction Coeff./Backscat. Coeff./Lidar Ratio/Dep. Ratio	1km 10km		± 50% / ± 90%, ± 140% / ± 150%	± 30% / ± 70%, ± 100% / ± 130%	± 15% / ± 50%, ± 65% / ± 100%	
			Planetary Boundary Layer Height			± 500m	± 300m	± 100m	
CPR + ATLID	L2b	CPR-ATLID synergy Cloud Products	Cloud Mask	① 1km ② 10km	① 0.1km ② 0.5km	-	root mean square of errors of one-sensor products	-	520MB
			Cloud Particle Type			-		± 2μm (Liquid) / ± 20% / ± 30%	
			Reff./LWC/IWC	1km	-	-		-	
CPR + ATLID + MSI	L2b	CPR-ATLID-MSI synergy Cloud Products	Cloud Mask	① 1km ② 10km	① 0.1km ② 0.5km	-	root mean square of errors of one-sensor products	-	550MB
			Cloud Particle Type			-		± 2μm (Liquid) / ± 20% / ± 30%	
			Reff./LWC/IWC			-		-	
CPR+ ATLID+ MSI+BBR	L2b	Four-sensors Synergy Radiative Products	SW/LW Radiative Flux	10km	-	-	± 25W/m2	± 10W/m2	6MB
			SW/LW Radiative Heating Rate		0.5km	-	-	-	

① and ② in the resolution row specifies the combination of horizontal and vertical resolution. JAXA will produce both ①- and ②-pair resolution products. The accuracies are defined using the "product resolution" in red italic numbers.

The accuracies of CPR L1b are defined by 10km integration.

Those accuracies except for CPR are assumed under the condition that sensors developed by ESA functioned as expected.

The accuracies of ATLID are based on the information before the change of specifications.

The length of a scene is defined as the length of an orbit divided equally (default : 1scene = 1 orbit)

CPR-ATLID-MSI Synergy Cloud Products and Four Sensors Synergy Radiative Product is the final goal of the EarthCARE mission. Therefore, they are defined as the standard products, although they will be released one year after the start of MOP.

Research L2a&L2b Products

Sensor(s)	処理レベル	Product Name	Primary Parameters	Resolution		Total Volume (/orbit)
				Horizontal	Vertical	
CPR	L2a	CPR one-sensor Doppler Products	Doppler Velocity/Multiple Scattering Effect	1km 10km	0.1km 0.5km	870MB
		CPR one-sensor Rain & Snow Products	LWC*/IWC*/ Rain Rate/Snow Rate			
		CPR one-sensor Vertical Velocity Products	Vertical air motion/ Sedimentation Velocity			
MSI	L2a	MSI one-sensor Ice Cloud Products	Ice Optical Thickness/Effective Radius of Ice/Ice Cloud Top Temperature/Pressure/Altitude	0.5km	-	500MB
		MSI one-sensor Aerosol Products	Aerosol Optical Thickness (Ocean/Land)/ Angstr. Exp.			
ATLID	L2a	ATLID one-sensor Aerosol Extinction Products	Aerosol Extinction Coefficient (Water Soluble/Dust/SS/BC)	1km 10km	0.1km	400MB
BBR	L2a	BBR one-sensor Radiative Flux Products	Radiative Flux at TOA/BOA	10 km	-	1 MB
CPR + ATLID	L2b	CPR-ATLID synergy Particle Mass Ratio Products	Mass Ratio (2D_Ice/IWC)	1km 10km	-	720MB
		CPR-ATLID synergy Rain & Snow Products	LWC*/IWC*/ Rain Rate/Snow Rate		0.1km 0.5km	
		CPR-ATLID synergy Vertical Velocity Products	Vertical air motion/ Sedimentation Velocity			
ATLID + MSI	L2b	CPR-MSI synergy Aerosol Components Products	Aerosol Extinction Coefficient (Water Soluble/Dust/SS/BC)	10km	0.1km	600MB
CPR + ATLID + MSI	L2b	CPR-ATLID-MSI Synergy Cloud Products	Cloud Mask/Cloud Particle Type/Effective Radius (Liquid/Ice)/LWC (with Doppler)/IWC(with Doppler)	1km 10km	0.1km 0.5km	1240MB
			Optical Thick./LWP(with Doppler)/IWP(with Doppler)	1km 10km	-	
		CPR-ATLID-MSI Synergy Rain & Snow Products	LWC*/IWC*/ Rain Rate/Snow Rate	1km	0.1km	
		CPR-ATLID-MSI Synergy Vertical Velocity Products	Vertical air motion/ Sedimentation Velocity	10km	0.5km	
		CPR-ATLID-MSI Synergy Ice Cloud Products	Effective Radius (Ice)/Optical Thickness	0.5km	-	

The length of a scene is defined as the length of an orbit divided equally (default : 1scene = 1 orbit)

* in the table : includes with and without Doppler

1.3. Phases of this RA and EarthCARE Algorithm Development and Validation

This RA covers a 2-year research period from JFY 2013 to JFY 2014, as shown in the schedule in Figure 2. Since this RA period will end before the launch of EarthCARE, JAXA invites proposals that contribute to the preliminary validation study of EarthCARE Standard and Research Products and those that contribute to the preparation of the implementation plan for validation activity after the launch. At the end of the first year, the feasibility and adequacy of the validation plan proposed by each Principal Investigator (PI) will be intermediately reviewed. At the end of the last year, the validation implementation plan must be submitted. Following this RA, JAXA is planning to make an RA for research based on the validation implementation plan according to the result of this RA. Some validation plans may be conducted considering

the collaboration with the ESA. This will be discussed during this RA period and reflected to the validation implementation plan.

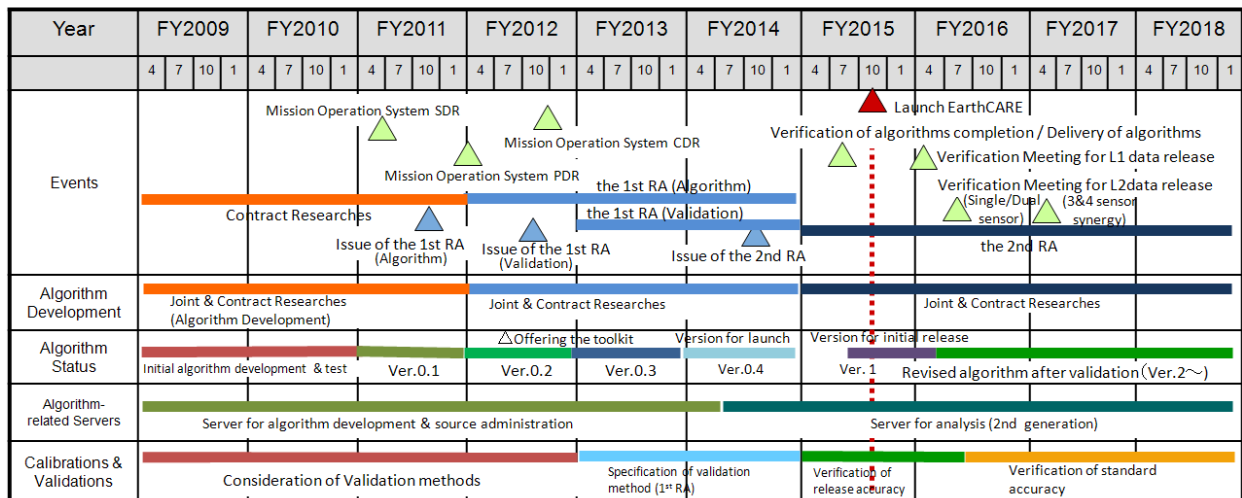


Figure 2. Schedule for the RA and EarthCARE Algorithm Development/Validation Phases

1.4. Role of PI and the RA Policy

For this RA, JAXA will fund about 10 research proposals in relation to the validation. The PIs of the selected 10 research topics will belong to the Japanese EarthCARE science team, and will conduct algorithm development activities in collaboration with JAXA Earth Observation Research Center (EORC). Those selected PIs are expected to join in the meetings organized by JAXA and the corresponding research groups, as well as to attend and make an accomplishment briefing at the workshops held approximately once a year.

Although it is still dependent on the budget status, JAXA is planning to distribute up to approximately 30,000,000 yen, which is the total for all research proposals during the 2-year RA period. As long as they are nonprofit and peaceful organizations, all categories of both domestic and foreign organization may apply to this RA, but funding may differ for each research category and applicant. According to the novelty of the proposed research and the contribution toward the JAXA mission, JAXA will select funded and non-funded PIs, and will distribute the budget after confirming of the appropriateness of the expenses. JAXA funding is basically restricted to domestic PIs. The selection of the proposals will be conducted through a peer-review process that includes discussions in science/project evaluation boards. The official announcement of the selection result is scheduled for February 2013.

2. Technical Description

2.1. Purposes of RA

By recruiting new knowledge and techniques, this RA intends to invite researchers who can efficiently carry out validation activities. The researchers selected in this RA will work in collaboration with JAXA/EORC/EarthCARE group. The selected PIs will belong to the validation team in the Japanese EarthCARE science team.

During the proposal submission, please identify in the proposal, which EarthCARE products the proposed research intends to validate. See Table 2 for the EarthCARE Product List and its accuracy criteria.

2.2. Research Areas

JAXA seeks proposals for the validation. In particular, this RA invites researches that contribute to the validation preliminary study and the preparation of the implementation plan for the validation activity after the launch, because the RA period lasts until one year before the launch of the EarthCARE satellite. Those researches proposals that are expected to conduct validation efficiently by collaborating with other research plans are also taken into account. Researchers (or a group of researchers), who apply to different RAs announced by JAXA, will need to specify in their proposals the percentage of their efforts with other JAXA RAs. Those related research that is externally funded also need to specify the percentage of the efforts. (Also see Section 4.3 “Proposal Contents” for details.)

The EarthCARE mission, through calibration and validation activities, aspires to distribute products whose quality and reliability are assured. Therefore, feasibility studies that quantitatively indicate how to link the observations to the evaluation of the EarthCARE products are required. Furthermore, the validation plans should be highly feasible (i.e., reliable observation instruments and valid data being available, good cost performance being maintained, etc.).

The EarthCARE satellite is on a synchronous sub-recurrent orbit, has global observation coverage, and passes 14:00 mean local solar time on descending (planned at the time of the orbit architecture). It is planned that validation will be conducted during the Initial CAL/VAL Period (up to 6 months after the launch) and the Routine Operations Period (6 months to 3 years after the launch). Currently, the planned recurrence period is 9 or 25 days for the Initial CAL/VAL Period, and 25 days for the Routine Operations Period. See Appendix C for the details of the sensors onboard the EarthCARE.

On any of the themes listed below, research applicants are required to contribute to the preparation of the validation implementation plan by collaborating with JAXA:

(i) Utilization of the existing observation network

The methods to validate EarthCARE products by using long-term/broad coverage data are invited. By using data from observation sites and networks with instruments such as radars, lidars, sky cameras, sky radiometers, sunphotometers, pyranometers, infrared radiometer, and microwave radiometers, JAXA calls for validation research proposals that quantitatively evaluate the product accuracies, as well as the effect of cloud inhomogeneity and errors induced

from satellite sampling on the validation.

(ii) Campaign observation

After the launch, JAXA is planning to conduct campaign observations that aim to compare the satellite products in a more direct way, and call for research proposals that contribute to this activity.

The active sensors on the EarthCARE satellite (i.e., CPR and ATLID; see Appendix C for details) do not have scanning functions, and will pass immediately above the particular regions a few times during the Initial CAL/VAL Period and a few dozen times during the Routine Operation Period.

In this RA, the propositions of the observation instruments are required. Validation research by, for example, radars, lidars, sky cameras, etc and by in-situ instruments onboard balloons or unmanned aerial vehicles is assumed. JAXA is not planning to conduct aircraft observations, although collaboration with aircraft observations conducted by other organizations is possible. Furthermore, marine observations by research vessels are also one of the possibilities.

(iii) Cross comparison with other satellite data

Research proposals on validation by cross comparison of the EarthCARE sensors (see Appendix C for details) with other satellite sensors are invited. For example, the products from CPR onboard CloudSat satellite, CALIOP onboard CALIPSO satellite, VIIRS/CERES onboard Suomi NPP satellite, MODIS/CERES onboard Terra/Aqua satellite, AVHRR onboard NOAA satellite, SGLI after the launch of GCOM-C1 satellite are assumed for this cross comparison.

(iv) Other validation observation, data acquisition

Research proposals that are not listed above in (i) to (iii), such as other validation activities and acquisition and maintenance of observation data, are also welcome. The topic must directly contribute to the EarthCARE validation.

3. Instructions for Responding to this RA

3.1. Qualifications

Researchers from all categories of Japanese domestic organizations, including educational institutions, government offices, public companies, and private enterprises, are free to apply for this RA provided that their proposals are intended for peaceful purposes and have non-commercial objectives.

3.2. Research Agreement Conclusion

Once the proposals are selected, a research agreement should be made between JAXA and the organization to which the Principle Investigator (PI) belongs, using associated terms and conditions to be prepared by JAXA. All applicants should carefully read Section 5, which provides detailed information regarding contract matters; the associated terms and conditions of the research agreement are listed in Appendix D.

3.3. Research Period

The total research period of this RA will be two years from the start of the 2013 Japanese fiscal year (JFY). However, performance will be evaluated on the basis of an interim report at the end of each JFY in order to verify and decide whether the research is to be continued the following year.

3.4. Resources

(1) Funding

JAXA will reserve funds to support selected proposals. The basic policy for funding is as follows:

- A) Based on the purpose of this RA, funding will be mainly available within JAXA's budget limit.
- B) JAXA funding is basically restricted to domestic PIs.
- C) JAXA funding is restricted to the direct cost of research ("Direct Cost") and does not cover any overhead, indirect, or general costs whatsoever ("Overhead Cost") of the organization to which an applicant belongs. However, if this is impossible or requires special procedures, an applicant may fill in the prescribed remarks column of the Resource Requirement (Appendix B) as such.
- D) If funding is not available for an applicant, they may be selected as a non-funded PI upon consultation with JAXA.

(2) Earth observation satellite data by JAXA

Any Earth observation satellite data necessary for conducting research owned by JAXA will be provided free of charge within the limitations of JAXA's distribution capability. Available data are listed in APPENDIX B. Those who receive Earth observation satellite data shall comply with the terms and conditions described in the chapter titled "Provision of Earth Observation Satellite Data by JAXA" in the research agreement.

3.5. Obligations

PIs have different obligations depending on their funding status:

- (1) Funded PIs shall submit to JAXA an interim report on their results at the end of each JFY and a final report at the end of the two-year research period. Funded PIs are also required to participate in the accomplishment debriefing meeting organized by JAXA once a year to deliver a presentation on the progress of their research. PIs must cover the necessary travel expenses for participating in this meeting using funds provided by their RA.
- (2) Non-funded PIs shall also submit an interim report and a final report. However, such reports can be substituted with papers published during the term. PIs shall also report on the progress of their research either through presentations at JAXA workshops and meetings or in writing at least one (1) month before the annual evaluation. Support for travel expenses will be decided by JAXA on a case-by-case basis, depending on the research's content, results, and progress.

3.6. Selection

Selection of proposals will be based on a peer-review process and discussions held by science/project evaluation boards. The final decisions will be made by the JAXA selection officials. The principal elements considered in evaluating a proposal are its relevance to the objectives, intrinsic merit, and cost. Evaluation of its intrinsic merit includes equal consideration of the following factors:

- (1) Overall scientific and technical merit of the proposal, or the demonstration of unique and innovative methods, approaches, or concepts
- (2) Proposer's capabilities, related experience, facilities, techniques, or unique combinations of these integral factors for achieving the proposal's objectives
- (3) The qualifications, capabilities, and experience of the proposed PI and CI
- (4) Overall standing among similar proposals and/or evaluation against state-of-the-art techniques

3.7. Late Proposals

Proposals or modifications received after the date specified in this RA may be considered if the selecting official deems them to offer JAXA a significant scientific and/or technical advantage or cost reduction.

3.8. Withdrawal of Proposal

Proposals may be withdrawn by the applicant until the agreement is made, but JAXA must be notified immediately. After making an agreement, the procedure is based on Appendix D.

3.9. Cancellation and Postponement

JAXA reserves the right to cancel the RA via notice, to be delivered by JAXA. In addition, JAXA assumes no liability for cancelling the RA or for postponing the RA schedule.

3.10. Important Dates

August 28, 2012	Research Announcement issued
<u>November 19, 2012</u>	<u>Proposal Due Date</u>
February, 2013	Notification of Selection Results

3.11. Proposal Submission and Contact Point

Proposals with complete sets of attachments, such as reprints of papers, should be converted to **PDF and sent via email** to the EarthCARE RA Office. The maximum file size acceptable by email is 10MB.

Email address of EarthCARE RA Office: EarthCARE_CNT@jaxa.jp

In case of difficulty sending submissions via email, five copies of both proposals and the complete set of attachments should be sent via postal mail to:

Mr. Kazuhide Yamamoto (EarthCARE RA Office)
Earth Observation Research Center (EORC)
Tsukuba Space Center
Japan Aerospace Exploration Agency
2-1-1, Sengen, Tsukuba, Ibaraki, 305-8505, Japan

The point of contact is:

Mr. Kazuhide Yamamoto (EarthCARE RA Office)
Earth Observation Research Center
Tel: +81-50-3362-6270
Fax: +81-29-868-2961
E-mail address: EarthCARE_CNT@jaxa.jp

4. Instructions for Proposal Content

4.1. General

- (1) Proposals received in response to this RA will be used only for evaluation purposes.
- (2) The following types of proposals are not acceptable:
 - A) Proposals that include restrictions or patents from other institutions
 - B) Proposals that have distribution or publication restrictions.
- (3) Proposals will not be returned to applicants.

4.2. Format

- (1) It is highly recommended that applicants send their proposals and complete sets of attachments, such as reprints of papers, in **PDF format via email.**
- (2) Forms for cover sheets, work plans, and resource requirements can be found in Appendices A and B. No mandatory formats are applied to other parts of the proposal except the following:
 - A) The page or paper size should be A4;
 - B) The page number must appear at the middle of the bottom of each page, and the name of the applicant must appear in the upper right-hand corner; and
 - C) Proposals should be word-processing documents in English, with a font size not smaller than 12 points.
- (3) Proposals should be concise and to the point, concentrating on substantive materials. The main body of the proposal should not exceed 20 pages in length. Pieces of necessary information, such as reprints, should be included as attachments. A complete set of attachments must accompany each copy of a proposal when submitting via email.

4.3. Proposal Contents

(1) Cover sheet

A) Research title

State your research title precisely and clearly. The title should be brief, and should reflect an especially valid project. It should be intelligible to a science-literate reader and suitable for use in the public process.

B) Research category

Choose the relevant category to which the proposal belongs.

D) Information of applicants

- Identifying information of PI.

State the name, job title, organization, address, email address, telephone number, and facsimile number of the PI.

- Identifying information of co-investigator.

State the name, organization, telephone number, and email address of each co-investigator (CI). Each research team should consist of only one PI, or one PI and several CIs.

E) Budget

Provide a two-year budget: it should be broken down by each year in addition to the total amount in Japanese Yen for the two-year period (from JFY 2013 through 2014).

F) Endorsement

The signature of a responsible official or authorized representative of the proposing organization should be provided.

(2) Abstract

Include a concise, one-page abstract describing the objectives, significance, method of approach, and anticipated results.

(3) Description of proposal

This is the main body of the proposal and it should not exceed 20 pages in length. It should include the following: a detailed statement of the work to be undertaken, including its objectives and significance; its relation to the present state of knowledge; and its relationship with previous work done on the project and related work in progress elsewhere. The proposal should especially detail what observation equipment and data will validate accuracies with which EarthCARE products and variables. The statement should outline the plan of work, including a broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation criteria in these instructions and any specific factors in the RA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is prohibited.

(4) Work plan (Research schedule)

The research schedule should be outlined in the form indicated in Appendix A.

(5) Management approach

For large or complex efforts involving interactions among numerous individuals or other organizations, plans for the distribution of responsibilities and arrangements to ensure a coordinated effort should be described.

(6) Personnel

- A) Biographical information, experience, papers in related fields: A short biographical sketch, a list of publications, experiences related to the RA, and professional qualifications of the PI should be included. Similar biographical information on each CI should also be provided.
- B) Role of CI: The PI is responsible for supervising the work and CIs in the research. State each CI's role in the proposed research.

(7) Resource requirements

Resource requirements should be described in the form indicated in Appendix B. Information relating to required resources will be considered during the selection process. After deciding the total amount of funding for each PI, JAXA will send further forms concerning detailed resource requirements to selected PIs. This will determine final adjustments of funding. Before beginning the second year, JAXA will send the same forms for resource requirements again. Instructions for the budget summary and data request are also included in Appendix B.

5. Description of Research Agreement

5.1. Contractual Procedure

- (1) After selecting the proposal and the PI, JAXA will send the PI guidelines and an application form to make an agreement. Please note that JAXA will make an agreement with the organization to which the PI belongs (“the Research Organization”), not with the PI or CI.
- (2) A research agreement will be made in accordance with the associated terms and conditions, attached herein as Appendix D. The Research Organization shall submit the application form with the necessary documents according to the guidelines before the submission due date. The submission of an application form will be regarded as a definite intention to make an agreement with JAXA in full consent to all of the terms and conditions stipulated in Appendix D. The agreement will be effective upon issuance of the confirmation sheet by JAXA.
- (3) In the case of funded PIs, the research agreement is made on a single-year basis. If JAXA determines that an extension of a research project is justified by the annual evaluation at the end of the JFY, the research agreement will be extended for one year, but no later than March 31, 2015. Funded organizations should submit a continuing agreement application form to JAXA at the beginning of every JFY.
- (4) In the case of non-funded PIs, the research agreement is made on a two-year basis. If JAXA determines that an extension of a research project is not justified at the annual evaluation at the end of the JFY, the research agreement will be dissolved.
- (5) The Research Organization shall comply with the terms and conditions defined in the research agreement.

5.2. Research Agreement Summary

There are two types of associated terms and conditions for research agreements, based on the applicable category of research: Commissioned Research Agreements and Collaborative Research Agreements. There are also two types of agreements for Collaborative Research Agreement: funded or non-funded.

(1) Commissioned Research Agreement (Funded)

- In principle, the Commissioned Research Agreement will be applied to research that develops “standard algorithms.” The Research Organization shall conduct research according to the Statement of Work provided by JAXA.
- JAXA will provide the Research Organization with the necessary funds and datasets to conduct the research, as described in the Statement of Work.
- JAXA will own all research results that the Research Organization delivers to JAXA, in accordance with the Statement of Work (Deliverable Research Results). The Research Organization shall assign to JAXA all Program/Data Copyrights obtained under this Agreement. This includes, but is not limited to, the right to translate, transform, or otherwise adapt works and the right to use derivative works.
- JAXA will retain royalty-free rights to use all results derived from these research activities, other than Deliverable Research Results, only for its own research and development purposes.
- In the event JAXA provides prior written consent, the Research Organization may use the Deliverable Research Results for its own research and development purposes.

- If the agreement is terminated, the Research Organization shall refund to JAXA any unexpended research funds that have already been paid by JAXA.

(2) Collaborative Research Agreement (Funded/Non-funded)

- In principle, the Collaborative Research Agreement will be applied to research that develops “research algorithms.”
- JAXA will provide the Research Organization with the funds (for funded cases) and datasets necessary to conduct the research.
- In principle, the research results will be jointly owned by the parties: the share of ownership shall be determined in proportion to the contribution of the parties.
- JAXA will retain the right to use all results, including results belonging to the Research Organization (if any), and the Research Organization will retain the right to use jointly owned research results. Results will only be used for each party’s own research and development purposes without prior consent of the other.

The difference between funded and non-funded agreements are as follows:

- Collaborative Research Agreement (Funded)
JAXA provides part of the research funds and the datasets. The Research Organization shall submit an interim report and a final report to JAXA, and shall participate in the workshops to report research progress. The submission of program algorithms will be followed in accordance with the statement in Section 2.2.1. If this agreement is cancelled or terminated, the Research Organization shall refund to JAXA any unexpended funds that have already been paid by JAXA.
- Collaborative Research Agreement (Non-funded)
JAXA provides only the datasets. The Research Organization shall submit an interim report and a final report to JAXA. However, such reports can be substituted with papers published during the research period. The submission of program algorithms will be followed in accordance with the statement in Section 2.2.1 is recommended. PIs shall also report research progress (“Research Progress”) either through a presentation at the workshops and meetings that JAXA holds, or in writing at least one (1) month before the annual evaluation.

(3) Publication of results

A PI who wishes to release his or her research results derived from these research activities to a third party shall

- Provide JAXA with a copy of the publication before release;
- Obtain the written consent of JAXA in advance;
- State in the publication that he or she obtained the results through participation in this RA research, and identify the owner of the rights to the Earth Observation Satellite Data and Meteorological Data used in any such publication; and
- Grant JAXA an irrevocable and royalty-free right to use any provided publications, unless an academic society responsible for its publication requires the PI to transfer the copyright to it.

APPENDIX A

PROPOSAL COVER SHEET AND SCHEDULE

Proposal Cover Sheet
JAXA EarthCARE Research Announcement

Proposal No.	_____ (Leave Blank for JAXA Use)								
Title									
Products intended for validation (check all that apply)	Class	CPR	ATLID	MSI	BBR	CPR/ATLID	ATLID/MSI	CPR/ATLID/MSI	4-sensor-synergy
	Standard Product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>
	Research Product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-

Principal Investigator

Name		Job Title	
Department			
Institution			
Address			
Country			
E-mail			
Telephone			
Facsimile			

Co-Investigator

Name	Institution	Telephone	E-mail

Budget (yen in thousands)

JFY2013	JFY2014	TOTAL

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(Leave Blank for JAXA Use)

Authorizing Official: _____
(Name and Title) (Institution)

Research Schedule

JFY	2013				2014			
Month	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3
Milestone								
Activities								

(1) Research Funding Applied for					
Funding System e.g. JAXA, JSPS etc.	Research Title (PI name)	Role e.g. PI or CI	Budget (throughout the period) (thousands of yen)	Effort (%)	Differences in Research and Reasons for Additional Application for This Research
(About this research) EarthCARE 1st RA(Validation) (JFY2013-2014)					
(2) Research Funding to Be Provided					
(3) Other activities					
Total (Total of the effort in (1), (2), and (3) above)				100 (%)	

APPENDIX B

RESOURCE REQUIREMENTS

BUDGET SUMMARY

1. Personnel Expenses (unit: yen in thousands)

	2013	2014	Total

2. Purchases

2.1 Computers / Peripheral Equipment (unit: yen in thousands)

ITEM	2013	2014	Total

2.2 Software (unit: yen in thousands)

ITEM	2013	2014	Total

2.3 Expendable Materials and Supplies (unit: yen in thousands)

ITEM	2013	2014	Total

3. Subcontracts (unit: yen in thousands)

ITEM	2013	2014	Total

4. Travel Expenses (unit: yen in thousands)

Departure Point – Destination	2013	2014	Total

5. Observation Equipment (unit: yen in thousands)

ITEM	2013	2014	Total

6. Satellite Data (unit: yen in thousands)

Name of Satellite / Sensors	Distributor	Purpose	Cost		
			2013	2014	Total

7. Other Data (unit: yen in thousands)

Name of Data Sets	Distributor	Purpose	Cost		
			2013	2014	Total

8. Others (unit: yen in thousands)

ITEM	2013	2014	Total

TOTAL (unit: yen in thousands)			
---------------------------------------	--	--	--

* Remarks “Overhead Cost” (q.v. 3.4(1)C) of this RA)

Please check either of the following boxes:

☐ Unnecessary

☐ Deductible with special procedures (e.g. submission of certain application form from JAXA)

☐ Indispensable (Reason(s):

)

BUDGET SUMMARY (*EXAMPLE*)

1. Personnel Expenses (unit: yen in thousands)

	2013	2014	Total
<i>Part-time job for DSD data analysis</i>	320 (40x8)	160 (20x8)	480

2. Purchases

2.1 Computers / Peripheral Equipment (unit: yen in thousands)

ITEM	2013	2014	Total

2.2 Software (unit: yen in thousands)

ITEM	2013	2014	Total

2.3 Expendable Materials and Supplies (unit: yen in thousands)

ITEM	2013	2014	Total
<i>8mm tape (112m)</i>	50	50	100
<i>CD-R</i>	100	120	220
<i>MO (640MB)</i>	15	10	25
<i>A4 Paper (package of 500 sheets)</i>	2	1	3
<i>CD-RW Drive</i>	50		50

3. Subcontracts (unit: yen in thousands)

ITEM	2013	2014	Total
<i>Software development for DSD data analysis</i>	1,500	600	2,100

4. Travel Expenses (unit: yen in thousands)

Departure Point – Destination	2013	2014	Total
Tokyo - Washington, D.C.	650	700	650
Tokyo - Paris	700	700	1,400
Tokyo - Paris		52	700
Tokyo - Osaka			52

5. Observation Equipment (unit: yen in thousands)

ITEM	2013	2014	Total
Micro Rain Radar	1,500		1,500

6. Satellite Data (unit: yen in thousands)

Name of Satellite / Sensors	Distributor	Purpose	Cost		
			2013	2014	Total

7. Other Data (unit: yen in thousands)

Name of Data Sets	Distributor	Purpose	Cost		
			2013	2014	Total

8. Others (unit: yen in thousands)

ITEM	2013	2014	Total

TOTAL (unit: yen in thousands) (Except “4.Travel Expenses”)	4,887	2,393	7,280
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JAXA DATA REQUIREMENTS

1. JAXA-Archived Satellite Data Sets

(ADEOS, JERS-1, ERS, MOS, TRMM, Aqua, ADEOS-II, ALOS, GOSAT)

Name of Satellite / Sensor	Quantity (scenes)	Purpose

B.1 Instructions for Budget Summary

Provide a budget summary by cost element (Personnel Expenses, Computers/Peripheral Equipment, Software, Expendable Materials and Supplies, Subcontracts, Travel Expenses, Observation Equipment, Satellite Data, Other Data, and Others), sorted by Japanese fiscal year as in the example attached to this form. An annual summary budget should also appear on the last line.

(1) Personnel Expenses

Enter expenses for part-time workers here as the total cost calculated by multiplying the unit cost per day by the number of days. For part-time workers, use your own cost estimates.

(2) Computers/Peripheral Equipment/Software

Enter the lease and rental cost of computers and/or peripheral equipment. Note that JAXA has the right to change specifications of all equipment. Also enter the cost of software here.

(3) Expendable Materials and Supplies

Enter the quantity of each item, following the example.

(4) Subcontracts

Provide the cost of subcontracts to outside companies or organizations here.

(5) Travel Expenses

Describe proposed domestic and/or international travel including information on destination and number of days/number of times (or travelers).

(6) Observation Equipment

Enter costs of observation equipment including installation cost.

(7) Satellite Data

Investigators requesting satellite data other than JAXA-owned or archived data (listed in the next section) should provide cost information here.

(8) Other Data

Enter costs for data other than satellite data.

(9) Others

Enter costs for publication and others here.

B.2 Instructions for Data Requirements

JAXA owns satellite data as listed below. JAXA will provide requested data judged necessary for the proposed research, subject to availability of data processing.

- Marine Observation Satellite (MOS) (only around Japan)
- European Remote-sensing Satellite (ERS)-1, 2 (only around Japan; for Japanese researchers only; available until JFY2002)
- Japanese Earth Resources Satellite (JERS)-1 (global)
- Tropical Rainfall Measuring Mission (TRMM)
- Advanced Earth Observing Satellite (ADEOS)
- Advanced Microwave Scanning Radiometer for EOS (AMSR-E) aboard EOS-Aqua Satellite
- Advanced Earth Observing Satellite-II (ADEOS-II)
- Advanced Land Observing Satellite (ALOS) (10 scenes from JAXA archives)
- Greenhouse gases Observing SATellite (GOSAT)

Data availability can be checked on JAXA's Earth Observation Satellite Data Distribution Service (linked from EORC website, <http://www.eorc.jaxa.jp/en/about/distribution/index.html>).

APPENDIX C OVERVIEW OF THE EARTH CLOUD, AEROSOL AND RADIATION EXPLORER (EarthCARE) MISSION

1. Introduction

1.1 Cloud and Climate Change

Since the last report of IPCC (Third Report), the level of scientific understandings regarding the effect of aerosols and clouds, show a good progress. From the most recent report (Fourth Assessment Report; FAR), carbon dioxide is said to be the largest factor to the influence of the global warming. However, the effect of carbon dioxide to the global warming is considered to have been evaluated with a good accuracy. On the other hand, the radiative forcing of clouds and aerosols still remains as the dominant uncertainty in the prediction of the climate change in the future. It is reported that -0.5 W/m^2 for aerosol direct effect and -0.7 W/m^2 for cloud albedo effect, -1.2 W/m^2 as total aerosol, are counted for radiative forcing relating with aerosol/cloud. The figure is large enough comparing with the total anthropogenic radiative forcing; $+1.6 \text{ W/m}^2$. We have to make a special attention to the fact that the uncertainty of the cloud albedo effect, i.e. interactions between aerosol and cloud, is very large; 2 W/m^2 . This leads, without the correct understanding of the interaction between aerosol and cloud, climate change to remain uncertainties to predict future status with sufficient accuracy.

Furthermore, FAR suggests that the cloud life cycle process should be examined not just for cloud forming but also for the precipitation process or cloud termination process, which will affect global radiation budget through latent heat release and changing the radiative characteristics of the ground surface by such as snowing (IPCC, 2007).

1.2 EarthCARE mission and instruments

Japanese Aerospace Exploration Agency (JAXA), National Institute of Information and Communications Technology (NICT) and European Space Agency (ESA) are going to materialize a project named “Earth Cloud, Aerosol and Radiation Mission; EarthCARE”. EarthCARE is a challenging mission toward to solve the issues noted in the previous section. The observation scope of the EarthCARE is to observe globally such processes; the aerosol distribution, cloud forming with aerosol interaction and beginning of precipitation. To materialize such observation, four instruments were chosen, with their respective needs, to load on EarthCARE; LIDAR (light detection and ranging) and Doppler Radar for the aerosol/cloud profile observation, multi spectral imager (MSI) for aerosol/cloud lateral distribution observation and broadband radiometer (BBR) for Earth radiative flux observation. The observations by these instruments guarantee their synchronism and their uniformity in the observation region. In other word, more accurate synergy observations are preserved, by minimizing the differences in the condition of the observations between the instruments, resulted from such as the differences in the timing of the observation. The relationship between target geophysical parameters and instruments is shown in figure 1. The final goal of the mission is to reconstruct aerosol cloud structure with their physical characteristics with the accuracy of 10 W/m^2 as radiative flux at top of atmosphere (ESA,2004, Gelsthorpe et.al., 2008).

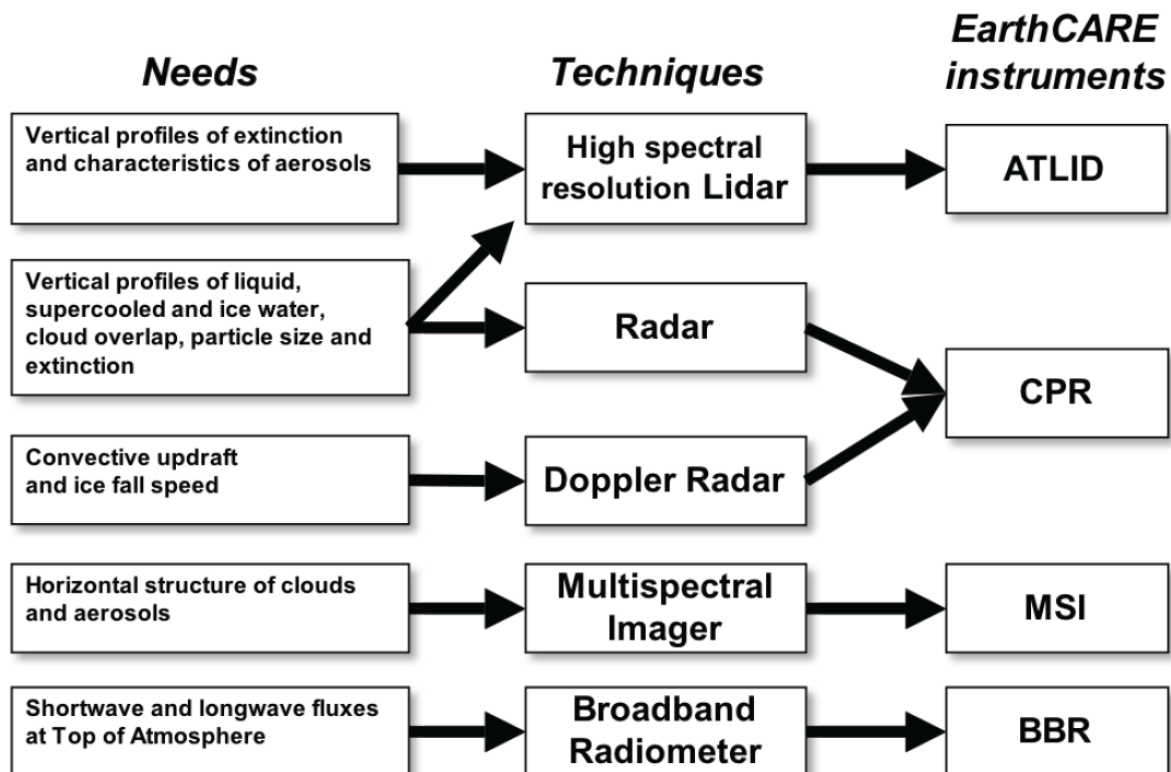


Figure 1 Relationship between target geophysical parameters and instruments

The outlook of EarthCARE satellite and CPR are shown in figure 2. A sun synchronous orbit was chosen as the observational orbit to cover all region of the Earth. Local time at equator of the orbit is 13:45 to 14:00 with consideration of cloud processes being active in the afternoon.

To get the accurate aerosol/cloud observation data, several unique points are implemented for instrumentation. The LIDAR is an Ultra Violet range single wavelength High Spectral Resolution LIDAR. The wavelength, 355 nm, has well sensitivity for the small aerosol particles that are missed by Radar, and make high transmit power possible for its eye safe character. It is possible for the LIDAR signals to be strongly attenuated when they meet dense regions composed by large particles such as clouds. High spectral resolution enables to receive Mie and Rayleigh scattering signals independently. In this way, the optical properties of aerosols can be retrieved directly, without an assumption of lidar ratio. Through its polarization measurement, the depolarization ratio can be calculated to estimate the nonsphericity of the observed particle. Doppler W-band Radar penetrates thick cloud layers. Doppler measurement function distinguishes cumulus / convective cloud types and its particle status inside of cloud layer. Using Doppler value, we precisely know kinds of cloud particles. The detailed description of the Doppler Radar is noted in Section 2.1. The MSI has 7 channels with their central wavelengths to be 0.67, 0.865, 1.65, 2.21, 8.8, 10.8 and 12.0 μm , respectively. These channels will be used with split window method to get optical depth and effective radius of cloud and aerosols. Thermal infrared channel can be used to retrieve the cloud top height. The ground resolution of MSI is 500 m^2 and the swath width is 150 km. BBR design is a heritage of past Earth Radiation Mission, such as ERBE or CERES. BBR has two channels; one for the observing shortwave (0.25 ~ 4 μm) and the other for longwave (4 ~ 50 μm). Three angle radiometer will be used for flux determination considering its angular distribution. The effect of cloud forcing by the reflection of sunlight as well as by its emittance of longwave radiation are expected to be evaluated from the BBR observation. General characteristics for all four instruments are shown in Table 1.

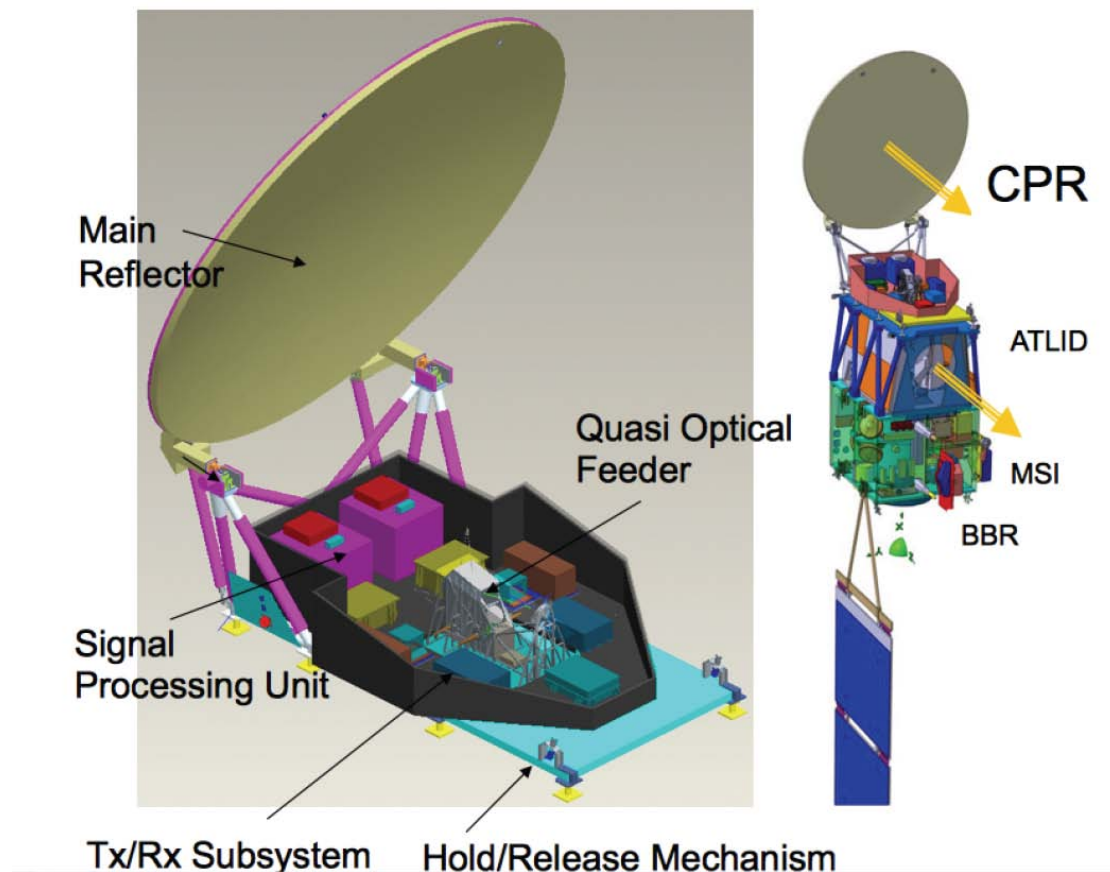


Figure 2. Outlook of CPR and EarthCARE satellite

Table 1 General characteristic of instruments

Instrument	Description
CPR	94 GHz Doppler Radar (see Table 2.)
ATLID	355 nm Hyper Spectral Resolution Lidar with three channels (Mie co-polar, Rayleigh, Mie cross-polar)
MSI	Push broom imager Resolution 500m, swath 150 km Seven channels (0.67, 0.865, 1.65, 2.21, 8.8, 10.8, 12.0 micron)
BBR	Three views radiometer Angle: Nadir, +/- 55 deg Two channels; 0.2–4, 4–50 micron

2. Doppler Cloud profiling RADAR

The new space borne radar; Cloud Profiling Radar (CPR) is going to be developed in the cooperation between JAXA and NICT. From CPR observational requirements, we identified following design requirements. First point is the high sensitivity. This requirement is divided into large antenna size requirement, low noise figure of receiver requirement and high power of transmitter requirement. Second point is the Doppler capability. To materialize this function with satisfactory accuracy, large diameter of antenna with precise surface figure and high pulse repetition frequency (PRF) are required. To keep accuracy especially at boundary layer region, several other fine characteristics, such as side lobe characteristics of antenna, cross polarization characteristics and so on, are also required for CPR design.

As the result of design, we chose pulse pair scheme for Doppler measurement. In addition, the diameter of antenna was set as 2.5 m considering the limited diameter of launcher fairing. For transmitter, we employed improved Extended Interaction Klystron (EIK), of which original model is already employed for CloudSAT mission by NASA (Stephens et.al., 2002). The transmit power is 1.5 kW at end of three year mission. For PRF design, CPR has variable control capability of PRF with satellite altitude information. This is for maximizing frequency to keep good coherency between radar pulses, also good sensitivity by having much integration. Outlook of CPR is shown in Figure 2 and major specification of CPR is shown in Table 2.

However, the PRF is a factor of trade off between observational heights. Considering the natural cloud height distribution, the planned operation of CPR is to change observational height with latitude. As natural cloud height distribution, for low latitude region, the cloud height is rather high; in contrast, the polar region cloud height is rather low. The image of CPR operation is shown in Figure 3.

Table 2. General Specifications of CPR

Item	Specification
Radar Type	94 GHz Doppler Radar
Center frequency	94.05 GHz
Pulse width	3.3 micro second (equivalent to 500m vertical resolution)
Beam width	0.095 deg
Polarization	Circular
Transmit power	> 1.5 KW (Klystron spec.)
Height range	-0.5 ~ 20 km
Resolution	500 m (100 m sample); Vertical 500 m integration; Horizontal
Sensitivity*	-35 ~ +21 dBZ
Radiometric accuracy*	< 2.7 dB
Doppler range*	- 10 ~ +10 m/s
Doppler accuracy*	< 1 m/s
Pulse repetition frequency	Variable; 6100 ~ 7500 Hz
Pointing accuracy	< 0.015 degree

; at 10 km integration and 387 km orbit height

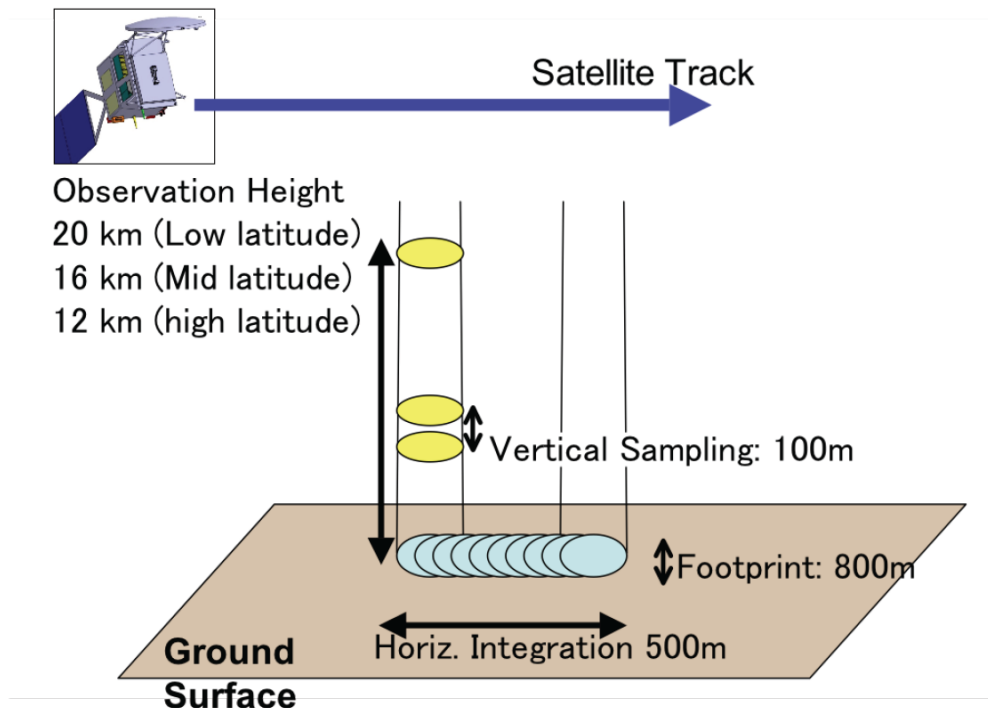


Figure 3. CPR Operation Image

3. Operation Planning

EarthCARE is planned to be launched in JFY2015. The calibrated engineering parameters (Level 1 data) and the retrieved physical parameters (Level 2 data) by all four sensors on EarthCARE will be stored and distributed from both JAXA and ESA. Data are planned to be used by research institutes and agencies in order to improve the accuracies of numerical weather/climate models. The data are also opened to researchers (after appropriate procedures), and are used in the analysis of radiation/aerosol/cloud/precipitation process.

REFERENCES

EarthCARE – Earth Clouds, Aerosols and Radiation Explore Mission Report, ESA SP-1279(1).2004, available from http://esamultimedia.esa.int/docs/SP_1279_1_EarthCARE.pdf

RV. Gelsthorpe, A. Heliere, A. Lefebvre, J. Lemanczyk, E. Mateu and K. Wallace, "EarthCARE and its payload", *Proc. SPIE*, Vol. 7152, 2008

T. Kimura and H. Kumagai, "Japanese Cloud Profiling RADAR for EarthCARE", *Proc. 26th ISTS*, Hamamatsu 2008

T. Kimura, H. Nakatsuka, K. Sato, Y. Sakaide, Y. Seki, K. Okada, N. Takahashi, Y. Ohno, H. Horie, "EARTHCARE MISSION WITH JAPANESE SPACE BORNE DOPPLER CLOUD RADAR; CPR", *Proc. ISPRS Technical Commission VIII symposium*, 2010.

APPENDIX D

ASSOCIATED TERMS AND CONDITIONS OF RESEARCH AGREEMENTS (FOR THE EARTHCARE RESEACH ANNOUNCEMENT)

COMMISSIONED RESEARCH AGREEMENT FOR THE EARTH CLOUD, AEROSOL AND RADIATION EXPLOERE BETWEEN THE JAPAN AEROSPACE EXPLORATION AGENCY AND THE RESEARCH ORGANIZATION (D-2 ~ D-18)

COLLABORATIVE RESEARCH AGREEMENT (FUNDED) FOR THE EARTH CLOUD, AEROSOL AND RADIATION EXPLOERE BETWEEN THE JAPAN AEROSPACE EXPLORATION AGENCY AND THE RESEARCH ORGANIZATION (D-19 ~ D-35)

COLLABORATIVE RESEARCH AGREEMENT (NON-FUNDED) FOR THE EARTH CLOUD, AEROSOL AND RADIATION EXPLOERE BETWEEN THE JAPAN AEROSPACE EXPLORATION AGENCY AND THE RESEARCH ORGANIZATION (D-36 ~ D-50)

COMMISSIONED RESEARCH AGREEMENT
FOR THE EARTH CLOUD, AEROSOL AND RADIATION EXPLORER
BETWEEN THE
JAPAN AEROSPACE EXPLORATION AGENCY (JAXA)
AND
THE RESEARCH ORGANIZATION
(FOR THE RESEARCH ANNOUNCEMENT)

JAPAN AEROSPACE EXPLORATION AGENCY

COMMISSIONED RESEARCH AGREEMENT

WHEREAS, JAXA issued the Research Announcement ("RA") to engage in research activities directly related to product validation of the Earth Cloud, Aerosol and Radiation Explorer ("EarthCARE"), and the Research Organization applied pursuant to such RA;

WHEREAS, JAXA accepted the Research Organization's proposal that was in response to the RA, delivered the confirmation sheet to the Research Organization and JAXA further desires to utilize such proposal in JAXA's project; and

WHEREAS, JAXA desires to commission the Research Organization to engage in the above research activities.

NOW, THEREFORE, in consideration of the mutual agreements hereinafter set forth, and for other good and reasonable consideration, the receipt and adequacy of which are hereby acknowledged, the Parties hereby agree as follows:

Article 1. Definition

1. The following capitalized terms in this Agreement shall have the following meanings.
 - (1) "Research Results" means the technical results and scientific knowledge derived from the implementation of the Research Projects pursuant to this Agreement, including all inventions, ideas, designs, literary works, algorithms (e.g. Technological development accompanied by Program/Data to embody such algorithms), and technical know-how.
 - (2) "Industrial Property Rights" means all domestic and foreign patents, utility models and industrial designs.
 - (3) "Commissioned Research Plan" means the plan described in Attachment 1 of the Application Form for the EarthCARE Research Announcement Commissioned Research Agreement (hereinafter "Application Form").
 - (4) "Research Period" means the research period as described in the Commissioned Research Plan. In accordance with the provisions of this Agreement, in the event that the Agreement ended prior to the completion date of the research originally set, the date the Agreement ends shall be read as the research period.
 - (5) "Annual Evaluation" means JAXA's annual review, which is carried out by JAXA before the end of the Japanese fiscal year during which the Agreement was concluded. At the end of each fiscal year, the review is conducted through the RO's presentation at workshops and meetings as well

as based on the Progress Report.

- (6) “Earth Observation Satellite Data” means data sets obtained from satellites, which are retained by JAXA at the time of execution of this Agreement. The available data sets including names of satellites or sensors, observation period that can be offered, and observation areas listed in the Attachment of this Agreement.
- (7) “Meteorological Data” means the data provided by the Japanese Meteorological Agency.
- 2. In this Agreement, “Invention etc.” contains multiple meanings: When it is a subject of patent rights it refers to an invention; when it is a subject of a utility model it refers to an idea; when it is a subject of the rights for industrial design, literary work of program and database, it refers to a creation; when it is a subject of algorithm and technological know-how it refers to proposition.
- 3. In this Agreement, “utilization” of Industrial Property Rights and Research Results refer to the acts specified in paragraph 3 of Article 2 of the Patent Act, paragraph 2 of Article 3 of the Utility Model Act, paragraph 3 of Article 2 of the Design Act, and Article 21 and 27 of the Copyright Act (including the use of the secondary publication created by JAXA), as well as the use of algorithm and technical know-how.
- 4. In this Agreement, “PI” (Principal Investigator) refers to the person who submitted the research proposal to this Research Announcement and who is also the RO employee selected to be responsible for the implementation of the accepted Research Project. “CI” means “Co-Investigator” who supports the research activities represented by the PI. Name of the PI and CI (hereinafter “Commissioned Researchers”) and their affiliated organization will be shown in the “Commissioned Research Plan”.

Article 2. Purpose and Scope of Research Projects

The RO shall implement the following tasks.

- (1) The RO shall conduct the research activities (“Research Projects”) in accordance with the Statement of Work issued by JAXA (“Statement of Work”) and the Commissioned Research Plan.
- (2) The RO shall respond to requests from JAXA and attend required meetings hosted by JAXA such as the workshop at the end of each fiscal year.
- (3) The RO shall report the Research Results and progress of the research at the annual workshops and meetings hosted by JAXA.
- (4) Each year before the end of the Agreement Period, the RO shall deliver JAXA the Research Results acquired during the effective term of the Agreement in the form of a Progress Report in accordance with the Statement of Work. The Progress Report shall contain the deliverable Research Results specified in the Statement of Work. In addition, upon the completion of the research period, the RO shall deliver JAXA the Progress Report regarding the Research Results

acquired during the whole of the commissioned research period. In such a case, the RO will not be required to deliver another Progress Report for the final year of the Agreement.

Article 3. Effective Term and Renewal

The Agreement shall be concluded upon the acceptance through the issuance of the Confirmation Sheet by JAXA for the application submitted by the RO using the application form, and the Agreement shall become effective as per the date prescribed on the Confirmation Sheet issued by JAXA and shall continue to be in effect until the end of the present Japanese fiscal year (“Agreement Term”). However, the Agreement Term shall be renewed for one Fiscal Year provided that JAXA approves an extension of the research period in the Annual Evaluation; provided, however, that the Parties mutually agree upon the amount to be paid by JAXA for the extended period; further provided, however, the RO shall submit a renewal Application Form to JAXA and JAXA shall approve by issuing a new Confirmation Sheet. Thereafter the procedure shall be the same as above.

Article 4. Annual Evaluation

1. JAXA shall conduct an Annual Evaluation regarding the contents of the Agreement fairly at the end of the Agreement Term.
2. In the event that the results of the evaluation was a fail in the Annual Evaluation, the provisions in Article 29 (“Incompleteness of Performance”) shall be applied.

Article 5. Commissioned Researchers

1. The RO shall let the researchers listed in the Commissioned Research Plan engage in this commissioned research.
2. The RO shall undertake necessary measures to ensure that all the commissioned researchers comply with the contents of the Agreement.
3. In the event that the RO intends to add new CIs, the RO shall obtain prior written consent from JAXA and the RO shall undertake necessary measures to ensure that such personnel comply with the contents of the Agreement.
4. In the event that the PI dies, retires from the RO, takes a leave of absence from work, or can no longer engaged in the RO for any other reasons, JAXA may terminate this Agreement. Provided, however, if the RO designates a researcher who belongs to the RO as the PI’s successor and JAXA approves the succession, the parties may amend this Agreement, with the succeeding researcher being a new PI. The terms and conditions of the amendment to this Agreement shall be determined separately upon mutual consultation and consent.

Article 6. Prohibition of Re-commission

1. The RO shall not commission the whole Research Projects to a third party (hereinafter “Subcontract”). The RO may, however, subcontract part of it upon prior written application to JAXA and approval from JAXA. Should there be a case where subcontractors further re-commission the Research Projects to a third party, the company name, address and scope of business of such third party are required to be submitted to the RO in writing.
2. If the RO subcontracts the Research Projects in accordance with the preceding paragraph, any act of all the third parties involved in the subcontract, which includes a contractor and commissioned party of the RO, re-commissioned party, subcontractor and supplier at any tier, in connection with the subcontractor shall be deemed to be an act of the RO and the RO shall be responsible therefor.
3. In the event that the RO subcontract part of the Agreement, the RO shall enter an agreement with the subcontractor regarding the items necessary for the RO to comply with the contents of the Agreement as well as the items specified by JAXA.

Article 7. Research Funding

1. JAXA shall make advance payment of the “Research Funding” stated in the Confirmation Sheet or Continuous Confirmation Sheet, which is issued in accordance with Article 3, to the RO as a necessary research expense to carry out the Agreement.
2. JAXA shall, within thirty (30) days from the date when they receive an invoice duly issued by the RO, make payment for the Research Funding described in the previous paragraph. If JAXA fails to pay the RO within the above period, JAXA shall pay to the RO default interest of six (6) percent per annum (calculation on a daily basis) on the unpaid amount.
3. If the interest on late payment calculated following the preceding paragraph is less than 10,000 Japanese yen, JAXA shall be exempt from payment of such interest. Where there is a fraction of that amount and if it is less than 1,000 yen, such a fraction shall be omitted.
4. The RO shall report to JAXA if there is a need to reallocate the budget, which is listed in the Budget Summary within the Commissioned Work Plan, between Expense Item Categories of Budget Summary. However, if the RO wishes to conduct the reallocation between Expense Item Categories with an increase in the personnel cost, or with items including the one with an amount that has more than 30% increase or decrease (500,000 Japanese yen in case the amount of 30% is less than 500,000 Japanese yen), the RO shall obtain an approval from JAXA in advance.
5. In order to clarify the status of accounting concerning the Research Funding stated in paragraph 1 above, the RO shall maintain books to record expenses according to items and types as well as logically storing documents to prove such expenses. In addition, the RO shall keep all the accounting documents for five (5) years after the end of the research period and starting the next

fiscal year. JAXA may request the RO to submit a copy of such books and the document to prove the expenses, and the RO shall respond to such a request from JAXA.

Article 8. Submission of Completion Notice and Performance Report

1. Upon the completion of the tasks stipulated in Article 2, the RO shall create a completion notice and submit it to JAXA before the end of the Agreement Period.
2. In the event that the research expenses, stated in paragraph 1 of the previous Article, exceed one (1) million Japanese yen, the RO shall submit a Performance Report containing the expenses breakdown to JAXA before one of the earlier dates, which are either prior to 30 days after the end of the Agreement Period or 10 April of the next fiscal year.

Article 9. Determining the Contract Amount

1. Upon the receipt of the Performance Report stipulated in paragraph 2 in the previous Article, JAXA and the RO adjust the expenses within the limit of the original contract amount in accordance with the present Article, Article 10 (Investigation of Actual Expenses) and Article 11 (Return of Paid Research Funding), and determine the final contract amount.
2. JAXA will notify the final contract amount determined by the adjustment procedure stipulated in the previous paragraph to the RO.
3. In the calculation of the actual expenses, the general administrative expenses ratio shall be calculated by using the ratio applied at the time the contract was concluded.

Article 10. Investigation of Actual Expenses

In determining the contract amount stipulated in paragraph 1 in the previous Article, JAXA shall investigate whether the actual expenses conform with the contents of the contract and accompanied conditions, and if necessary, request that the RO submit reports or materials to be referenced, or provide consent for JAXA to enter the RO's office to inspect the books and relevant documents.

Article 11. Return of Paid Research Funding

1. After the payment by the method stipulated in paragraph 1 and 2 of Article 7, if the amount already paid exceeds the final contract amount determined through the process stipulated in paragraph 1 of Article 9, JAXA shall reclaim the excess amount from the RO.
2. In the case of the previous paragraph, the RO shall remit such funds within thirty (30) days from the date when the RO receives an invoice issued by JAXA with regard to such funds.
3. In the event there is no return made by the RO within the set time limit as described in the preceding paragraph, the provisions of paragraph 2 and 3 of Article 7 shall be applied.

Article 12. Ownership of the Rights to the Acquired Equipment

1. The ownership of the equipment acquired with the Research Funding in accordance with paragraph 1 of Article 7 shall be retained by JAXA. However, upon mutual agreement between JAXA and the RO the ownership of the equipment may be transferred to the RO.
2. The RO shall create a ledger for the equipment mentioned in the previous paragraph and manage the equipment with the care of a good manager. When the contract ends, the RO must submit to JAXA a list of acquired property.

Article 13. Providing of the Earth Observation Satellite Data and Rights

1. JAXA will provide the RO with the Earth Observation Satellite Data necessary for the implementation of the Agreement free of charge.
 - (1) JAXA may not provide all of the Earth Observation Satellite Data, which the RO may request due to limitations on the capacity of the JAXA equipment or resources; Amongst the Earth Observation Satellite Data, which the RO may request JAXA, there is a limit of ten scenes in total within one fiscal year regarding the data collected from the Advanced Land Observing Satellite (ALOS);
 - (2) JAXA does not guarantee a specific quality or the timely provisions of the Earth Observation Satellite Data and will not be liable for any deterioration of quality and delay in providing the Data;
 - (3) JAXA will not be liable for any situation whereby the Earth Observation Satellite Data cannot be supplied to the RO due to faults relating to the satellites, limitations on their operations, or for any other reason.
2. With respect to the handling of the Earth Observation Satellite Data provided by JAXA, the RO shall follow the conditions below:
 - (1) RO may not duplicate the Earth Observation Satellite Data for any purpose other than creating a backup. However, this excludes the duplication to provide for the collaborating research organizations stated in Article 5 and the re-commissioned party (hereinafter “PI etc.”) stated in Article 6 that are necessary for the implementation of the Agreement;
 - (2) The RO may not disclose the Earth Observation Satellite Data, which is restorable to its primary data, to any third party, except the PI etc.
 - (3) The RO shall use the provided the Earth Observation Satellite Data solely for the purpose stipulated in the Agreement;
 - (4) The RO shall return or otherwise appropriately keep the Earth Observation Satellite Data in accordance with the instruction of JAXA upon the termination of this Agreement.
3. The right concerning the Earth Observation Satellite Data provided by JAXA shall not be transferred to the RO through the supply. In addition, for the handling of the Data, the RO will

follow the instruction of JAXA.

4. Regardless of the preceding paragraphs, if value-added products, which refers to highly processed products that cannot be restored to the primary Earth Observation Satellite Data, are developed in the course of executing the Agreement, the ownership of such products shall be determined upon mutual agreement between the Parties, taking into consideration the degree of contribution by JAXA and the RO.

Article 14. Providing of Meteorological Data and Rights

1. JAXA will provide the RO with the Meteorological Data necessary for the implementation of the Agreement free of charge.
2. The rights concerning the Meteorological Data provided by JAXA shall not be transferred to the RO through the supply. In addition, for the handling of the Data, the RO will follow the instruction of JAXA.
3. The RO may not disclose the provided Meteorological Data to any third party.
4. The RO shall use the provided Meteorological DATA solely for the purpose of the Agreement.
5. The RO shall return or otherwise appropriately keep the Meteorological Data in accordance with the instruction of JAXA upon the termination of this Agreement.

Article 15. Providing of Technical Data

1. JAXA will provide the RO with the technical data such as satellite operation data and ground verification data owned by JAXA as well as Program/Data, excluding the Earth Observation Satellite Data and the Meteorological Data (hereinafter “Technical Data”) that are necessary for the implementation of the Agreement free of charge, allow the RO to use it, and provide advice when required.
2. The RO shall not use the Technical Data provided by JAXA for any other purpose than to fulfill the purpose of the Agreement, and must not disclose it to anyone but the PI etc.
3. After the completion of the research period, the RO shall return or otherwise dispose of the Technical Data provided by JAXA following the instruction from JAXA.

Article 16. Ownership of the Research Results

1. Of the Research Results that the RO acquired through the implementation of the Agreement, the ownership of the Research Results specified by JAXA in the Statement of Work shall belong to JAXA. Such Research Results do not include the data that is proved to have had been possessed by the RO at the time of concluding this Agreement.
2. The copyright of the documents, which include the rights regulated in Article 27 and 28 of the Copyright Act, that JAXA specified to be delivered by the RO shall be transferred to JAXA at

the point of delivery. In this case, the RO shall not exercise the moral rights.

3. In addition to paragraph 1, for the purpose of confirming the progress of the Research Projects, JAXA may demand to show all the Research Results acquired through the implementation of the Agreement.
4. JAXA shall obtain the prior written consent of the RO in case JAXA plans to disclose the Research Results (excluding the delivered Research Results) that was presented or submitted by the RO.
5. The RO shall obtain the prior written consent of JAXA if the RO plans to disclose the Research Results, the ownership of which belongs to JAXA, to a third party.

Article 17. Usage of the Research Results

1. Of the Research Results acquired through the implementation of the Agreement, JAXA may use the Research Results other than the one specified in paragraph 1 of the previous Article free of charge only for the purpose of its research development including the case for allowing a third party, which includes partners of joint research projects, to use the Research Results for its own purpose, as well as for its own peaceful and non-commercial purposes.
2. Of the Research Results acquired through the implementation of the Agreement, the RO may use the Research Results other than those delivered in accordance with paragraph 1 of the previous Article free of charge only for the purpose of its research development including the case for allowing a third party to use the Research Results for its own purpose, as well as for its own peaceful and non-commercial purposes, upon the prior consent of JAXA.

Article 18. Industrial Property Rights

1. The RO shall report the existence of Potential Industrial Property Rights generated in the course of the Research Projects, if any, and submit a document with such information to JAXA without delay, as well as taking a procedure to apply for its Industrial Property Rights following JAXA's instructions. If the RO is successfully granted such Industrial Property Rights, it shall notify JAXA without delay.
2. The RO shall consult JAXA each time regarding important matters concerning the application procedure for the Industrial Property Rights described in the previous Article.
3. The expense incurred in applying to the Industrial Property Rights as described in paragraph 1 shall be JAXA's responsibility.
4. In the event the invention etc. that are generated by the commissioned researchers stipulated in Article 5 are properties subject to registration for the Industrial Property Rights under the name of the duty of the commissioned researchers, the RO concludes the Agreement that stipulates the right to apply for the Industrial Property Rights concerning such invention belongs to the RO

shall be concluded with the commissioned researcher, or set the rules for regulating the duties of the employees regarding such a matter.

5. If the technology developed by the RO due to the implementation of the Research Projects is recognized as an invention, JAXA, if necessary, may succeed the right to apply for the Industrial Property Rights from the RO and make an application for such Potential Industrial Property Rights to be registered Industrial Property Rights in JAXA's name, after receiving the materials required for the application from the RO.

Article 19. Foreign Application for Industrial Property Rights

The provisions of the previous Article shall be applied to the application for Industrial Property Rights abroad and the preservation of rights.

Article 20. Ownership of Industrial Property Rights

1. The RO shall transfer the Industrial Property Rights obtained in compliance paragraph1 of Article 18. In this case, the cost for the transfer shall be included in the Research Funding stipulated in paragraph1 of Article 7.
2. If the RO requests a license to use the Industrial Property Rights assigned to JAXA under the preceding paragraph, JAXA will grant the RO such a license unless it is reasonable for it to be deemed to be inappropriate. The conditions for the approval shall be determined by mutual agreement between the Parties as necessary.
3. With regard to the Industrial Property Rights stipulated in paragraph 1 of Article 18, if the RO, before obtaining the Rights, wishes to use it for any purpose other than that of the Agreement, or wishes to grant its use to a third party, shall consult JAXA as necessary.
4. In accordance with the provisions in paragraph 1, JAXA, based on the criteria determined by JAXA, shall bear the total or a portion of the costs, which the RO should pay the commissioned researcher who created the technology, which is subject to the Industrial Property Rights transferred from the RO and the Right to receive the transferred Industrial Property Rights from the RO stipulated in paragraph 5 of Article 18.

Article 21. Ownership of Program/Data Copyrights

1. Upon the completion of the Agreement, the RO shall notify JAXA without delay in the event that the RO creates a program and/or database (hereinafter "Program/Data") that may potentially constitute the Program/Data copyrights. In this case, the Program/Data that the Statement of Work specifies its delivery shall be excluded from the notification stipulated in this Article.
2. The RO shall transfer the copyrights of the Program/Data, including the rights stipulated in Article 27 and 28 of the Copyrights Act, acquired through the implementation of this Agreement

to JAXA. The cost for this transfer shall be included in the Research Funding stipulated in paragraph 1 of Article 7. Regarding the Program/Data of which the RO already had its rights prior to the conclusion of the Agreement as well as among the know-how, routine, subroutine and modules that are commonly used by similar program the RO specified, copyrights of such products are retained by the RO but not transferred to JAXA.

3. In the event that the RO transfer copyrights to JAXA, if the product subject to the copyright is created by the RO, the RO waives any related moral rights. If it is created by a third party but not by the RO, the RO shall take measures to prevent the third party from using any related moral rights.
4. If the RO requests a license to use the Program/Data copyrights assigned to JAXA, JAXA will grant the RO such a license unless it is reasonable for it to be deemed to be inappropriate. The conditions for the approval shall be determined by mutual agreement between the Parties as necessary.
5. In the event that programs are modified/adapted not by JAXA or the RO but by a third party, JAXA shall bear the responsibility related to the use of such programs and the RO shall not be responsible for any liability caused by such programs.
6. With regard to the know-how, routine, subroutine and modules utilized commonly by similar programs, the copyrights of which are retained by the RO in accordance with paragraph 2 of this Article, the RO shall approve JAXA of a royalty-free right to use such products in the form of the program acquired through the implementation of the Agreement without consent from the RO. Such used by JAXA shall include the right of JAXA to grant a third party the right to use the know-how, routine, subroutine and modules without paying any royalties to the RO.

Article 22. Use of Facilities

1. The RO may use JAXA's facilities and equipment (hereinafter "Facilities") free of charge upon the prior consent of JAXA if there is a necessity for the implementation of the Agreement.
2. In the event of using JAXA's Facilities, the RO shall use the Facilities in compliance with all the regulations stipulated by JAXA.

Article 23. Bringing in Instruments

If necessary for the implementation of the Agreement, the RO may bring instruments and other items into JAXA's facilities with the prior consent of JAXA. In such a case the RO shall be in compliance with all the regulations stipulated by JAXA.

Article 24. Delivery of Rental Items, Storage and Return

1. If required to implement the Agreement, JAXA shall lend the RO any instruments and other

items owned by JAXA.

2. At the time of delivery of the instruments and items for lending (hereinafter “Rental Items”) in accordance with the preceding paragraph, JAXA shall submit a delivery note to the RO and the RO shall submit a receipt to JAXA.
3. In the event that the RO received the delivery of the Rental Items, the RO shall confirm the presence of any abnormality regarding the list of articles and numbers. If a lack of quantity or abnormality including inappropriate quality and standard for use, with the Rental Items is found, the RO shall notify JAXA of the matter immediately and seek further instruction.
4. The RO shall manage and use the Rental Items delivered with the care of a good manager and shall use items solely for the purpose of the Agreement.
5. The RO shall maintain books of receipts and shipment as well as management regarding the Rental Items delivered, record and organize the receipts, and always make the situation of the Rental Items clear.
6. In the event that the Rental Items are lost or damaged, the RO shall report this to the lender without delay.
7. In the event that all or part of the Rental Items become unnecessary due to the completion of the whole or part of the Agreement as well as of any amendment or termination of the Agreement, the RO shall notify JAXA and undertake a procedure to return the Rental Items in compliance with JAXA’s instruction without delay.

Article 25. Confidentiality

1. In this Agreement, “Confidentiality Information” means those that are applicable to any of the following items.
 - (1) Amongst the outcome as a result of the Agreement, any documents with an indication of confidential notice, tangible objects such as samples, or regardless of its form in tangible or intangible, any items that have been confirmed in writing as Confidential Information by JAXA and the RO.
 - (2) Any information that a party discloses or presents as confidential in the forms of document, drawing, photograph, test piece, sample, magnetic tape, and floppy disk.
2. JAXA and the RO must manage Confidential Information properly and may not leak or disclose to anyone other than those involved in the Agreement. However, any information that is applicable to any of the following items may be an exception:
 - (1) Information that is already known to the public when disclosed by the disclosing party;
 - (2) Information that becomes known to the public after the disclosure by the disclosing party without intentional misconduct of the receiving party;
 - (3) Information that the receiving party already had before the disclosure by the disclosing party

- and that is able to verify this fact;
- (4) Information with proof that the receiving party acquires legally from a duly authorized third party not subject to confidentiality obligations;
 - (5) Information and materials that the receiving party independently acquire without utilizing information obtained from the disclosing party and that are able to verify this fact;
 - (6) Information with written consent from the disclosing party for the disclosure and the publication; or
 - (7) Information that is required to be disclosed by applicable laws, judgment or order of a competent court. In this case, the receiving party shall promptly notify the disclosing party of the necessity of disclosure.
3. The confidentiality obligation under paragraph 2 shall remain effective for a period of five (5) years after the termination of the Agreement. However, this period of keeping confidentiality may be extended or shortened by mutual agreement between JAXA and the RO.

Article 26. Publication of Research Results

- 1. The RO shall be able to present or publish the Research Results, which were acquired through the implementation of the Agreement and delivered in accordance with paragraph 1 of Article 16; provided, however, in compliance with the obligation of Confidentiality Information stated in Article 25 (hereinafter “publication of Research Results”).
- 2. In the case of the preceding paragraph, the RO shall notify JAXA with a written document and obtain written consent from JAXA prior to the publication of Research Results. JAXA will not unreasonably withhold consent from the publishing party’s request.
- 3. When JAXA receives the notification mentioned in the previous paragraph, if the judgment that the notification contains contents, which potentially cause a loss of anticipated benefit by being published, JAXA shall notify the RO in writing, and the RO shall consult with JAXA. The RO may not publish the part that has been notified as contents, which potentially cause a loss of anticipated benefit by being published as described in this paragraph without consent from JAXA.
- 4. The RO shall state in the publication of the Research Results that such results have been obtained pursuant to this Agreement and identify the owner of the rights to the Earth Observation Satellite Data and Meteorological Data used in such publication.
- 5. After disclosing or publishing the Research Results that belong to the RO, the RO shall provide JAXA with a copy of the publication as soon as possible. JAXA is entitled to a royalty-free right to use, photocopy and distribute the provided publications unless the copyright of such publication is owned by an academic society.

Article 27. Security

Upon the implementation of the Agreement, the RO shall take security measures in accordance with the JAXA's regulations and must follow JAXA's instruction.

Article 28. Impossibility of Performance

1. In the event it becomes impossible for the RO to carry out all or any part of the Agreement due to reasons attributable to the RO, JAXA may terminate all or any part of the Agreement.
2. In the case of the termination of the Agreement following the previous paragraph, JAXA shall apply the provisions in paragraph 1 of Article 11 mutatis mutandis and demand the restitution of the disused amount.
3. In the case of the termination of the Agreement in accordance with Article 1, JAXA, based on paragraph 3 of Article 31, shall be able to demand the RO incur a penalty.

Article 29. Incompleteness of Performance

1. If the performance of the RO for the Agreement is confirmed not to be following the purpose of the Agreement due to the liability of the RO, JAXA may claim the RO subsequent completion by setting an appropriate period.
2. In the event that there is no prospect of the completion of the performance by the RO in accordance with the Agreement despite the claim made for the subsequent completion stipulated in paragraph 1, JAXA may terminate all or part of this Agreement.
3. In case the termination of the Agreement is performed in accordance with the preceding paragraph, JAXA shall apply the provisions in paragraph 1 of Article 11 and claim a return of the amount of Research Funding that becomes unnecessary.
4. In case the termination of the Agreement is performed in accordance with paragraph 2 above, JAXA may claim the RO incur a penalty in accordance with paragraph 3 of Article 31.

Article 30. Extension of the Delivery Deadline

1. In case there is an acceptable reason for not fulfilling the obligation until the delivery deadline, the RO may in advance propose JAXA such a reason and planned delivery date and apply for an extension to the delivery deadline in writing. In this case, if the extension of the delivery deadline is approved as not to hinder the achievement of the objective of the Agreement, JAXA may approve the extension.
2. In the event the RO does not fulfill the obligation by the scheduled delivery date, JAXA may terminate all or any part of the Agreement.
3. If the Agreement is terminated as set forth in the preceding paragraph, JAXA shall apply the provisions of paragraph 1 of Article 11 and claim a refund of any unexpended Research

Funding.

4. If the Agreement is terminated as set forth in paragraph 2, JAXA in compliance with paragraph 3 of Article 31 shall claim the RO incur a penalty.

Article 31. Termination of the Agreement

1. In the event of any of the following conditions, JAXA and the RO may terminate the Agreement.
 - (1) Upon the consent of both JAXA and the RO.
 - (2) When the other party commits a dishonest or inequitable act and the breaching party fails to offer any satisfactory remedial measures within seven (7) days after receiving demands for corrective action.
 - (3) When the other party violates any of the terms and conditions of this Agreement provided that the breaching party fails to offer any satisfactory remedial measures within seven (7) days after receiving demands for corrective action.
 - (4) When the events stipulated in paragraph 5 (transfer of the PI) of Article 4 occurs and there is no one who engages in this joint research project at the RO.
 - (5) When unavoidable circumstances occur such as natural disasters
2. Upon the termination of the Agreement, the RO shall submit to JAXA all work in progress and completed work based on the research carried out prior to the termination.
3. In the event that the Agreement is terminated in accordance with number 2 or 3 of paragraph 1, JAXA and the RO may claim the other party a penalty equivalent to 10% of the Research Funding stipulated in paragraph 1 of Article 7, which corresponds to the contents of the termination above. However, if the amount of the penalty is less than 10,000 Japanese yen, the payment of such penalty is not required. Where there is a fraction of that amount and if it is less than 1,000 yen, such a fraction shall be omitted.
4. Neither JAXA nor the RO shall claim any compensation in case the termination of the Agreement is exercised in accordance with number 5 of paragraph 1 of the present Article.

Article 32. Effective Term of the Agreement

1. Effective Term of the Agreement shall be the period stipulated in Article 3.
2. Even after the end of the Effective Term of the Agreement stipulated in the previous paragraph, provisions in paragraph 2 to 4 of Article 13 (Providing of the Earth Observation Satellite Data and Rights), paragraph 2 to 5 of Article 14 (Providing of Meteorological Data and Rights), Article 15 (Providing of Technical Data), Article 17 (Usage of the Research Results) to 21 (Ownership of the Copyrights of Program/Data), and Article 26 (Publication of Research Results) continues to be effective for the duration of the continuance of the rights stated in the

present Article. Provisions of Article 25 (Confidentiality) and Article 26 (Publication of Research Results) possess the terms effect stipulated in the present Article.

Article 33. Amendment of the Agreement

1. JAXA can amend the contents of this Agreement. In such a case, JAXA announces the amended contents by posting it to the website operated by JAXA, and thereafter the Agreement is handled based on the amended contents.
2. In the case the RO has a legitimate reason for not agreeing with the amendment of the previous paragraph, the RO may terminate the Agreement by notifying JAXA in writing within thirty (30) days from the date the amended contents were posted on the website.

Article 34. Consultation

In the event that any doubt arises with regard to provisions that are not included in the Agreement and those stipulated in the Agreement, it shall be resolved upon mutual agreement between JAXA and the RO as necessary.

Attachment “Earth Observation Satellite Data”

Name of Satellite or Sensor	Observation Period (YYYY/MM/DD)	Observable Area
JERS (Japanese Earth Observation Satellite)	1992/09/01~1998/10/11	Global
ADEOS (Advanced Earth Observation Satellite)	1996/10/15~1997/06/29	Global
ADEOS-II (Advanced Earth Observing Satellite-II)	2003/01~2003/10	Global
ALOS (Advanced Land Observing Satellite)	2006/05/16~2011/04/22	Global
GCOM-W1 (The Global Change Observation Mission 1st-Water)	2012 Fiscal Year~	Global
TRMM (Tropical Rainfall Measuring Mission)	1997/12~	Global (PR: Approximately 36°S-36°N. TMI and VIRS: Approximately 38°S-38°N)
AMSRE (Advanced Microwave Scanning Radiometer for EOS-Aqua satellite)	2002/06/19~2011/10/04	Global
GOSAT (Greenhouse Gases Observing Satellite)	2009/04/23~	Global

* Regarding GPM/DPR, it is planned to be added when the dataset becomes available upon the modification to the Agreement in accordance with Article 33.

COLLABORATIVE RESEARCH AGREEMENT (FUNDED)
FOR THE EARTH CLOUD, AEROSOL AND RADIATION EXPLORER
BETWEEN THE
JAPAN AEROSPACE EXPLORATION AGENCY (JAXA)
AND
THE RESEARCH ORGANIZATION
(FOR THE RESEARCH ANNOUNCEMENT)

JAPAN AEROSPACE EXPLORATION AGENCY

COLLABORATIVE RESEARCH AGREEMENT (FUNDED)

This agreement ("Agreement") is entered into between the Japan Aerospace Exploration Agency, established under the provisions of the Law Concerning the Japan Aerospace Exploration Agency on October 1, 2003, represented by its President and having its principal office at 7-44-1 Higashimachi, Jindaiji, Choufu-shi, Tokyo, Japan ("JAXA") and a research organization ("Research Organization") that submitted an application form for the below described research activities to JAXA, hereinafter collectively referred to as "the Parties."

WITNESSETH

WHEREAS, JAXA issued the Research Announcement ("RA") to engage in collaborative research activities directly related to product validation of the Earth Cloud, Aerosol and Radiation Explorer ("EarthCARE"), and the Research Organization applied pursuant to such RA;

WHEREAS, JAXA accepted the Research Organization's proposal that was in response to the RA, delivered the confirmation sheet to the Research Organization and JAXA further desires to utilize such proposal in JAXA's project; and

WHEREAS, JAXA desires to engage in the above research activities in collaboration with the Research Organization.

NOW, THEREFORE, in consideration of the mutual agreements hereinafter set forth, and for other good and reasonable consideration, the receipt and adequacy of which are hereby acknowledged, the Parties hereby agree as follows:

Article 1. Definitions

1. The following capitalized terms shall have the following meanings:

- (1) "Research Results" means the technical results and scientific knowledge derived from the implementation of the Research Projects pursuant to this Agreement, including all inventions, ideas, designs, literary works, algorithms, and technological developments, such as programs, that can execute the algorithm(s).
- (2) "Intellectual Property Rights" generated in the course of implementation of the Agreement

means the following:

- (i) Industrial Property Rights (as defined below);
- (ii) Potential Industrial Property Rights (as defined below); and
- (iii) Program/Data Copyrights (as defined below).

"Industrial Property Rights" means all domestic and foreign patents, utility models, and industrial designs.

"Potential Industrial Property Rights" means all domestic and foreign application rights for patents, utility models, or industrial designs.

"Program/Data Copyrights" means all domestic and foreign copyrights related to computer programs, software and databases.

(1) "Collaborative Research Plan" means the plan described in the Application for Collaborative Research Agreement for the EarthCARE ("Application").

(2) "Research Period" means a period described in the Collaborative Research Plan. Based on the regulations of this Agreement, in case this Agreement is terminated before the completion date of the Research Period, such date of termination of the Agreement shall be the final date of the Research Period.

(1) "Annual Evaluation" means evaluation by JAXA for the results achieved within the year in which this Agreement was concluded. JAXA evaluates the results by reports presented at the research presentation meeting by the Research Organization and Research Results Report (as defined below).

(2) "Earth Observation Satellite Data" means data sets obtained from satellites which are retained by JAXA at the time of execution of this Agreement. The available data sets (including names of satellites, sensors, observation period that can be offered, and observation areas) are listed in Attachment A of this Agreement.

(3) "Meteorological Data" means data sets provided by the Japan Meteorological Agency pursuant to the agreement between JAXA and the Japan Meteorological Agency.

1. In this Agreement, "Invention, etc." means an invention in terms of a subject of patent rights, a

utility model in terms of a subject of utility model rights, a creation in terms of a subject of copyrights such as design rights and programs, and ideas in terms of a subject of algorithm and know-how.

2. In this Agreement, “utilization” of the intellectual property rights and Research Results means act defined in Article 2, Paragraph 3 of the Patent Act, act defined in Article 2, Paragraph 3 of the Utility Model Act, act defined in Article 2, Paragraph 3 of the Design Act, enforcement of right defined in Articles 21 and 27 of Copyright Act (including utilization of secondary work created by JAXA or the Research Organization), and use of algorithm and know-how.
3. In this Agreement, “Principal Investigator” (“PI”) means the Research Organization employee who submitted the proposal in response to the RA and was selected to be responsible for the Research Projects. “Co-Investigator” (“CI”) means a person who supports the PI in performing the Research Projects with approval by JAXA. Names, affiliation, and other information concerning PI and CI (collectively “Collaborative Researchers”) shall be described on the Collaborative Research Plan.

Article 2. JAXA's Performance for Research Projects and the Research Organization's General Responsibilities for Research Projects

1. JAXA shall make reasonable efforts to perform the following tasks related to the Research Projects:
 - a) Deliver the Earth Observation Satellite Data and Meteorological Data required for performing the Collaborative Research to the Research Organization free of charge;
 - b) Hold research presentation meetings for checking progress of the research and other necessary meetings;
 - c) Evaluate the Research Result Report submitted at the end of fiscal year for the Annual Evaluation.
2. For the purpose of ensuring the Research Organization's performance of the above obligations, the Research Organization shall perform certain actions including, but not limited to:
 - a) The Research Organization shall conduct and complete the Research Projects in accordance with the Collaborative Research Plan.
 - b) Participate in necessary workshops and meetings for the Research Projects such as the research presentation meeting hosted by JAXA at the end of the fiscal year;
 - c) Participate in the research presentation meeting hosted by JAXA every year to report on the the Research Results and progress of research to JAXA; and
 - d) Deliver the reports as a report of all the Research Results obtained during the fiscal year by the end of such fiscal year to JAXA. Furthermore, at the completion of the research period, the Research Organization shall report all the Research Results obtained throughout the entire

period of the Collaborative Research in the Final Report and submit it to JAXA. In this case, the Research Organization does not need to separately submit an annual report for the final year of the term.

Article 3. Finalization and Renewal of the Contract

The Agreement shall become effective as of the date of the issuance of the Confirmation Sheet prescribed by JAXA in response to an application by the Research Organization. Period of the Agreement shall be the period described in the Confirmation Sheet issued by JAXA. However, provided that JAXA approves an extension of the research period in the Annual Evaluation and the Parties mutually agree upon the amount to be paid by JAXA for such extended period; further provided, however, the Research Organization shall submit a renewal Application Form to JAXA and JAXA shall issue a new Confirmation Sheet; the Research Organization may renew the Agreement by one fiscal year and the same shall apply thereafter.

Article 4. Researchers

1. The Research Organization shall cause the Collaborative Researchers listed on the Collaborative Research Plan to participate in the Collaborative Research.
2. JAXA shall allow those who are listed on the Collaborative Research Plan to participate in the Research Projects.
3. The Research Organization shall ensure all the Collaborative Researchers engaging in the Research Projects act in accordance with the terms and conditions of the Agreement.
4. In the event that the Research Organization intends to newly select or add CIs, the Research Organization shall first notify to JAXA by a written form in advance and obtain the consent of JAXA for such personnel. The Research Organization shall take necessary measures to cause such CI to follow the Collaborative Research Agreement.
5. In the event that the PI dies, retires from the Research Organization, takes a leave absent from work, or come to be no longer engaged in the Research Projects, the Research Organization shall immediately notify to JAXA as such and JAXA may at its sole discretion terminate this Agreement; provided however, if the Research Organization designates a researcher who belongs to the Research Organization as the PI's successor and JAXA approves the succession, the Parties may amend this Agreement, with the succeeding researcher being a new PI. The terms and conditions of the amendment to this Agreement shall be determined upon mutual consultation and consent.

Article 5. Subcontract

1. The Research Organization shall not re-commission the whole Research Projects to a third party ("Subcontract"). Provided, however, that the Research Organization may re-commission part

of it upon a written prior application to JAXA and a prior written approval of JAXA. Should there be a case where subcontractors re-commission part of the Research Projects to a third party, the company name, address and scope of business of such third party are required to be submitted to the Research Organization in writing.

2. If the Research Organization re-commissions the Research Projects to a third party at any tier (contractor or subcontractor, including any company of any stage of the Projects in connection with the subcontract) of the Research Organization, act of such subcontractor, or, any act of such third party in connection with the subcontract shall be deemed to be an act of the Research Organization and the Research Organization shall be fully responsible therefor.
3. If the Research Organization re-commissions part of the Research Projects to a third party, the Research Organization shall conclude an agreement with the subcontractor on issues necessary for the Research Organization to comply with the Agreement and on issues designated by JAXA.

Article 6. Research Funding

1. The Confirmation Sheet issued on the basis of Article 3 identifies the amount of funding to be provided by JAXA to the Research Organization for the Research Projects ("Research Funding") and JAXA shall pay such amount to the Research Organization in advance.
2. JAXA shall, within thirty (30) days from the date when JAXA receives an invoice duly issued by the Research Organization, make payment for the Research Funding. If JAXA fails to pay the Research Funding within the above period, JAXA shall pay to the Research Organization default interest of six (6) percent per annum on such unpaid amount for the period from the immediately succeeding day of due date for payment to the date of actual payment.
3. If the interest on late payment is less than 10,000 yen, JAXA shall be exempt from payment of such interest and if there is any amount less than 1,000 yen, such amount shall be rounded off.
4. The Research Organization shall submit Budget Summary as attachment of Commissioned Work Plan at the beginning of every Japanese fiscal year. The Research Organization shall report to JAXA in advance if there is a need to reallocate the budget between Expense Item Categories of Budget Summary. For the reallocation in the amount of Expense Item Categories for over 30%, or 500,000 Japanese yen, in case the amount of 30% is less than 500,000 Japanese yen, or increase in the personnel cost, the Research Organization shall resubmit the revised Budget Summary to JAXA for approval in advance.
5. Throughout the performance of the Agreement, the Research Organization shall maintain books, records, logs, documents and other evidence sufficient to record all actions taken with respect to the funding in Paragraph 1. The Research Organization shall agree to allow JAXA to inspect, copy, and audit such books, records, documents and other evidence at any reasonable time. The

Research Organization shall keep all the accounting documents for 5 (five) years after the end of the research period.

Article 7. Submission of Financial Statement

If the original funding amount stipulated in Paragraph 1 of the previous Article is one (1) million Japanese yen or more, the Research Organization shall submit fiscal Financial Statement on either the 30th day following the date of termination of the Agreement, or on April 10 of the fiscal year following the year in which the Agreement was terminated, whichever comes earlier.

Article 8. Determination of Contract Amount

1. If the Parties receive the Financial Statement regulated in the previous Article, the Parties shall settle the funding, setting the contract amount as the upper limit, in accordance with the stipulation in Articles 8 and 9 (Checking of Funding Spent) and 10 (Refund) to determine the contract amount.
2. JAXA shall notify the contract amount determined by the settlement in the previous Paragraph to the Research Organization
3. In the calculation of the amount, ratio of general and administrative expenses shall be calculated based on the ratio applied upon conclusion of the Agreement.

Article 9. Checking of Funding Spent

For determination of contract amount stipulated in Paragraph 1 of the previous Article, JAXA shall check whether the amount spent matches the content and conditions of the Agreement. If necessary, JAXA requests the Research Organization to submit reference materials or report, or to investigate books and relevant documents in the offices of the Research Organization.

Article 10. Refund

1. Provided that the payment by the method stipulated in Paragraphs 1 and 2 of Article 6 has been made and such paid amount exceeds the amount determined by the method stipulated in Paragraph 1 of Article 8, JAXA requests refund of the exceeding portion of the paid amount.
2. In the case of the previous Paragraph, the Research Organization shall refund the exceeding portion within thirty (30) days from the date when Research Organization receives an invoice duly issued by JAXA.
3. In the event that the Research Organization does not refund the exceeding amount within the days stipulated in the previous Paragraph, regulations set forth in Paragraphs 2 and 3 of Article 6 shall apply.

Article 11. Ownership of the Rights to the Acquired Equipments

1. The Research Organization shall transfer, upon the expiration of this Agreement, all rights and ownership in the equipment acquired by the Research Organization with the Research Funding paid according to Article 5, Paragraph 1; provided, however, that JAXA and the Research Organization may determine through mutual agreement that any or all such rights and ownership will be retained by the Research Organization.
2. The Research Organization shall manage the equipment acquired with the Research Funding (if any) with the care of a good manager. Such equipment shall be listed in a “List of Property” which should be submitted to JAXA upon termination of the Agreement.

Article 12. Providing of Earth Observation Satellite Data by JAXA

1. JAXA will provide the Research Organization with the Earth Observation Satellite Data for the Research Projects free of charge in accordance with Article 2, Paragraph 1, Item 2 subject to the following conditions:

- a) The Research Organization agrees and accepts that JAXA may not provide all the Earth Observation Satellite Data which the Research Organization may request due to restrictions in the allowance range of JAXA’s equipment and in resources.

Note that the Advance Land Observing Satellite data, which is one portion of the Earth Observation Satellite Data required by the Research Organization and is to be provided to the Research Organization, shall be limited to ten scenes every fiscal year;

- a) JAXA does not guarantee a specific quality or the timely provisions of the Earth Observation Satellite Data and does not take responsibility for quality and delay of provisions of such data; and
- b) JAXA reserves the right to curtail or suspend Earth Observation Satellite Data supply to the Research Organization due to faults or difficulties relating to the satellites, limitations on their operations, or any other reasons and JAXA shall be exempt from any responsibility for such curtailing and for suspension

2. With respect to the Earth Observation Satellite Data provided by JAXA, the Research Organization shall:

- a) Not duplicate the Earth Observation Satellite Data except for the purpose of backup. However, this excludes duplication for distributing to authorized Collaborative Researchers stipulated in Article 4 and subcontractors stipulated in Article 5 (“PIs, etc.” collectively) which are necessary for the Collaborative Research Project.
- b) Not provide or disclose the Earth Observation Satellite Data which can be converted back to the primary Earth Observation Satellite Data except to PI;
- c) Only use the Earth Observation Satellite Data for the singular purpose of advancing the efforts

of the Research Projects; and

- d) Return or otherwise appropriately manage the Earth Observation Satellite Data upon completion of this Agreement, according to the directives of JAXA.
3. Any rights regarding the Earth Observation Satellite Data provided by JAXA shall conform to the following:
 - a) Any rights relating to the Earth Observation Satellite Data provided by JAXA to the Research Organization shall not be transferred to the Research Organization by such provisions. In terms of the intellectual property rights of the data, the Research Organization shall follow instructions of JAXA.
 - b) If value-added products, which mean highly processed products that do not retain the original pixel structure and that cannot be converted back to the primary Earth Observation Satellite Data, are developed in the course of executing the Research Projects, the ownership of such products shall be determined upon mutual agreement between the Parties, taking into consideration the degrees of contribution by JAXA and the Research Organization.

Article 13. Providing of Meteorological Data by JAXA

1. For the purpose of performing the Research Projects, JAXA will attempt to provide the Research Organization with the Meteorological Data based on Article 2, Paragraph 1, Item 1.
2. Any rights relating to the Meteorological Data provided by JAXA to the Research Organization shall not be transferred to the Research Organization by such provisions. In terms of the intellectual property rights of the data, the Research Organization shall follow instructions of JAXA.
3. The Research Organization may not disclose the provided Meteorological Data to any third party except for PIs, etc.
4. The Research Organization shall use the provided Meteorological Data solely for the purpose of conducting the Research Projects.
5. The Research Organization shall return or otherwise appropriately keep the Meteorological Data in accordance with the instructions of JAXA upon the termination of this Agreement.

Article 14. Disclosure of Technical Data

1. To the extent feasible, each party shall disclose and allow use of all necessary technical information, programs, etc. ("Technical Data"), which does not include the Earth Observation Satellite Data and the Meteorological Data, necessary for performing the Collaborative Research free of charge. The Parties will undertake to handle expeditiously any request for the Technical Data presented by the other party.
2. The Technical Data shall be used by the receiving party only for the purpose of fulfilling the

receiving party's responsibilities under this Agreement and shall not be disclosed to any third party except for PIs, etc.

3. According to directives of the furnishing party, the receiving party shall return or otherwise dispose of Technical Data provided under the Agreement upon completion of the activities under the Agreement.

Article 15. Usage of Research Results

1. All Research Results obtained through the course of the Collaborative Research may be used for non-commercial and peaceful purposes by the Parties (or by the third party including for JAXA or the Research Organization) ("Jointly-Owned Research Results") without consent of the Research Organization.
2. With regard to copyrights in the Final Reports submitted by the Research Organization to JAXA, JAXA may freely use, edit, copy, and distribute such reports. In this case, the Collaborative Researchers shall waive any related moral rights to the copyrights in the Final Reports.

Article 16. Ownership of Research Results

1. Both Parties shall solely own the rights of the Research Results if JAXA or the Research Organization solely generates such Research Results in the course of the Research Projects.
2. The Parties shall jointly own the rights to the Research Results obtained through the course of the Collaborative Research and the ownership of such results shall be determined upon mutual agreement between the Parties, taking into consideration the degrees of contribution by JAXA and the Research Organization.

Article 17. Application etc. of Intellectual Property Rights

1. JAXA or the Research Organization shall give the other party prompt written notice of Intellectual Property Rights generated, such as the Invention, Utility Model, and Creation, in the course of the Collaborative Research and discuss the ownership of such generated Intellectual Property Rights, as well as whether it is necessary to submit an application for registration of such Intellectual Property Rights.
2. JAXA and/or Research Organization shall take any necessary procedures for any Industrial Property Rights owned by and/or held by each Collaborative Researchers (including invention etc. jointly generated by such Joint Researcher and JAXA or the Research Organization) to be transferred by such Joint Researcher to JAXA or the Research Organization.
3. If JAXA or the Research Organization solely generates Potential Intellectual Property Rights in the course of the Research Projects ("Solely-Owned Intellectual Property Rights"), the party may take steps to apply for the registration of the resulting Intellectual Property Rights as

solely-owned ones, provided that it shall obtain prior confirmation of the other party. In this case, expenses for application and rights preservation shall be borne by the party solely holding the Intellectual Property Rights.

4. In the event that the Parties jointly generate an invention etc., and submit an application for Intellectual Property Rights to such invention, the Parties shall enter into a separate joint ownership agreement ("Joint Ownership Agreement") and jointly perform submission of the application and other procedures according to the Joint Ownership Agreement. In this case, expenses for application and rights preservation shall be borne by the both JAXA and the Research Organization depending on the degree of ownership.

Article 18. Application of Intellectual Property Rights Overseas

1. Regulations of the previous Article shall apply to the case of application and rights preservation of the Intellectual Property Rights in foreign countries.
2. In the event of an application of the Intellectual Property Rights jointly owned by the Parties pursuant to Paragraph 4 of the previous Article, the Parties shall discuss whether it is necessary to submit an application for registration of such Intellectual Property Rights.

Article 19. Utilization of Jointly-Owned Intellectual Property Rights

In case either of the Parties utilizes the Jointly-Owned Intellectual Property Rights, such party shall obtain a consent from the other party in advance and pay utilization fee as set forth in a separate utilization agreement, except for the case stipulated in Article 15.

Article 20. License of Utilization of Jointly-Owned Intellectual Property Rights to Third Party

1. The Parties may grant to any third party a license to use the Jointly-Owned Intellectual Property Rights, provided, however that the relevant party shall obtain the written prior consent of the other party, and determine the licensing terms after discussion with the other party.
2. In the case of granting a license to use the Jointly-Owned Intellectual Property Rights to a third party as in the previous Paragraph, the relevant party shall collect the usage fee from such third party as set forth in the separate usage agreement. The usage fee to be collected from the third party shall be distributed between the Parties pro rata in proportion to their respective interests in those rights.

Article 21. Transfer of Interests to Jointly-Owned Intellectual Property Rights

1. The Parties may transfer their respective interests to the Jointly-Owned Intellectual Property Rights generated in the course of the Collaborative Research only to their respective designees after discussion between the Parties. Such transfer may be carried out pursuant to a separate

transfer agreement. In this event, the Parties shall cause its designee to succeed to all of its rights and obligations with respect to those Intellectual Property Rights.

2. If JAXA or the Research Organization disclaims its interests in the Jointly-Owned Intellectual Property Rights, the relevant party shall give the other party prior notice thereof and transfer its interests to the other party, only if the other party wishes to acquire it.

Article 22. Improved Invention

If JAXA or the Research Organization alters or improves the Jointly-Owned Intellectual Property within one (1) year from the application for registration of the original Jointly-Owned Intellectual Property Rights, the party shall provide a written notice without delay to the other party describing the alterations or improvements. Ownership and other issues of the Intellectual Property Rights concerning the altered or improved invention shall be determined through discussion between the Parties.

Article 23. Designation of Know-How

1. After mutual agreement by the Parties, JAXA and the Research Organization shall promptly designate as know-how the Research Results which are appropriately to be treated as know-how ("Know-How").
2. For designation of Know-how, a period during which the Research Results are designated to be Know-How shall be specified.
3. After designating the Know-How, such Know-How shall be kept in confidence in principle, for five (5) years commencing on the day immediately following the date of the completion of this Agreement; provided, however, that JAXA and the Research Organization may extend or shorten that period upon mutual agreement.

Article 24. Utilization of Facilities, etc.

1. The Parties may use facilities and equipment ("Facilities") of the other party free of charge with a prior consent from the other party if it is necessary for implementation of the Research Projects.
2. The Parties shall follow rules and regulations of the other party in case of using the Facilities of the other party.

Article 25. Installation of Equipment

1. The Parties may, if necessary for implementation of the Research Projects, install necessary equipment and other materials into the facility of the other party with a prior consent from the other party. In this case, the party which installs such equipment shall follow the rules and regulations of the other party.
2. In the event that JAXA or the Research Organization uses the material etc. installed by the other party (Installed Material), such party shall obtain a prior consent of the other party and shall not use the Installed Material for other purposes than the Research Projects.
3. In the event that JAXA or the Research Organization loses or damages the Installed Material, such party should immediately notify the other party such fact irrespective of the reason.

Article 26. Delivery, Storage, and Returning of Lent Equipment

1. The Parties may lend machinery or other material to the other party if it is required for implementation of the Research Projects.
2. Upon delivery of the machinery or other material (“Lent Equipment”) lent in accordance with the previous Paragraph, owner of the Lent Equipment (“Lessor”) shall submit the other party a Note of Delivery and the other party shall submit the Lessor a receipt.
3. The Parties shall confirm items, amount, etc. of the Lent Equipment upon delivery of the Lent Equipment and if there is a shortage in the amount or any defect (including ones whose quality and/or specification does not meet the requirement), JAXA or the Research Organization shall notify such fact to the Lessor and receive an instruction from the Lessor.
4. JAXA and the Research Organization shall manage and use the Lent Equipment with the care of a good manager and should not use the Lent Equipment for the purposes other than the Research Projects.
5. JAXA and the Research Organization shall keep the record of usage and management of the Lent Equipment to record delivery, usage, and returning of the Lent Equipment for the purpose of clarifying the condition of the Lent Equipment.
6. In the case of loss or damage to the Lent Equipment, JAXA and the Research Organization shall immediately notify the fact to the Lessor without delay.
7. The party shall notify the Lessor if any of the Lent Equipment becomes unnecessary due to the reasons such as completion, change, or termination of whole or part of the Research Projects and shall take returning procedures according to the instruction from the Lessor.

Article 27. Confidentiality

1. In this Agreement, "Confidential Information" means any information that corresponds to any of the following:

- (1) Any information that includes documents classified “Confidential”, any material object such as a sample, or any information, either material or immaterial, which JAXA and the Research Organization agreed to handle as the Confidential Information by a written agreement, obtained in the course of these Research Projects; and
- (2) Any information disclosed or distributed to the other party as Confidential Information in the form of a document, a drawing, a photograph, a specimen, a sample, a magnetic tape, a floppy disk, or the like for the purpose of the Research Projects.
2. The Parties shall appropriately keep the Confidential Information secret, and shall not disclose or divulge any Confidential Information to any party other than those who engage in the Research Projects; provided, however, that any information which corresponds to any of the following is not included in the Confidential Information.
 - a) Information that is already known to the public when disclosed by the disclosing party;
 - b) Information that becomes known to the public after the disclosure by the disclosing party without intentional misconduct or negligence of the receiving party;
 - c) Information that the receiving party already had before the disclosure by the disclosing party;
 - d) Information that the receiving party acquires from a duly authorized third party not subject to confidentiality obligations;
 - e) Information that the receiving party independently develops without utilizing information obtained from the disclosing party;
 - f) Information with a prior written consent of the disclosing party for the disclosure and the publication; or
 - g) Information that is required to be disclosed by applicable laws, judgment or order of a competent court. In this case, the receiving party shall promptly notify the disclosing party of the necessity of disclosure.
3. The confidentiality obligation under this Article shall remain effective for a period of five (5) years after the termination of the Agreement. However this period of keeping confidentiality may be extended or shortened by mutual agreement between JAXA and the Research Organization.

Article 28. Publication of Research Results

1. The Parties may disclose or publish the Research Results obtained in the course of the Research Projects (Publication of Research Results”) provided that such publishing party follows the obligations stipulated in Article 27.
2. In the case of the previous Paragraph, before publishing, JAXA or the Research Organization (“the publishing party”) shall provide the other party with a written document regarding the description of the subjected Research Results to be published and request a written consent of

the other party. The other party will not unreasonably withhold consent from the publishing party's request for such publication.

3. The other party, upon receiving the notice, will request correction of the content of the publication in a written form if it is judged that such content includes a portion which may lead to the loss of the future interest of the other party and the publishing party shall consult with the other party about such portion. The publishing party may not publish the portion which the other party notified as having possibility of resulting in the loss of the future interest of the other party without consent of the other party.
4. The Research Organization shall state in the publication that such Research Results have been obtained pursuant to this Agreement and identify the owner of the rights to the Earth Observation Satellite Data and Meteorological Data used in such publication.
5. The period during which the notification pursuant to Paragraph 2 is required shall be one (1) year from the day following the day of termination of the Agreement. However this period may be extended or shortened by mutual agreement between JAXA and the Research Organization.
6. JAXA and the Research Organization shall provide the other party with a copy of the publication immediately after the disclosure or publishing of such publication. Each party is entitled to an irrevocable and royalty-free right to use the provided publications, unless the copyright of such publication is owned or held by an academic society.

Article 29. Security

In the course of the Collaborative Research, the Parties shall take necessary procedures for maintaining an order in the areas managed by each party, ensuring appropriate and smooth operation of the research, and ensuring protection of important assets and information (security).

Article 30. Termination of the Contract

1. The Parties may terminate the Agreement in any case that corresponds to any one of the following. In such a case, the Parties agree to waive any claim against the other.
 - (1) Upon the consent of both JAXA and the Research Organization;
 - (2) When the other party commits a dishonest and/or inequitable act; provided, that breaching party fails to offer any effective and satisfactory remedial measures within seven (7) days after receiving demands for corrective action from the harmed party;
 - (3) When the other party breaches the Agreement; provided, that breaching party fails to offer any effective and satisfactory remedial measures within seven (7) days after receiving demands for corrective action from the harmed party;
 - (4) When the Research Organization loses a person who engages in the Research Projects due to the reasons described in Paragraph 5 of Article 4 such as transfer of the PI; and

- (5) When an inevitable reason such as the natural disaster arises.
2. In a case where the Agreement is terminated due to the reasons described in the previous Paragraph, JAXA shall request refund of the funding which is no longer necessary pursuant to Paragraph 1 of Article 8.
3. The Parties shall waive any claim against the other if the Agreement is terminated pursuant to Paragraph 1, Item 5 of this Article.
4. Upon the termination of the Agreement, the Research Organization shall promptly deliver to JAXA all work including, but not limited to, all works in progress and all work that is completed and otherwise ready for delivery.

Article 31. Effective Term

1. The effective term of the Agreement shall be the period set forth in Article 3.
2. Termination of this Agreement shall not affect a Party's continuing obligation under Paragraph 2 and 3 of Article 12 (Providing and Rights of Earth Observation Satellite Data by JAXA), Paragraph 2 to 5 of Article 13 (Providing and Rights of Meteorological Data by JAXA), Paragraph 3 of Article 14 (Exchange of Technical Information etc.), and Article 15 (Usage of Research Results) through Article 21 (Transfer of interests to Jointly-Owned Intellectual Property Rights) during the effective period of rights set forth in each Article and Paragraph while Article 22 (Improved Invention), Article 23 (Designation of Know-How), Article 27 (Confidentiality) and Article 28 (Publication of Research Results) shall be effective during the period set forth in each Article.

Article 32. Changes

1. JAXA may change the content of the Agreement. In such a case, JAXA shall notify the changes by posting such changes on the website of JAXA and subsequently shall follow the changed Agreement.
2. The Research Organization may terminate the Agreement, if the Research Organization has justifiable grounds, by notifying JAXA such intent by a written notification within thirty (30) day from the date of posting of the change on the website of JAXA.

Article 33. Consultation

1. Any matter not stipulated herein or any question arising out of, or in connection with, this Agreement shall be settled each time upon consultation between JAXA and the Research Organization.

Attachment “Earth Observation Satellite Data”

Name of Satellite or Sensor	Observation Period (YYYY/MM/DD)	Observable Area
JERS (Japanese Earth Observation Satellite)	1992/09/01~1998/10/11	Global
ADEOS (Advanced Earth Observation Satellite)	1996/10/15~1997/06/29	Global
ADEOS-II (Advanced Earth Observing Satellite-II)	2003/01~2003/10	Global
ALOS (Advanced Land Observing Satellite)	2006/05/16~2011/04/22	Global
GCOM-W1 (The Global Change Observation Mission 1st-Water)	2012 Fiscal Year~	Global
TRMM (Tropical Rainfall Measuring Mission)	1997/12~	Global (PR: Approximately 36°S-36°N. TMI and VIRS: Approximately 38°S-38°N)
AMSRE (Advanced Microwave Scanning Radiometer for EOS-Aqua satellite)	2002/06/19~2011/10/04	Global
GOSAT (Greenhouse Gases Observing Satellite)	2009/04/23~	Global

* GPM/DPR will be added by revision of the Agreement pursuant to Article 32 when provisions of data becomes available

COLLABORATIVE RESEARCH AGREEMENT (NON-FUNDED)
FOR THE EARTH CLOUD, AEROSOL AND RADIATION EXPLOERE
BETWEEN THE
JAPAN AEROSPACE EXPLORATION AGENCY (JAXA)
AND
THE RESEARCH ORGANIZATION
(FOR THE RESEARCH ANNOUNCEMENT)

JAPAN AEROSPACE EXPLORATION AGENCY

COLLABORATIVE RESEARCH AGREEMENT (NON-FUNDED)

This agreement ("Agreement") is entered into between the Japan Aerospace Exploration Agency, established under the provisions of the Law Concerning the Japan Aerospace Exploration Agency on October 1, 2003, represented by its President and having its principal office at 7-44-1 Higashimachi, Jindaiji, Choufu-shi, Tokyo, Japan ("JAXA") and a research organization ("Research Organization") that submitted an application form for the below described research activities to JAXA, hereinafter collectively referred to as "the Parties."

WITNESSETH

WHEREAS, JAXA issued the Research Announcement ("RA") to engage in collaborative research activities directly related to product validation of the Earth Cloud, Aerosol and Radiation Explorer ("EarthCARE"), and the Research Organization applied pursuant to such RA;

WHEREAS, JAXA accepted the Research Organization's proposal that was submitted in response to the RA, delivered the confirmation sheet to the Research Organization and JAXA further desires to utilize such proposal in JAXA's project; and

WHEREAS, JAXA desires to engage in the above research activities in collaboration with the Research Organization.

NOW, THEREFORE, in consideration of the mutual agreements hereinafter set forth, and for other good and reasonable consideration, the receipt and adequacy of which are hereby acknowledged, the Parties hereby agree as follows:

Article 1. Definitions

1. The following capitalized terms shall have the following meanings:

- (1) "Research Results" means the technical results and scientific knowledge derived from the implementation of the Research Projects pursuant to this Agreement, including all inventions, ideas, designs, literary works, algorithms, and technological developments, such as programs, that can execute the algorithm(s).
- (2) "Intellectual Property Rights" generated in the course of implementation of the Agreement

means the following:

- (i) Industrial Property Rights (as defined below);
- (ii) Potential Industrial Property Rights (as defined below); and
- (iii) Program/Data Copyrights (as defined below).

"Industrial Property Rights" means all domestic and foreign patents, utility models, and industrial designs.

"Potential Industrial Property Rights" means all domestic and foreign application rights for patents, utility models, or industrial designs.

"Program/Data Copyrights" means all domestic and foreign copyrights related to computer programs, software and databases.

- (1) "Collaborative Research Plan" means the plan described in the Application for Collaborative Research Agreement for the EarthCARE ("Application").
 - (2) "Research Period" means a three-year period from the beginning of fiscal year 2013 to the end of fiscal year 2015. Based on the regulations of this Agreement, in case this Agreement is terminated before the completion date of the Research Period, such date of termination of the Agreement shall be the final date of the Research Period.
 - (3) "Annual Evaluation" means evaluation by JAXA of the research results achieved at the end of each Japanese fiscal year, in order to assess the progress of the research.
 - (4) "Earth Observation Satellite Data" means data sets obtained from satellites which are retained by JAXA at the time of execution of this Agreement. The available data sets (including names of satellites, sensors, observation periods that can be offered, and observation areas) are listed in Attachment A of this Agreement.
 - (5) "Meteorological Data" means data sets provided by the Japan Meteorological Agency pursuant to the agreement between JAXA and the Japan Meteorological Agency.
- 2. In this Agreement, "Invention, etc." means inventions in terms of items subject to patent rights, utility models in terms of items subject to utility model rights, creations in terms of items subject to copyrights such as design rights and programs, and ideas in terms of items subject to algorithms and know-how.
 - 3. In this Agreement, "utilization" of the intellectual property rights and Research Results means activities defined in Article 2, Paragraph 3 of the Patent Act, activities defined in Article 2,

Paragraph 3 of the Utility Model Act, activities defined in Article 2, Paragraph 3 of the Design Act, enforcement of rights defined in Articles 21 and 27 of the Copyright Act (including utilization of secondary work created by JAXA or the Research Organization), and use of algorithms and know-how.

4. In this Agreement, "Principal Investigator" ("PI") means the Research Organization employee who submitted the proposal in response to the RA and was selected to be responsible for the Research Projects. "Co-Investigator" ("CI") means a person who supports the PI in performing the Research Projects with approval by JAXA. Names, affiliation, and other information concerning the PI and CI (collectively "Collaborative Researchers") shall be described in the Collaborative Research Plan.

Article 2. JAXA's Performance for Research Projects and the Research Organization's General Responsibilities for Research Projects

1. JAXA shall make reasonable efforts to perform the following tasks related to the Research Projects:
 - a) Deliver the Earth Observation Satellite Data and Meteorological Data required for performing the Collaborative Research to the Research Organization free of charge;
 - b) Hold research presentation meetings (Research Presentation Meeting) to check progress of the research and other necessary meetings;
 - c) Carry out an Annual Evaluation based on the report made in the Research Presentation Meeting stipulated in the previous Paragraph, or written reports similar to the one stipulated therein.
2. For the purpose of ensuring the Research Organization's performance of the above obligations, the Research Organization shall perform certain actions including, but not limited to:
 - a) Conduct and complete the Research Projects in accordance with the Collaborative Research Plan.
 - b) Participate in the Research Presentation Meeting hosted by JAXA every fiscal year in response to the request from JAXA;
 - c) Report on the Research Results and progress of research in the Research Presentation Meeting stipulated in the previous Paragraph, or submit in a written form to JAXA by the day before the Annual Evaluation that JAXA implements every fiscal year;
 - d) Deliver the reports as a report of all the Research Results obtained during the fiscal year by the end of such fiscal year to JAXA. Furthermore, upon completion of the research period, the Research Organization shall report all the Research Results obtained throughout the entire period of the Collaborative Research in the Final Report and submit it to JAXA. In this case, the Research Organization does not need to separately submit an annual report for the final year of the term; and

- e) Alternatively may substitute the submission of a thesis published during the Research Period for the submission of the report of Research Results.

Article 3. Finalization of the Contract

The Agreement shall become effective as of the date of the issuance of the Confirmation Sheet prescribed by JAXA in response to an application by the Research Organization. The period of the Agreement shall be the period described in the Confirmation Sheet issued by JAXA.

Article 4. Researchers

1. The Research Organization shall ensure that the Collaborative Researchers listed in the Collaborative Research Plan to participate in the Collaborative Research.
2. JAXA shall allow those who are listed in the Collaborative Research Plan to participate in the Research Projects.
3. The Research Organization shall ensure that all the Collaborative Researchers engaging in the Research Projects act in accordance with the terms and conditions of the Agreement.
4. In the event that the Research Organization intends to newly select or add CIs, the Research Organization shall first notify JAXA in written form in advance and obtain the consent of JAXA for such personnel. The Research Organization shall take necessary measures to cause such CI to follow the Collaborative Research Agreement.
5. In the event that the PI dies, retires from the Research Organization, takes a leave of absence from work, or comes to be no longer engaged in the Research Projects, the Research Organization shall immediately notify JAXA as such and JAXA may at its sole discretion terminate this Agreement; provided however, that if the Research Organization designates a researcher who belongs to the Research Organization as the PI's successor and JAXA approves the succession, the Parties may amend this Agreement, with the succeeding researcher being a new PI. The terms and conditions of the amendment to this Agreement shall be determined upon mutual consultation and consent.

Article 5. Research Funding

Each party shall bear the necessary costs of fulfilling its own responsibilities under this agreement.

Article 6. Ownership of the Rights to the Acquired Equipment

Equipment acquired by each party in the course of the Research Projects shall be owned by the party who purchased such equipment.

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Article 7. Providing of Earth Observation Satellite Data by JAXA

1. JAXA will provide the Research Organization with the Earth Observation Satellite Data for the Research Projects free of charge in accordance with Article 2, Paragraph 1, a) subject to the following conditions:

a) The Research Organization agrees and accepts that JAXA may not provide all the Earth Observation Satellite Data which the Research Organization may request due to rights restrictions of JAXA's equipment and resource limitations.

Note that the Advanced Land Observing Satellite data, which is one portion of the Earth Observation Satellite Data required by the Research Organization and to be provided to the Research Organization, shall be limited to ten scenes every fiscal year;

b) JAXA does not guarantee a specific quality or the timely provision of the Earth Observation Satellite Data and does not take responsibility for the quality or any delay of provision of such data; and

c) JAXA reserves the right to curtail or suspend Earth Observation Satellite Data supply to the Research Organization due to faults or difficulties relating to the satellites, limitations on their operations, or any other reasons, and JAXA shall be exempt from any responsibility for such curtailing or suspension.

2. With respect to the Earth Observation Satellite Data provided by JAXA, the Research Organization shall:

a) Not duplicate the Earth Observation Satellite Data except for the purpose of backup. However, this excludes duplication for distributing to authorized researchers engaged in the Research Project as stipulated in Article 4 and subcontractors stipulated in Article 4 ("Collaborative Researchers" collectively) which are necessary for the Collaborative Research Project.

b) Not provide or disclose the Earth Observation Satellite Data which can be converted back to the primary Earth Observation Satellite Data except to the PI;

c) Only use the Earth Observation Satellite Data for the singular purpose of advancing the efforts of the Research Projects; and

d) Return or otherwise appropriately manage the Earth Observation Satellite Data upon completion of this Agreement, according to the directives of JAXA.

3. Any rights regarding the Earth Observation Satellite Data provided by JAXA shall conform to the following:

a) Any rights relating to the Earth Observation Satellite Data provided by JAXA to the Research Organization shall not be transferred to the Research Organization by such provisions. In terms of the intellectual property rights of the data, the Research Organization shall follow instructions of JAXA.

b) If value-added products, which mean highly processed products that do not retain the original pixel structure and that cannot be converted back to the primary Earth Observation Satellite Data,

are developed in the course of executing the Research Projects, the ownership of such products shall be determined upon mutual agreement between the Parties, taking into consideration the degrees of contribution by JAXA and the Research Organization.

Article 8. Providing of Meteorological Data by JAXA

1. For the purpose of performing the Research Projects, JAXA will attempt to provide the Research Organization with the Meteorological Data based on Article 2, Paragraph 1, a).
2. Any rights relating to the Meteorological Data provided by JAXA to the Research Organization shall not be transferred to the Research Organization by such provisions. In terms of the intellectual property rights of the data, the Research Organization shall follow the instructions of JAXA.
3. The Research Organization may not disclose the provided Meteorological Data to any third party except for Collaborative Researchers.
4. The Research Organization shall use the provided Meteorological Data solely for the purpose of conducting the Research Projects.
5. The Research Organization shall return or otherwise appropriately keep the Meteorological Data in accordance with the instructions of JAXA upon the termination of this Agreement.

Article 9. Disclosure of Technical Data

1. For the purpose of performing the Research Projects, JAXA will attempt to provide the Research Organization with the meteorological data provided by the Japan Meteorological Agency pursuant to the agreement between JAXA and the Japan Meteorological Agency ("Meteorological Data"). The Research Organization agrees that JAXA's provision of the Meteorological Data may be limited or otherwise affected by the fact that some rights to the Meteorological Data belong to the Japan Meteorological Agency.
2. The Research Organization shall use the provided Meteorological Data solely for the purpose of conducting the Research Projects. The Research Organization may not disclose the provided Meteorological Data to any third party.
3. The Research Organization shall return or otherwise appropriately keep the Meteorological Data in accordance with the instructions of JAXA upon the termination of this Agreement.

Article 10. Usage of Research Results

1. All Research Results obtained through the course of the Collaborative Research ("Jointly-Owned Research Results") may be used for non-commercial and peaceful purposes by the Parties (or by a third party including for JAXA or the Research Organization) without prior consent of the other party.
2. With regard to copyrights in the Final Reports submitted by the Research Organization to JAXA, JAXA may freely use, edit, copy, and distribute such reports. In this case, the Collaborative Researchers shall waive any related moral rights to the copyrights in the Final Reports.

Article 11. Ownership of Research Results

1. Both Parties shall solely own the rights of the Research Results only if JAXA or the Research Organization solely generates such Research Results in the course of Research Projects.
2. The Parties shall jointly own the rights to the Research Results obtained through the course of the Collaborative Research and the ownership of such results shall be determined upon mutual agreement between the Parties, taking into consideration the degrees of contribution by JAXA and the Research Organization.

Article 12. Application, etc., of Intellectual Property Rights

1. JAXA or the Research Organization shall give the other party prompt written notice of Intellectual Property Rights generated in the course of the Collaborative Research, such as Inventions, Utility Models, and Creations, and discuss the ownership of such generated Intellectual Property Rights, as well as whether it is necessary to submit an application for registration of such Intellectual Property Rights.
2. JAXA and/or the Research Organization shall take any necessary procedures for any Industrial Property Rights owned by and/or held by each Collaborative Researcher (including inventions, etc., jointly generated by such Joint Researcher and JAXA or the Research Organization) to be transferred by such Joint Researcher to JAXA or the Research Organization.
3. If JAXA or the Research Organization solely generates Potential Intellectual Property Rights in the course of the Research Projects ("Solely-Owned Intellectual Property Rights"), the party may take steps to apply for the registration of the resulting Intellectual Property Rights as solely-owned ones, provided that it shall obtain prior confirmation of the other party. In this case, expenses for application and rights preservation shall be borne by the party solely holding the Intellectual Property Rights.
4. In the event that the Parties jointly generate an invention, etc., and submit an application for Intellectual Property Rights to such invention, the Parties shall enter into a separate joint ownership agreement ("Joint Ownership Agreement") and jointly perform submission of the

application and other procedures according to the Joint Ownership Agreement. In this case, expenses for application and rights preservation shall be borne by both JAXA and the Research Organization in accordance with the degree of ownership.

Article 13. Application of Intellectual Property Rights Overseas

1. Regulations of the previous Article shall apply to the case of application and rights preservation of the Intellectual Property Rights in foreign countries.
2. In the event of an application of the Intellectual Property Rights jointly owned by the Parties pursuant to Paragraph 4 of the previous Article, the Parties shall discuss whether it is necessary to submit an application for registration of such Intellectual Property Rights.

Article 14. Utilization of Jointly-Owned Intellectual Property Rights

In case either of the Parties utilizes the Jointly-Owned Intellectual Property Rights, such party shall obtain the consent of the other party in advance and pay a utilization fee as set forth in the separate utilization agreement, except for the case stipulated in Article 10.

Article 15. License of Utilization of Jointly-Owned Intellectual Property Rights to Third Party

1. The Parties may grant to any third party a license to use the Jointly-Owned Intellectual Property Rights, provided, however that the relevant party shall obtain the written prior consent of the other party, and determine the licensing terms after discussion with the other party.
2. In the case of granting a license to use the Jointly-Owned Intellectual Property Rights to a third party as in the previous Paragraph, the relevant party shall collect the usage fee from such third party as set forth in the separate usage agreement. The usage fee to be collected from the third party shall be distributed between the Parties pro rata in proportion to their respective interests in those rights.

Article 16. Transfer of Interests to Jointly-Owned Intellectual Property Rights

1. The Parties may transfer their respective interests to the Jointly-Owned Intellectual Property Rights generated in the course of the Collaborative Research only to their respective designees after discussion between the Parties. Such transfer may be carried out pursuant to a separate transfer agreement. In this event, the Parties shall cause its designee to succeed to all of its rights and obligations with respect to those Intellectual Property Rights.
2. If JAXA or the Research Organization disclaims its interests in the Jointly-Owned Intellectual Property Rights, the relevant party shall give the other party prior notice thereof and transfer its interests to the other party, only if the other party wishes to acquire it.

Article 17. Improved Invention

If JAXA or the Research Organization alters or improves the Jointly-Owned Intellectual Property within one (1) year from the application for registration of the original Jointly-Owned Intellectual Property Rights, the party shall provide a written notice without delay to the other party describing the alterations or improvements. Ownership and other issues of the Intellectual Property Rights concerning the altered or improved invention shall be determined through discussion between the Parties.

Article 18. Designation of Know-How

1. After mutual agreement by the Parties, JAXA and the Research Organization shall promptly designate as know-how the Research Results which are appropriately to be treated as know-how ("Know-How").
2. For designation of Know-How, a period during which the Research Results are designated to be Know-How shall be specified.
3. After designating the Know-How, such Know-How shall be kept in confidence in principle, for five (5) years commencing on the day immediately following the date of the completion of this Agreement; provided, however, that JAXA and the Research Organization may extend or shorten that period upon mutual agreement.

Article 19. Utilization of Facilities, etc.

1. The Parties may use facilities and equipment ("Facilities") of the other party free of charge with the prior consent of the other party if it is necessary for implementation of the Research Projects.
2. The Parties shall follow the rules and regulations of the other party in case of using the Facilities of the other party.

Article 20. Installation of Equipment

1. The Parties may, if necessary for implementation of the Research Projects, install necessary equipment and other materials into the facility of the other party with the prior consent of the other party. In this case, the party which installs such equipment shall follow the rules and regulations of the other party.
2. In the event that JAXA or the Research Organization uses the materials, etc., installed by the other party (Installed Material), such party shall obtain the prior consent of the other party and shall not use the Installed Material for other purposes than the Research Projects.
3. In the event that JAXA or the Research Organization loses or damages the Installed Material, such party should immediately notify the other party of such fact irrespective of the reason.

Article 21. Delivery, Storage, and Returning of Lent Equipment

1. The Parties may lend machinery or other materials to the other party if it is required for implementation of the Research Projects.
2. Upon delivery of the machinery or other materials ("Lent Equipment") lent in accordance with the previous Paragraph, the owner of the Lent Equipment ("Lessor") shall submit to the other party a Note of Delivery and the other party shall submit to the Lessor a receipt.
3. The Parties shall confirm the items, amount, etc. of the Lent Equipment upon delivery of the Lent Equipment and if there is a shortage in the amount or any defect (including ones whose quality and/or specification does not meet the requirements), JAXA or the Research Organization shall notify such fact to the Lessor and receive an instruction from the Lessor.
4. JAXA and the Research Organization shall manage and use the Lent Equipment with the care of a good manager and should not use the Lent Equipment for purposes other than the Research Projects.
5. JAXA and the Research Organization shall keep a record of usage and management of the Lent Equipment to record the delivery, usage, and returning of the Lent Equipment for the purpose of clarifying the condition of the Lent Equipment.
6. In the case of loss or damage to the Lent Equipment, JAXA and the Research Organization shall immediately notify the fact to the Lessor without delay.
7. The receiving party shall notify the Lessor if any of the Lent Equipment becomes unnecessary due to reasons such as completion, change, or termination of whole or part of the Research Projects and shall take procedures to return the Lent Equipment according to the instructions of the Lessor.

Article 22. Confidentiality

1. In this Agreement, "Confidential Information" means any information that corresponds to any of the following:
 - (1) Any information that includes documents classified "Confidential", any material object such as a sample, or any information, either material or immaterial, which JAXA and the Research Organization agreed to handle as Confidential Information by a written agreement, obtained in the course of these Research Projects; and
 - (2) Any information disclosed or distributed to the other party as Confidential Information in the form of a document, a drawing, a photograph, a specimen, a sample, a magnetic tape, a floppy disk, or the like for the purpose of the Research Projects.
2. The Parties shall appropriately keep the Confidential Information secret, and shall not disclose or divulge any Confidential Information to any party other than those who engage in the Research Projects; provided, however, that any information which corresponds to any of the

following is not included in the Confidential Information.

- a) Information that is already known to the public when disclosed by the disclosing party;
 - b) Information that becomes known to the public after the disclosure by the disclosing party without intentional misconduct or negligence of the receiving party;
 - c) Information that the receiving party already had before the disclosure by the disclosing party;
 - d) Information that the receiving party acquires from a duly authorized third party not subject to confidentiality obligations;
 - e) Information that the receiving party independently develops without utilizing information obtained from the disclosing party;
 - f) Information with prior written consent of the disclosing party for disclosure or publication; or
 - g) Information that is required to be disclosed by applicable laws, judgment or order of a competent court. In this case, the receiving party shall promptly notify the disclosing party of the necessity of disclosure.
3. The confidentiality obligation under this Article shall remain effective for a period of five (5) years after the termination of the Agreement. However this period of maintaining confidentiality may be extended or shortened by mutual agreement between JAXA and the Research Organization.

Article 23. Publication of Research Results

1. The Parties may disclose or publish the Research Results obtained in the course of the Research Projects ("Publication of Research Results") provided that such publishing party follows the confidentiality obligations stipulated in Article 22.
2. In the case of the previous Paragraph, before publishing, JAXA or the Research Organization ("the publishing party") shall provide the other party with a written document regarding the description of the Research Results to be published and request the written consent of the other party. The other party will not unreasonably withhold consent from the publishing party's request for such publication.
3. The other party, upon receiving the notice, will request correction of the content of the publication in written form if it is judged that such content includes a portion which may lead to the loss of the future interest of the other party and the publishing party shall consult with the other party about such portion. The publishing party may not publish the portion which the other party has notified as having the possibility of resulting in the loss of the future interest of the other party without the consent of the other party.
4. The Research Organization shall state in the publication that such Research Results have been obtained pursuant to this Agreement and identify the owner of the rights to the Earth Observation Satellite Data and Meteorological Data used in such publication.

5. The period during which the notification pursuant to Paragraph 2 is required shall be one (1) year from the day following the day of termination of the Agreement. However this period may be extended or shortened by mutual agreement between JAXA and the Research Organization.
6. JAXA and the Research Organization shall provide the other party with a copy of the publication immediately after the disclosure or publishing of such publication. Each party is entitled to an irrevocable and royalty-free right to use the provided publications, unless the copyright of such publication is owned or held by an academic society.

Article 24. Security

In the course of the Collaborative Research, the Parties shall take necessary procedures for maintaining order in the areas managed by each party, ensuring appropriate and smooth operation of the research, and ensuring the protection (security) of important assets and information.

Article 25. Termination of the Contract

1. The Parties may terminate the Agreement in any case that corresponds to any one of the following. In such a case, the Parties agree to waive any claim against the other.
 - (1) Upon the consent of both JAXA and the Research Organization;
 - (2) When the other party commits a dishonest and/or inequitable act; provided that the breaching party fails to offer any effective and satisfactory remedial measures within seven (7) days after receiving demands for corrective action from the harmed party;
 - (3) When the other party breaches the Agreement; provided that the breaching party fails to offer any effective and satisfactory remedial measures within seven (7) days after receiving demands for corrective action from the harmed party;
 - (4) When JAXA determines that it cannot continue the Research Projects with the Research Organization as a result of the Annual Evaluation stipulated in Article 2, Paragraph 1, c).
 - (5) When the Research Organization loses a person who is engaged in the Research Projects due to the reasons described in Paragraph 5 of Article 4, such as transfer of the PI; and
 - (6) Due to an unavoidable occurrence such as a natural disaster.
2. Upon the termination of the Agreement, the Research Organization shall promptly deliver to JAXA all work including, but not limited to, all works in progress and all work that is completed and otherwise ready for delivery.
3. The Parties shall waive any claim against the other if the Agreement is terminated pursuant to Paragraph 1, Item 6 of this Article.

Article 26. Effective Term

1. The effective term of the Agreement shall be the period set forth in Article 3.
2. Termination of this Agreement shall not affect a Party's continuing obligation under Paragraph 2 and 3 of Article 7 (Providing and Rights of Earth Observation Satellite Data by JAXA), Paragraph 2 to 5 of Article 8 (Providing and Rights of Meteorological Data by JAXA), Paragraph 3 of Article 9 (Exchange of Technical Information etc.), and Article 10 (Usage of Research Results) through Article 16 (Transfer of interests to Jointly-Owned Intellectual Property Rights) during the effective period of rights set forth in each Article and Paragraph while Article 17 (Improved Invention), Article 18 (Designation of Know-How), Article 22 (Confidentiality) and Article 23 (Publication of Research Results) shall be effective during the period set forth in each Article.

Article 27. Changes

1. JAXA may change the content of the Agreement. In such case, JAXA shall notify the changes by posting such changes on the website of JAXA and subsequently shall follow the changed Agreement.
2. The Research Organization may terminate the Agreement, if the Research Organization has justifiable grounds, by notifying JAXA of such intent in writing within thirty (30) days from the date of posting of the change on the website of JAXA.

Article 28. Consultation

Any matter not stipulated herein or any question arising out of, or in connection with, this Agreement shall be settled each time upon consultation between JAXA and the Research Organization.

Attachment “Earth Observation Satellite Data”

Name of Satellite or Sensor	Observation Period (YYYY/MM/DD)	Observable Area
JERS (Japanese Earth Observation Satellite)	1992/09/01~1998/10/11	Global
ADEOS (Advanced Earth Observation Satellite)	1996/10/15~1997/06/29	Global
ADEOS-II (Advanced Earth Observing Satellite-II)	2003/01~2003/10	Global
ALOS (Advanced Land Observing Satellite)	2006/05/16~2011/04/22	Global
GCOM-W1 (The Global Change Observation Mission 1st-Water)	2012 Fiscal Year~	Global
TRMM (Tropical Rainfall Measuring Mission)	1997/12~	Global (PR: Approximately 36°S-36°N. TMI and VIRS: Approximately 38°S-38°N)
AMSRE (Advanced Microwave Scanning Radiometer for EOS-Aqua satellite)	2002/06/19~2011/10/04	Global
GOSAT (Greenhouse Gases Observing Satellite)	2009/04/23~	Global

* GPM/DPR will be added by revision of the Agreement pursuant to Article 27 when provision of the data becomes available.