

1st Research Announcement on the Earth Observations

Product Development Research

GCOM-W Algorithm Development, GCOM-W Calibration & Validation

Application Research towards Future Earth Observations

*GCOM-W Application, GCOM-C Application,
PMM Application, ALOS-2 Application,
Earth Observation Priority Researches*

*(Ocean Environmental Monitoring, Water Cycle/Water Resource Management,
Atmospheric Environmental Monitoring, Infrastructure Displacement, Climate
System/Radiation Process, Ecosystems, Agriculture, Public Health)*

Issued: September 7, 2016

Proposal Due: November 15, 2016

**Earth Observation Research Center
Space Technology Directorate I
Japan Aerospace Exploration Agency**

Contents

1. Introduction.....	1
1.1. About the Earth Observation Research Announcement.....	1
1.2. About the Product Development Research.....	2
1.3. About the Earth Observation Priority Research.....	3
1.4. About the First Research Announcement.....	3
2. Technical descriptions.....	5
2.1. Product Development Research.....	5
2.2. Application Research towards Future Earth Observations.....	2
3. Instructions for responding to this RA.....	11
3.1. Qualifications.....	11
3.2. Research agreement conclusion.....	11
3.3. Research period.....	11
3.4. Resources.....	11
3.5. Obligations.....	12
3.6. Selection.....	12
3.7. Late proposals.....	12
3.8. Withdrawal of proposal.....	12
3.9. Cancellation and postponement.....	13
3.10. Important dates.....	13
3.11. Proposal submission and contact point.....	13
4. Instructions for proposal contents.....	15
4.1. General.....	15
4.2. Format.....	15
4.3. Proposal contents.....	15
5. Description of research agreement.....	18
5.1. Contractual procedure.....	18
5.2. Research agreement summary.....	18
APPENDIX A PROPOSAL COVER SHEET AND SCHEDULE.....	A-1
APPENDIX B RESOURCE REQUIREMENTS.....	B-1
APPENDIX C TERMS AND CONDITIONS OF RESEARCH CONTRACT.....	C-1
APPENDIX 1 OVERVIEW OF THE GLOBAL CHANGE OBSERVATION MISSION (GCOM).....	1-1
APPENDIX 2 OVERVIEW OF THE GLOBAL PRECIPITATION MEASUREMENT (GPM) AND TROPICAL RAINFALL MEASURING MISSION (TRMM).....	2-1
APPENDIX 3 OVERVIEW OF THE EARTH CLOUD, AEROSOL AND RADIATION EXPLORER (EarthCARE) MISSION.....	3-1
APPENDIX 4 OVERVIEW OF THE ADVANCED LAND OBSERVING SATELLITE-2 (ALOS-2)..	4-1
APPENDIX 5 EARTH OBSERVATION PRIORITY RESEARCH.....	5-1

1. Introduction

1.1. About the Earth Observation Research Announcement

The Japan Aerospace Exploration Agency (JAXA)/Earth Observation Research Center (EORC) have been conducting research announcements (RA) for each earth observation satellite project. Since Japanese fiscal year 2015, EORC started to promote research to focus our attention to “Earth Observation Priority Research”.

Under these circumstances, EORC newly calls for the Earth Observation RA based on the following philosophy.

- EORC reorganizes the RA plan that has been conducted under each satellite project, and summarize to one “Earth Observation RA”. In this way, EORC will enhance multidisciplinary application research using satellite data.
- The categories of the Earth Observation RA consist of “Product Development Research” and “Application Research” (including Earth Observation Priority Research^(*)) towards future earth observations contributing to three major challenges; 1) response to climate change; 2) promotion of satellite utilization in disaster mitigation and response; and 3) pioneering new areas. (See Figure 1)

By announcing widely to researchers/engineers of various research areas from domestic and foreign organizations, EORC will effectively conduct research and product development on technologies and new insights required to achieve mission success criteria for JAXA satellite projects and promote EORC Earth Observation Priority Research.

However, EORC will not conduct the Earth Observation RA in cases where research objective/content and implementation period had significant limitations, where there were few advantages for changing to the new RA, and where the research principal that can conduct the research was limited to a certain agency/institute.

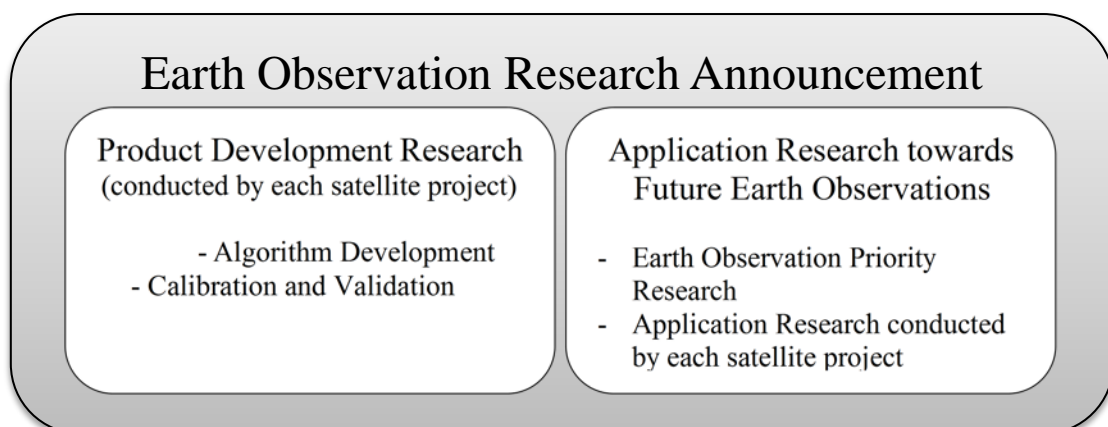


Figure 1: Overview of the Earth Observation Research Announcement

^(*)JAXA has been conducting “Earth Observation Priority Research” from Japanese fiscal

year 2015 to promote synergistic application of satellite data. The objective of the Earth Observation Priority Research is to derive high-level products from multiple satellite mission data and to enhance monitoring ability by creating advanced and temporally/spatially homogeneous dataset from satellite-model application. In this way, we aim to develop prediction technology using numerical models, leading to the operational application and service provision. Currently, the following research topics are established as EORC Earth Observation Priority Research: “Ocean Environmental Monitoring”, “Water Cycle/Water Resource Management”, “Atmospheric Environmental Monitoring”, “Infrastructure Displacement”, “Climate System/Radiation Process”, “Ecosystems”, “Agriculture”, and “Public Health”. See APPENDIX 5 for more details about each Earth Observation Priority Research.

1.2. About the Product Development Research

A) Objective

JAXA seeks research proposals for standard and research algorithm maintenance and improvement, and their validation that are necessary for satellite mission.

B) Overview

(1) Development and Maintenance of Standard Algorithm

In this category, JAXA seeks for research proposals on maintenance and improvement of the standard algorithms, which will be used for processing standard products after the launch. In principle, to utilize the existing results of the first RA directly, proposals from applicants whose algorithms were selected as the standard algorithm after the launch through the previous RA research activity will continue to be selected. Selected PIs and JAXA will work together in maintaining, evaluating, implementing, and validating the algorithms, as well as in preparing the algorithm theoretical basis document (ATBD) and validation plans.

(2) Development of Research Algorithm

Research algorithms will include a new algorithm to produce standard products with further improved accuracy, and ones to produce research products. The former ones have the potential to be selected as standard algorithms at the time of product revision through the inter-comparison study with other algorithms. Therefore, the research needs to be carried out with the goal accuracy in mind. Other preferable characteristics are the same as those of standard algorithms. Regarding the latter ones, those research products will have the potential to be candidates of new standard products after certain evaluation process.

(3) Standard Algorithm Calibration/validation, and Provision of Validation Data

JAXA seeks research proposals contributing to the calibration and the validation of standard products and to the acquisition of basic datasets, which are necessary to improve algorithms. It is also expected to feed back the validation results to improve sensor calibration. Regarding the field campaigns and experiments, obtaining both effective validation results and scientific outputs by collaborating with other research programs is expected. Particularly,

measurements and validation studies of geophysical parameters, for which obtaining the global and operational validation dataset is difficult, are highly desired.

To apply for improving the algorithms, obtained validation data and knowledge need to be provided to JAXA. Furthermore, JAXA intends to open these data to the public, after consulting with the PIs about their disclosure level and release timing. Proposals including both algorithm development and validation can be submitted to the category of algorithm development.

1.3. About the Earth Observation Priority Research

The Earth Observation Priority Research aims to solve social problems, by the synergetic use of satellite data including non-JAXA satellites such as Himawari-8 geostationary satellite, using assimilation and modelling techniques. Following is the overall direction that the Earth Observation Priority Research is aiming. For further information, please refer APPENDIX 5.

(1) Fusion of Satellite Data and Earth Environmental Modeling

Earth observation satellite has been contributing to monitor earth environment and disasters. In the future, in addition to this, it is necessary to promote high-level application of satellite observation data in response to the issues that are needed to be solved including global warming and global environmental change. In order to do this, it is necessary to predict the processes that induce the changes. The development of earth system models and environment models that enables to simulate those processes are ongoing in many research fields and the use of satellite observation has been essential in these area.

(2) Earth Observation for Earth Science and Social Application

Earth observation is expected to contribute to both earth science and social application. Therefore, we consider that it is inevitably inefficient to separate these aspects apart and that it is strategically effective to produce and enhance their synergy.

1.4. About the First Research Announcement

JAXA will conduct the “1st Research Announcement on the Earth Observations” for research activities from next Japanese fiscal year.

In the 1st Research Announcement on the Earth Observations, JAXA solicits product development researches (algorithm development, calibration and validation) of the Global Change Observation Mission - Water "SHIZUKU" (GCOM-W) and, application research for each satellite projects and Earth Observation Priority Research towards future earth observations contributing to three major challenges; 1) response to climate change; 2) promotion of satellite utilization in disaster mitigation and response; and 3) pioneering new areas.

On the other hand, JAXA continues the research announcements of Advanced Land Observing Satellite-2 (ALOS-2), Global Precipitation Measurement (GPM)/Precipitation Measuring Mission (PMM) and Global Change Observation Mission - Climate (GCOM-C)

which have been already adopted in Japanese fiscal year 2016 and also continues Earth Clouds, Aerosols and Radiation Explorer (EarthCARE) under the current research framework based on the situation that has been described in section 1.1^(*).

^(*)Greenhouse Gases Observing Satellite (GOSAT) will be excluded from the scope of this RA as the RA has been conducted in collaboration with the Ministry of the Environment and the National Institute for Environmental Studies.

In the first Earth Observation RA, we invite the following research themes that effectively use JAXA Earth observation satellite data, strengthen and evolve of the existing output, and/or find the new values that will increase the scientific and social significance of the satellite data, building on three themes; 1) response to climate change; 2) promotion of satellite utilization in disaster mitigation and response; and 3) pioneering new areas which JAXA considers as major challenges for future earth observations.

(1) Research Themes

- (a) Product Development Research (GCOM-W)
- (b) Application Research (for JAXA earth observation satellite and eight Earth Observation Priority Research themes *1)

*1 Please refer section 2.2 for further details.

(2) Research Period

April 2017—March 2019

The 2nd Earth Observation Research Announcement is planned to be conducted after the Japanese fiscal year 2019. The 2nd Earth Observation RA will merge the research topics that are in the scope of this RA, the existing RA by JAXA (ALOS-2, GPM (PMM), GCOM-C) and the new opportunities from the EarthCARE and the Advanced Optical Satellite projects.

The principal investigator (PI) of each selected proposal will become a science team member of Earth Observation Satellite. The PI will conduct frequent discussions and collaborations with JAXA EORC staffs for the algorithm development, validation, and application studies. The PI must attend and present the research statuses at annual PI workshops.

With the exception of students, all categories of domestic and foreign nonprofit and peaceful organizations can apply under this RA. However, funding may differ for each research category and applicant. Funding by JAXA is essentially restricted to domestic PIs, although some exceptions may be made for research necessary to achieve the Earth Observation Satellite mission success criteria. Proposal due date is 15 November 2016. Proposals will be selected on the bases of a peer-review process and discussions in science/project evaluation boards. JAXA plans to announce the selection results in February 2017.

Applicants should consider that JAXA is not a general funding body for the scientific community. This RA seeks to accomplish the Earth Observation mission's goals and to discover new possibilities for utilizing Earth Observation data. Proposals should clearly describe plans for the data usage of JAXA Earth Observation data.

2. Technical descriptions

2.1. Product Development Research

2.1.1. The Global Change Observation Mission – Water (GCOM-W)

GCOM seeks to establish and demonstrate a global, long-term satellite observing system to measure essential geophysical parameters for understanding global climate change and the water cycle mechanism, and eventually contribute to improving future climate projections through a collaborative framework with climate model institutions. Demonstrating capabilities of operational applications through the provision of continuous data to operational agencies is another important objective. GCOM will take over the Advanced Earth Observing Satellite-II (ADEOS-II) mission and transition into long-term monitoring of the Earth. To achieve global, comprehensive, long-term, and homogeneous observation, GCOM will consist of three consecutive generations of two satellite types with a 1-year overlap, resulting in a 13-year observation period. The two satellites are GCOM-W and GCOM-C. The 1st generation of GCOM-W satellite “SHIZUKU” was launched in May 2012, and carries the Advanced Microwave Scanning Radiometer-2 (AMSR2) to contribute to understanding the water and energy cycle.

The AMSR2 instrument on board GCOM-W is a multi-frequency, dual-polarized, passive microwave radiometer for observing water-related geophysical parameters. AMSR2 was designed and manufactured based on the experience of the AMSR aboard ADEOS-II and the AMSR for EOS (AMSR-E), which completed its scientific observation in October 2011. AMSR-E had restarted its observation in slow rotation mode at 2rpm since December 2012 in order to implement cross-calibration with AMSR2 on orbit, but completed its operation in December 2015. All AMSR-E brightness temperature data obtained during the slow rotation period are open to public via internet

(http://suzaku.eorc.jaxa.jp/GCOM_W/research/resdist.html).

Details of the GCOM sensor and satellite specification are presented in APPENDIX 1.

(1) GCOM-W Algorithm Development

JAXA seeks proposals on maintenance and improvement of GCOM-W standard algorithms, which were defined in TABLE 6 of APPENDIX 1, to meet the standard and target accuracies and also for research algorithms, which were defined in TABLE 7 of APPENDIX 1. Proposals on development of other research algorithm that is not defined in TABLE 7 should be applied to the category of GCOM-W Application in Section 2.2.1. As described in Chapter 5, proposals in standard algorithm validation and improvement will be implemented under the “Commissioned Research Agreement (Funded),” and proposals in research algorithm development under the “Collaborative Research Agreement (Funded/Non-funded),” in principle. Depending on its budget status, JAXA plans to spend 60 million yen per year for total of the GCOM-W researches (GCOM-W Algorithm Development, GCOM-W Calibration & Validation, GCOM-W Application, and Earth Observation Priority Researches focused on GCOM-W data).

(a) Maintenance and improvement of standard algorithms

In this category, JAXA seeks proposals on maintenance and improvement of the standard algorithms, which is used for processing GCOM-W standard products after launch. In principle, to utilize the existing results of the previous research periods directly, proposals from applicants whose algorithms were selected as the standard algorithm after launch through the first RA research activity will continue to be selected. Selected PIs and JAXA will work together in evaluating, implementing, and validating the algorithms, as well as revision of the algorithm theoretical basis document (ATBD) and validation plans.

The GCOM-W standard products and their expected accuracies, which are defined in the mission success criteria, are listed in Table 6 of APPENDIX 1. These accuracies were defined in consultation with data users based on the experience and performance of the AMSR and AMSR-E products.

The “data release” accuracy denotes the minimum accuracy for the data release, the “standard” accuracy is defined as the valuable and standard accuracy, and the “goal” accuracy includes many challenges in improving algorithm performance and/or calibration accuracy and is to be achieved on a research basis. The all standard algorithms are required to produce standard products that meet the “standard” accuracy requirements in Table 6 of APPENDIX 1 before the completion of operation phase of the GCOM-W satellite scheduled in May 2017, and it is also required to maintain the “standard” accuracy during the post-operation phase. To meet the GCOM objectives, retrieval algorithms will require global applicability, robustness, and long-term stability. Algorithms that can be extended and applied to similar microwave radiometers and historical data records are preferable for integrated retrieval. Computationally efficient, fast-processing algorithms are important for the operational applications of the products.

(b) Maintenance and improvement of research algorithms

Research algorithms will include a new algorithm to produce standard products with further improved accuracy, and ones to produce research products defined in TABLE 7 of APPENDIX 1. The former ones have the potential to be selected as standard algorithms at the time of future product revision through the inter-comparison study with other algorithms. Therefore, the research needs to be carried out with the goal accuracy in mind. Other preferable characteristics are the same as those of standard algorithms. Regarding the latter ones, once after the proposed products are selected as research products, those research products will have the potential to be candidates of new standard products.

(2) GCOM-W Calibration & Validation

JAXA seeks proposals contributing to the validation of standard and research products. It is also expected to feed back the validation results to improve AMSR2 algorithms and calibration. Regarding the field campaign and experiments, obtaining both effective validation results and scientific outputs by collaborating with other research programs is expected. Particularly, in-situ measurements and validation studies of geophysical parameters, for which obtaining the global and operational validation dataset is difficult, are highly desired as indicated below.

- Land

JAXA maintains test sites to obtain validation data such as soil moisture and meteorological measurements are already established and maintained in the Mongolian plateau (semi-arid area) and the Murray-Darling basin in Australia (humid to arid area). JAXA seeks proposals which will actively participate in these validation efforts.

- Atmosphere

JAXA seeks proposals to validate precipitation and integrated water vapor products by utilizing operational observation data such as ground-based rain radars. For the validation of precipitation and integrated cloud liquid water, cooperation with other research projects which can provide us validation data, and the research on quantitative validation by comparing with other satellite observations are expected.

- Ocean

JAXA seeks proposals to validate sea surface temperature and sea surface wind speed products by using operational observation data such as mooring and floating buoys and ships. Cooperation with other research projects which can provide us validation data, and the research on quantitative validation by comparing with other satellite observations are expected.

- Cryosphere

Participation to the validation activities using operational ground observation data of snow depth, and cooperation with other research projects, in which snow pit observations are being conducted under a variety of snow condition, is expected. For sea ice validation, cooperation with research projects operating research vessels in various sea areas, as well as validation using high spatial resolution satellite images, are expected.

To apply for improving the algorithms, obtained in-situ data and knowledge need to be provided to JAXA. Providers of in situ data can define the disclosure levels specified in the following Table: for EORC members only, EORC and PIs for algorithm development, calibration and validation, registered users, and open to the public. The provider will define the disclosure level for data and provide this information to EORC, which will share the data via EORC/GCOM-C Web pages (The disclosure level is required to be open wider user levels as much as possible). It is asked to provide in-situ data which was not funded by JAXA, if the policy of the in-situ data is allowed with appropriate disclosure levels.

Proposals including both algorithm development and validation can be submitted to the category of algorithm development.

As described in Chapter 5, the research themes in this category will be implemented under the “Collaborative Research Agreement (Funded/Non-funded),” in principle. Depending on its budget status, JAXA plans to spend 60 million yen per year for total of the GCOM-W researches (GCOM-W Algorithm Development, GCOM-W Calibration & Validation, GCOM-W Application, and Earth Observation Priority Researches focused on GCOM-W data).

Table 1 Definition of the disclosure level (DL)

Disclosure level (A-D) to be set by data provider	EORC researchers	GCOM PI	Other Mission's PI	Registered users	General users	Usage
(A) EORC Internal use only	OK	×	×	×	×	1) Cal & Val of SGLI products and/or applications for Earth sciences (such as scatter plots, statistics from which raw data cannot be reproduced) are possible to be published. It is necessary to describe the use of JAXA's database and the organization of data acquisition in the acknowledgement *1 2) Redistribution of the raw data is prohibited.
(B1) GCOM related PIs only	OK	OK	×	×	×	1) Cal & Val of GCOM products and/or applications for Earth sciences are possible to be published. It is necessary to agree with data provider about how to acknowledge the favor (e.g., including data provider as a co-author or in the acknowledgement) and to describe the use of JAXA's database and the organization of data acquisition in the acknowledgement*1. 2) Data use beyond the objectives of the GCOM mission is prohibited. 3) Redistribution of the raw data is prohibited.
(B2) GCOM & other PIs only	OK	OK	OK	×	×	1) Cal & Val of GCOM and other environmental missions (GPM, EarthCARE, etc) products and/or applications for Earth sciences are possible to be published. It is necessary to agree with data provider about how to acknowledge the favor (e.g., including data provider as a co-author or in the acknowledgement) and to describe the use of JAXA's database and the organization of data acquisition in the acknowledgement *1. 2) Data use beyond the objectives of the GCOM and other mission is prohibited. 3) Redistribution of the raw data is prohibited.
(C) Registered users	OK	OK	OK	OK	×	1) User registration is required. 2) Applications for Earth sciences are possible to be published. It is necessary to submit an application form to JAXA prior to the publication. Also, it is necessary to describe the use of JAXA's database and the organization of data acquisition in the acknowledgement*1. 3) Redistribution of the raw data is prohibited.
(D) Open to the public (no limitation)	OK	OK	OK	OK	OK	1) It is necessary to describe the use of JAXA's database when using the data and publishing results. It is also necessary to report the results of publication to JAXA*1. 2) Redistribution of the raw data is prohibited.

*1 follow the JAXA's policy on data use

2.2. Application Research towards Future Earth Observations

2.2.1. Application Research for each Satellite Projects

(1) GCOM-W Application

In this category, JAXA seeks research themes aiming to development of new research products, which will contribute to the GCOM-W mission purposes and its follow-on mission, and other application researches that use the GCOM-W data. Especially, JAXA will be intensely focused on following research themes that will emphasize scientific and/or social values of the GCOM-W mission;

- application researches that proposes new GCOM-W research product, such as sea ice thickness and sea ice temperature that is needed in the fields of marine navigation and resource development in Polar Regions; and
- application researches that produce Climate Data Record of Essential Climate Variables (ECVs) by using AMSR2 and other passive microwave imagers, and/or, uses those data in understanding and monitoring of global environmental changes, or improvements of climate models.

As described in Chapter 5, the research themes in this category will be implemented under the “Collaborative Research Agreement (Funded/Non-funded),” in principle. Depending on its budget status, JAXA plans to spend 60 million yen per year for total of the GCOM-W researches (GCOM-W Algorithm Development, GCOM-W Calibration & Validation, GCOM-W Application, and Earth Observation Priority Researches focused on GCOM-W data).

Proposal that mainly uses GCOM-W data in the area of Ocean Environmental Monitoring can be applied to the Section 2.2.2 “Earth Observation Priority Researches.”

(a) Development of new GCOM-W Research Product

Other than existing research products that will be solicited in Section 2.2.1 “GCOM-W Product Development Research,” JAXA seeks research product that will estimate new geophysical parameters, which contribute to purposes of GCOM-W mission and new target fields, such as marine navigation and resource development in Polar Regions, in its follow-on mission. Each proposal is expected to target production or submission of new research product when this RA period is completed.

(b) Application research using the GCOM-W data

JAXA seeks application researches to produce long-term Climate Data Record of Essential Climate Variables (ECVs) by using AMSR2 and other passive microwave imagers, to use those data in understanding and monitoring of global environmental changes, or improvements of climate models, and to directly contribute to societal benefits other than eight Earth observation priority researches that are described in APPENDIX 5. Research themes based on new concepts or needs, utilization of AMSR2 data in numerical models, such as weather, climate and vegetation models are also preferable. Each proposal is expected to target production or distribution of long-term

dataset, or publication of his/her achievements in scientific paper or report when this RA period is completed.

(2) GCOM-C Application

The GCOM-C satellite will be equipped with the Second-generation Global Imager (SGLI) to observe the Earth's atmosphere and surface to elucidate the carbon cycle and the radiation budget. The GCOM-C mission seeks to establish and to demonstrate a global, long-term satellite observation system to measure essential geophysical parameters for understanding global climate change, and the carbon cycle mechanism in cooperation with GCOM-W and other sensors. Its ultimate objectives are to improve future climate projection through a collaborative framework with climate model researches and to demonstrate the capabilities of operational applications by providing continuous data to operational agencies.

The GCOM-C PI team has been organized in summer 2009 as the first research period (Sep. 2009 - Mar. 2013), followed by the second research period (Apr. 2013 - Mar. 2016), and currently continued as the third research period (Apr. 2016 - Mar. 2019) which includes launch time, the initial Cal/Val phase, and the first product release (both funded and non-funded ones). It will be continued after FY2019 for the achievement of the product accuracy targets and the mission objectives. This announcement of "Earth observation priority research" (Apr. 2017 - Mar 2019) includes GCOM-C application studies (as a "non-funded Collaborative Research Agreement" in principle), and seeks following proposals based on effective use of the GCOM-C data.

- (a) Researches to improve environmental change monitoring and future prediction
- (b) Researches leading to the social benefits including practical applications such as fishery use, agricultural use, biological carbon fixation, environment disaster monitoring, and so on
- (c) Development of new research products on the basis of new approaches or social needs for achievement of the GCOM mission targets

(3) PMM Application

In this category, JAXA seeks application researches relating to the Global Precipitation Measurement (GPM) mission and the Tropical Rainfall Measuring Mission (TRMM) satellite, as the Precipitation Measuring Mission (PMM).

Research themes related to application research to utilize satellite-based precipitation observation data, such as the GPM and TRMM data, will be adopted in this RA. For example, following research themes are included;

- research to utilize the GPM and TRMM data into atmospheric, climate, land, hydrological, and other models, and/or by data assimilation;
- development and evaluation of new research products, such as data assimilation using the GPM and TRMM data, or combination of other satellites and/or sensors with them;
- creation of long-term and continuous data set using the GPM and TRMM

products;

- research contributing to climate and global water cycle variation and precipitation system climatology using long-term satellite data, necessarily including the GPM and TRMM data;
- operational utilization research leading to societal benefits at present and in the future GPM era, for example, flood prediction, water resource management, weather forecast, agricultural field, etc.;
- data utilization research in Asia, Africa and other areas, where ground precipitation observation is not sufficient; and
- research contributing EORC's earth observation priority research themes mainly using GPM and TRMM data

(4) ALOS-2 Application

“The sixth Research Announcement for the Advanced Land Observing Satellite-2” (ALOS-2/RA-6) has been released in 2015, and now the selected PIs are implementing its research activities. Under this “1st Research Announcement on the Earth Observations”, the following research themes are called for the ALOS-2 applications as the late proposal of ALOS-2/RA-6 as a “non-funded Collaborative Research Agreement”. Therefore, the accepted proposal for ALOS-2/RA-6 is pushing aside, and ten proposals will be accepted as maximum.

(a) “Priority Themes”

- Monitoring of the prediction of natural disasters and its damage situations:
JAXA preferentially selects the research proposal on “Priority Themes” if PIs can be shared the related truth data i.e. the validation data and information with JAXA.

(b) Utilization Research

The integration of ALOS-2 data with numerical prediction models of sea ice, sea state, and disasters as well as monitoring and managing agricultural products, and forestry, and fishery will directly lead to national benefits. Providing the ALOS-2 for international utilization will also lead to the discovery of potential users and the enhancement of the market. Moreover, a wide range of provided data and user-oriented or value-added services will be able to satisfy a variety of market needs from personal to commercial applications. Examples of utilization research are given below.

- Land use and land cover change monitoring
- Forecasting of sea-state conditions and sea-ice for off-shore applications
- Ship traffic monitoring and fishery management in coastal waters
- Agriculture and forestry management (planting status, agricultural productivity estimation, vegetation changes, etc.)
- Natural disasters (forest fires, flooding, landslide, earthquakes, etc.)
- Pollution monitoring (oil spill, red tide, etc.)

- Geology and natural resources exploration
- Applications related to SAR interferometry (digital elevation models, crustal movements, vegetation distribution, etc.)
- Development of the Geographic Information System (GIS) database at national land
- Educational use
- Synthetic use of ALOS-2 data with other satellite data, products, and numerical models

Proposals should indicate research and development activities requiring operational use of ALOS-2 data products, whether derived from ALOS-2 data alone or from ALOS-2 data integrated with that of other satellites. Such proposals should also include the definition of new products and algorithms required for the application development.

(c) Scientific Research

The data products obtained by ALOS-2 will contribute to promoting science. It will be essential to address many environmental issues (such as vegetation change, biomass burning, water resource management, resource assessment, disaster and earthquake mitigation, and cryosphere monitoring) in a broad range of Earth science disciplines. Our current knowledge of the complex interactions between the various components of the Earth system is not yet sufficient to predict environmental changes with the accuracy required for effective strategic development. Examples of major objectives are presented as follows.

- Land use and land cover change
- Topography and geology
- Terrestrial ecosystem, agriculture and forestry
- Climate system, hydrological processes, and water resource related research
- Oceanography and coastal zone related research
- Microwave scattering, SAR interferometry, and the Polarimetric SAR researches

Other “Priority Themes” in ALOS-2/RA-6 i.e. “Ecological systems monitoring including agriculture” and “Civil infrastructures monitoring” seeks in “2.2.2. Earth Observation Priority Researches”. The details about ALOS-2/RA-6 can refer on; http://www.eorc.jaxa.jp/ALOS/en/ra/ra6_guide.htm

2.2.2. Earth Observation Priority Researches

JAXA seeks research proposal that contribute to the purposes of EORC’s Earth Observation Priority Researches (see APPENDIX 5 for details) focusing on the JAXA’s Earth Observation satellite data and coordinating with other satellite data, ground observations, and numerical models. PIs, who are adopted in this category, are expected to cooperate with corresponding group of the Earth Observation Priority Researches.

As described in Chapter 5, the research themes in this category will be implemented under the “Collaborative Research Agreement (Non-funded),” in principle. However, part of proposals that are applied to the categories of “Ocean Environmental Monitoring”, “Water Cycle/Water Resource Management”, “Atmospheric Environmental Monitoring” or “Climate System/Radiation Process” will be implemented under the “Collaborative Research Agreement (Funded).

(1) Ocean Environmental Monitoring

The main objective of the Ocean Environmental Monitoring group is to contribute to climate change studies by creating consistent and continuous Climate Data Record of ECV-defined ocean geophysical parameters from multiple satellites, including JAXA satellites, Himawari and other satellites, and by utilizing those data to climate change studies. In addition, it is expected to contribute to pioneering new area through the contribution to the near-real-time ocean information services or fisheries fields by providing ocean data set including vertical information produced as outputs of high-resolution ocean model near the Japan assimilating satellite-based ocean data.

In this research announcement, we invite proposals that will collaborate with the Ocean Environmental Monitoring group and share the above objectives. We welcome research themes that will (1) validate and evaluate satellite-based ocean dataset and ocean dataset that assimilates satellite data produced by JAXA, (2) utilize those datasets in climate change studies and/or operational applications, and (3) propose new ocean dataset that mainly or actively uses JAXA satellite data. Especially, JAXA will be intensely focused on research themes that will promote coordination between ocean models and GCOM-W data, extend data utilization by end users in fisheries and other fields, and contribute to full utilization in society through, for example, effective operation in fisheries. Each proposal is expected to target being able, or, obtaining prospect to shift from demonstration of utilization to operational utilization when this RA period is completed.

In this category, we will adopt research proposals (Funded or Non-funded), but only fund research proposal that mainly uses GCOM-W data. Depending on its budget status, JAXA plans to spend 60 million yen per year for total of the GCOM-W researches (GCOM-W Algorithm Development, GCOM-W Calibration & Validation, GCOM-W Application, and Earth Observation Priority Researches focused on GCOM-W data).

(2) Water Cycle/Water Resource Management

The main objective of the Water Cycle/Water Resource Management group is to contribute to climate change studies by creating satellite-based long-term dataset of geophysical parameters related to water cycle and monitoring current status of water cycle, whose variation is supposed to be intensified by the global warming, and connecting it to future prediction. Specifically, we will comprehend water cycle parameters, such as precipitation or soil moisture obtained from satellite observations, and its variation quantitatively, and constantly monitor higher level information, such as risks of landslide disasters or flooding area, by combining these data with water cycle models. In addition, we expect to contribute to disaster prevention through contribution to disaster prevention by providing prediction and/or alert of water-related disasters utilizing above data and information. For this purpose, we actively promote development of global and regional (Japan area) water cycle model in higher spatial resolution, which can contribute to disasters in regional scale, and implementation of data fusion of satellite observation and models.

In this research announcement, we invite proposals that will collaborate with the Water Cycle/Water Resource Management group and share the above objectives. We welcome

research themes that will (1) validate and evaluate higher level information that are outputs from the global land surface simulation system (YEE) developed by JAXA/EORC, (2) contribute to improve physical process of land models, (3) utilize above data in climate change studies and disaster prevention, and (4) propose new water cycle dataset that mainly or actively uses JAXA satellite data.

In this category, we will adopt research proposals (Funded or Non-funded). Depending on its budget status, JAXA plans to spend 5 million yen per year for total of research theme of “Water Cycle/Water Resource Management”.

(3) Atmospheric Environmental Monitoring

The main objective of the Atmospheric Environmental Monitoring group is to contribute to climate change studies by creating ECV-defined atmospheric parameters from the synergistic use of JAXA earth observation satellites and satellites of external agencies including Himawari, and configuring them as long-term dataset towards scientific evidence for climate change strategies. Collaborating with modelling institutes, we conduct satellite data assimilation research that applies the above datasets as inputs, leading to the improvement of forecasting and prediction techniques. This is expected to provide a near-real time information for measures against meteorological, environmental, agricultural, and ecosystem field and therefore contribute to pioneering new area. At the time of the announcement, we consider the following variables as targets: aerosols (including desert dust, PM2.5, volcanic ash and forest fire), cloud and radiation budget.

In this research announcement, we invite proposals that will collaborate with the Atmospheric Environmental Monitoring group and share the above objectives. We welcome research themes that will (1) validate and evaluate the satellite-derived atmosphere datasets developed by JAXA and model datasets that were retrieved through satellite data assimilation, (2) demonstrate the application of satellite dataset in operational agencies (or in comparable research institutes), (3) conduct research on global monitoring of atmospheric environmental changes and/or on the improvement of climate change prediction and (4) propose new atmospheric dataset derived that mainly or actively use JAXA satellite observation data.

In this category, we will adopt about three research proposals (Funded or Non-funded). Depending on its budget status, JAXA plans to spend 9.5 million yen per year for total of research theme of “Atmospheric Environmental Monitoring”.

(4) Infrastructure Displacement

Our country has been concerned about critical accident risks and rising maintenance costs due to dilapidated infrastructures constructed in the period of high economic growth. It is necessary to build low-cost infrastructure monitoring systems to avoid critical accidents.

Our Earth Observation Priority Research, “Infrastructure displacement monitoring”, contributes to pioneering new area. To accomplish this, we are proceeding research and development using ALOS/ALOS-2 PALSAR/PALSAR-2 data mainly.

The research objective includes our domestic infrastructure, such as road, railway, bridge, dam, river embankment, airport, harbor, building, and so on. We call for application for

research to monitor such infrastructure.

ALOS-2 RA-6 includes civil infrastructure monitoring as important theme, therefore 'Infrastructure displacement monitoring' research application must include data utilization of multi-satellite such as optical satellite, or other satellite. Especially, the following two aspects will be evaluated.

(a) Damage detection for disaster response

This theme is to develop accurate algorithms to detect damaged facilities in response to natural hazards (e.g., earthquake, typhoon and tsunami). Administrators require quick and accurate assessment of the infrastructures in disaster affected areas so that they can decide whether their facilities are operational or in need of repair. Algorithms will be highly rated when they fulfill speed, accuracy and comprehensible explanation for the facility administrators.

(b) Development of methods detecting deformation by periodic monitoring of infrastructures

We focus on the development of new techniques periodically monitoring for infrastructure deformation that cannot be detected under the traditional methods. Assessment with these techniques is expected to reduce management costs. We mainly evaluate the proposals from a point of view that the techniques extract many kinds of damages with high accuracy.

Note) In this chapter the 'deformation' means crack, depression, subsidence, uplift, distortion, slope collapse and changes from the initial condition of the structures.

We should note that any proposals adopted in the ALOS-2 / RA-6 are unable to be accepted. Approximately less than 5 proposals (funding or no funding) are to be adopted.

(5) Climate System/Radiation Process

There are large uncertainties related cloud and precipitation process in the numerical climate model to be used for climate change prediction. Therefore, "Climate System and Radiation Process" group is developing the satellite data simulator, for contributing to climate change studies. Also it will establish a satellite data set to help in the evaluation of climate models (ex., CloudSat / CALIPSO cloud information, etc.). In addition, conducting research on satellite data assimilation related to the physical quantity, such as clouds and precipitation, by the simulator. These activities will contribute to the improvement of weather/climate prediction simulations.

In this research announcement, we invite proposals that will collaborate with the Climate System and Radiation Process group and share the above objectives. We welcome research themes of the satellite data simulator, Joint-Simulator that are developed by the present group and EarthCARE mission, and radiative transfer model, RSTAR, in terms of, for example, the introduction of scattering database for non-spherical particles, integration of RSTAR and Polarization System for Transfer of Atmospheric Radiation (PSTAR), gas absorption process, the development of the land surface and the sea surface process, consideration of multiple scattering of active sensor, the three-dimensional radiative transfer

model development, the development of the adjoint function, faster code, and etc. We also invite proposals of evaluation methods of numerical climate models using Joint-Simulator and RSTAR, and the development of data assimilation techniques.

In this category, we will adopt about four research proposals (Funded/Non-funded). Depending on its budget status, JAXA plans to spend 4 million yen per year for total of research theme in this category.

(6) Ecosystems

Earth ecosystem is directly affected by global warming, climate change etc. Especially land-use and land-cover (LULC) and its temporal changes are essential information to consider global phenomena i.e. climate, energy and water cycles, and ecosystem simulations as well as biodiversity, agriculture, forestry, fishery, life environment, disaster, public health in local scale. The main objective of the “Ecosystems research group” is to contribute such issues by providing LULC classification information at appropriate timing, frequency, spatial resolution. This will also contribute to the climate change studies.

In this research announcement, we invite the research proposal related to create LULC and forest map and their improvement, collect the reference data i.e. supervised and validation information on the ground, combine usages with ground measurement, numerical models, disturbance and habitat change research etc. that will collaborate with the Ecosystems research group and share the above objectives (“non-funded Collaborative Research Agreement” in principle).

(7) Agriculture

The main objective of the Agriculture group is to contribute to climate change studies and pioneering new area by developing crop monitoring (e.g. planted-area, crop calendar, growth condition etc.) or crop production estimation/forecast methodology using earth observation satellite data and crop model, and by disseminating these information to domestic or international stakeholders for the use of their decision support such as production, storage or export/import strategy.

In this research announcement, we invite proposals that will collaborate with the Agriculture group and share the above objectives (“non-funded Collaborative Research Agreement” in principle). We welcome research themes that will be (1) identification of crop planted-area or crop calendar on a country/global scale, (2) new crop stress or growth monitoring methodology, LAI or biomass estimation, (3) agricultural damage assessment by drought or flood, and (4) estimation or forecast of main cereal crops including soybeans, maize, soybeans, and rice by using statistical or crop growth model. All themes are expected to mainly and actively utilize JAXA’s earth observation satellites data.

(8) Public Health

It is concerning that environmental changes including temperature or precipitation changes accompanied by global warming can cause health hazards directly (heatstroke, circulatory disease or respiratory illness, etc.) or indirectly (Malaria, Cholera, polio or other infectious

diseases). The main objective of the Public Health group is to contribute to climate change studies and pioneering new area by mitigating these health hazards using early warning system which will be developed and utilizes various environmental information (solar radiation, precipitation, land surface temperature, and digital elevation model etc.) derived from JAXA's earth observation satellites data.

In this research announcement, we invite proposals that will collaborate with the Public health group and share the above objectives ("non-funded Collaborative Research Agreement" in principle). We welcome research themes that will be (1) the development of the health hazard risk model by the epidemiological analyses between environmental information data mainly derived from JAXA's earth observation satellites data and health event data which will be collected by applicant, (2) development of the environmental information database without missing values both temporally and spatially, which meets requirements from public health related communities, and (3) other public health related researches using JAXA's earth observation satellites data.

3. Instructions for responding to this RA

3.1. Qualifications

If the proposal is for peaceful purposes and has non-commercial objectives, researchers from all categories, except students, of domestic and foreign organizations, including educational institutions, government offices, public companies, private enterprises, and other groups can apply for this RA.

3.2. Research agreement conclusion

After the proposals are selected, a research agreement should be made between JAXA and the organization to which the PI belongs, using associated terms and conditions to be prepared by JAXA. In principle, the associated terms and conditions of research agreements attached in APPENDIX C will be used. However, JAXA may coordinate with a PI to use a standard contract document depending on the contents of the proposal and its research phase.

All applicants should read Chapter 5 carefully, which describes detailed information on contract matters and the associated terms and conditions of the research agreement in APPENDIX C.

3.3. Research period

The total research period of this RA will be 2 years from JFY 2017. However, performance will be evaluated based on an interim report at the end of each JFY 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 for proposals applies to the “Product Development Research of GCOM-W”, “GCOM-W Application”, and the part of Earth observation priority researches, which are “Ocean Environmental Monitoring”, “Water Cycle/Water Resource Management”, “Atmospheric Environmental Monitoring”, and “Climate System/Radiation Process”, within JAXA’s budget limitation. Proposals submitted to other areas may be funded if they provide a substantial contribution to each satellite mission and Earth observation priority research.
- B) JAXA funding is basically restricted to domestic PIs, although some exceptions may be made for research that is necessary to the success of each satellite mission.
- C) If funding is not available for an applicant, the applicant may be selected as a non-funded PI upon consultation with JAXA.

(2) Earth observation satellite data, etc.

Earth observation satellite data and meteorological data necessary for conducting research and owned by JAXA will be provided free of charge within the limitations of distribution capability of JAXA. Available data are listed in Appendix B. Those who receive Earth observation satellite data shall comply with terms and conditions described in the chapter titled “Providing 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 a yearly report on the results at the end of each JFY and a final report at the end of the entire research period. Furthermore, funded PIs are required to participate in the workshop organized by JAXA once a year and present a status report. PIs must cover necessary travel expenses to participate in the workshop within the funds provided by this RA.
- (2) Non-funded PIs shall also submit a yearly report and a final report. However, such reports can be substituted with papers published during the term. Participation in the workshop is recommended. Support of travel expenses will be decided by JAXA on a case-by-case basis depending on the research content, results, and its progress.

3.6. Selection

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

- (1) Overall scientific, technical and societal merits of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal
- (2) Proposer’s capabilities, related experience, facilities, techniques, or unique combinations of these that are integral factors for achieving the proposal objectives
- (3) Qualifications, capabilities, and experience of the proposed PI and CI
- (4) Overall standing among similar proposals and/or evaluation against the state-of-the-art

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 at any time. To withdraw a proposal, the applicant should notify JAXA immediately.

3.9. Cancellation and postponement

JAXA reserves the right to cancel or postpone this RA for reasons of JAXA's own. In addition, JAXA assumes no liability for canceling this RA or for postponing this RA schedule.

3.10. Important dates

September 7, 2016	1st Earth Observation Research Announcement Issued
<u>November 15, 2016</u>	<u>Proposal Due Date</u>
February 2017(plan)	Notification of Selection Results

3.11. Proposal submission and contact point

Please access to the web site (http://www.eorc.jaxa.jp/en/research/ra/1st_ra_eo/index.html) of this RA at first, and apply through the online form, and receive your online registration number through the web site and also by E-mail. Proposals with complete sets of attachments, such as reprints of papers, with online registration number should be converted to **PDF (Portable Document Format) and sent via E-mail** to the Earth Observation RA Office. The maximum file size acceptable by E-mail is **10 MB**.

Earth Observation RA Office E-mail address: EO_RA @ jaxa.jp

NOTICE when you submit proposal by E-mail:

Please send E-mail with any of the following subject line to indicate appropriate category to apply. Please also indicate your online registration number, which you receive when applying through the online form, within your E-mail.

<Product Development Research(GCOM-W Funded or Non-funded)> Earth Observation RA Proporsal Submission

<Application Research(GCOM-W Funded or Non-funded)> Earth Observation RA Proporsal Submission

<Application Research(GCOM-C Non-funded)> Earth Observation RA Proporsal Submission

<Application Research(PMM Non-funded)> Earth Observation RA Proporsal Submission

<Application Research(ALOS-2 Non-funded)> Earth Observation RA Proporsal Submission

<Earth Observation Priority Research (Funded or Non-funded)> Earth Observation RA Proporsal Submission

In case of difficulty sending via E-mail, five copies each of the proposal and the complete set of attachments should be sent via postal mail to:

Earth Observation RA Office
Earth Observation Research Center (EORC)
Tsukuba Space Center
Japan Aerospace Exploration Agency
2-1-1 Sengen, Tsukuba, Ibaraki, 305-8505, Japan
Fax: +81-29-868-2961
E-mail address: EO_RA @ jaxa.jp

4. Instructions for proposal contents

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 from other institutions or have the potential to infringe on third-party rights
 - B) Proposals that are restricted when distributed or published
 - C) Proposals that are already accepted by the 6th Research Announcements for the Advanced Land Observing Satellite-2 (ALOS-2), the 8th Precipitation Measuring Mission (PMM) Science Research Announcement, and the 6th Global Change Observation Mission (GCOM) Research Announcement, which have already started since Japanese Fiscal Year of 2016, as described in Section 1.4.
- (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 all attachments, such as reprints of papers, in **PDF via E-mail**.
- (2) Forms for the cover sheet, work plan, and resource requirements can be found in APPENDIX A and APPENDIX B. Only the following formatting is mandatory in other parts of the proposal:
 - A) The page or paper size should be A4 or letter size.
 - B) The page number must appear at bottom center of each page, and the name of the applicant must appear in the upper right corner.
 - C) Proposals should be word-processed documents in either English or Japanese, with a font size no smaller than 12 points.
- (3) Proposals should be brief and to the point, concentrating on substantive material. The main body of the proposal (content described in Section 4.3 (3) Description of proposal) should not exceed 20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments must accompany each copy of a proposal when submitting via postal mail.

4.3. Proposal contents

- (1) Cover sheet
 - A) Research title
State your research title precisely and clearly. The title should be brief, reflecting an especially valid project intelligible to a science-literate reader and suitable for use in the public process.
 - B) Research category
Choose a relevant category to which the proposal belongs.
 - C) Information of applicants
 - Identifying information of the PI
State the name, job title, organization, address, E-mail address, and telephone and facsimile numbers of the PI.
 - Identifying information of the Co-investigator

State the name, organization, telephone number, and E-mail address of each Co-investigator (CI).

One research team should consist of only one PI, or one PI and several CIs.

D) Budget

Provide a budget broken down by year and the total amount in Japanese yen.

E) Endorsement

Provide a signature of a responsible official or authorized representative of the proposing organization.

(2) Abstract

Include a concise abstract less than 500 words in English (or 1,500 characters in Japanese) describing the objective, significance, method of approach, and anticipated results.

(3) Description of proposal

This is the main body of the proposal and should not exceed 20 pages. This main body shall be a detailed statement of the work to be undertaken, including its objectives and significance, relation to the present state of knowledge, and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experiment methods and procedures. The project description should address the evaluation factors 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 discouraged.

(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 distribution of responsibilities and arrangements for ensuring 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 this RA, and professional qualifications of the PI should be included. Also provide similar biographical information on each CI.

B) Role of CI

The PI is responsible for supervising the work and the CIs in the research. State each CI's role in the proposed research.

(7) Resource requirements (for Funded cases only)

Resource requirements should be described in the form indicated in APPENDIX B. Information regarding required resources will be considered during the selection process. After deciding the total amount of funding for each PI, JAXA will send detailed forms for resource requirements to selected PIs for the final adjustment of

funding. Before the beginning of each subsequent 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 for making an agreement. Please note that JAXA will make an agreement with the organization to which the PI belongs (“the Organization”), not to the PI or CI.
- (2) A research agreement will be made using associated terms and conditions, such as those in APPENDIX C. The Organization should submit the application form with the necessary documents according to the guidelines by the submission due date. Submission of the application form will be regarded as definite intention of making an agreement with JAXA in accordance with the terms and conditions as stipulated in APPENDIX C, and the agreement will be effective upon issuance of the confirmation sheet by JAXA.
“The additional agreement for the ALOS-2 Application Research in the 1st Research Announcement on the Earth Observation” will be attached to “the 1st EARTH OBSERVATION RESEARCH ANNOUNCEMENT COLLABORATIVE RESEARCH AGREEMENT (NON-FUNDED) BETWEEN THE JAPAN AEROSPACE EXPLORATION AGENCY AND THE RESEARCH ORGANIZATION” in APPENDIX C for the ALOS-2 Application Research.
- (3) If JAXA determines that extension of a research project is qualified by the interim report at the end of the Japanese Fiscal Year, the research agreement will be extended for 1 year, and up to March 31, 2019. Funded organizations should submit the continuing agreement application form to JAXA at the beginning of every JFY.
- (4) Organizations shall comply with the terms and conditions defined in the research agreement.
- (5) JAXA may coordinate to make an agreement with the Organization using JAXA’s standard contract document if JAXA thinks it appropriate in consideration of the research content and phase.

5.2. Research agreement summary

There are two types of research agreements based on the applicable category of research: a Commissioned Research Agreement and a Collaborative Research Agreement. There are also two types of Collaborative Research Agreement: funded by JAXA and not funded.

(1) Commissioned Research Agreement (Funded)

- In principle, the Commissioned Research Agreement will be applied to research in the “Algorithm Development” and a part of “Calibration and Validation” category. The Organization shall conduct the research according to the Statement of Work provided by JAXA;
- JAXA will provide the necessary funds and Earth observation satellite data to the Organization to conduct the research as described in the Statement of Work;
- JAXA will own the research results required to be delivered by the Statement of

Work (Deliverable Research Results);

- JAXA will retain royalty-free rights to use research results other than the Deliverable Research Results only for its own research and development purposes;
- In the event JAXA provides prior written consent, the Organization may use the Deliverable Research Results for its own research and development purposes;
- If the Agreement is terminated, the Organization will refund to JAXA any unexpended research funds that have already been paid by JAXA; and
- JAXA will adjust the amount of the research funds based on a fiscal financial statement at the end of a year-on-year contract.

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

- In principle, the Collaborative Research Agreement will be applied to research in categories of “Calibration and Validation”, “Application”, and “Earth Observation Priority Research”;
- JAXA will provide the necessary funds (for funded cases) and Earth observation satellite data to the Organization to conduct the research;
- In principle, the research results will be jointly owned by the parties; and
- JAXA will retain the right to use all results including results belonging to the Organization (if any), and the Organization will retain the right to use jointly-owned research results only for its own research and development purposes, without prior consent by the other party.

The difference between a funded agreement and non-funded agreement:

A) Collaborative Research Agreement (Funded)

- JAXA provides part of the research funds and the Earth observation satellite data. JAXA adjusts the amount of the research funds based on a fiscal financial statement at the end of a year-on-year contract;
- The Organization shall submit an interim report and a final report to JAXA, and shall participate in the workshops to report research progress; and
- If this agreement is canceled or terminated, the Organization shall refund to JAXA any unexpended funds that have already been paid by JAXA.

B) Collaborative Research Agreement (Non-funded)

- JAXA provides the Earth observation satellite data. The Organization shall submit an interim report and a final report to JAXA. However, such reports can be substituted with papers published during the research term; and
- Participation in the workshops is highly recommended.

(3) Publication of results (both for Funded and Non-funded)

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 and obtain JAXA’s consent;

- State in the publication that the results are obtained in this RA research; and
- Grant JAXA an irrevocable and royalty-free right to use the provided publications, unless an academic society responsible for its publication requires the PI to transfer the copyright to it.