# RESEARCH ANNOUNCEMENT
## - 3rd -

Tropical Rainfall Measuring Mission (TRMM) SCIENCE:
RESEARCH OPPORTUNITIES

**Letter of Intent Due August 18, 2000**
**Proposals Due September 29, 2000**

National Space Development Agency of Japan

# TROPICAL RAINFALL MEASURING MISSION (TRMM) SCIENCE:

# RESEARCH OPPORTUNITIES

**NASDA Research Announcement**
**Soliciting Research Proposals**
**for Period Ending**
**September 29, 2000**

**Issued: July 11, 2000**

**Office of Earth Observation Systems**
**National Space Development Agency of Japan**
**Tokyo**

| | |
|---|---|
| **Identifier:** | NDX-00187 |
| **Submit Letter of Intent to:** | Mr. Toshihiro Katsumata<br>Earth Observation Research Center<br>Office of Earth Observation Systems<br>National Space Development Agency of Japan<br>1-9-9 Roppongi, Minato-ku,<br>Tokyo 106-0032 Japan<br>Telephone: (03) 3224-7066<br>Fax: (03) 3224-7051<br>Email: trmmcont@eorc.nasda.go.jp |
| **Submit Proposals to:** | TRMM RA OFFICE (C/O Mr. Toshihiro Katsumata)<br>Earth Observation Research Center<br>Office of Earth Observation Systems<br>National Space Development Agency of Japan<br>1-9-9 Roppongi, Minato-ku,<br>Tokyo 106-0032 Japan |
| **Copies Required:** | 8 |
| **Selecting Official:** | Director<br>Earth Observation Research Center<br>Office of Earth Observation Systems<br>National Space Development Agency of Japan<br>1-9-9 Roppongi, Minato-ku,<br>Tokyo 106-0032 Japan |
| **Obtain Additional Information From:** | Mr. Toshihiro Katsumata<br>Earth Observation Research Center<br>Office of Earth Observation Systems<br>National Space Development Agency of Japan<br>1-9-9 Roppongi, Minato-ku,<br>Tokyo 106-0032 Japan<br>Telephone: (03) 3224-7066 |

Please use identifier number NDX-00187 when making an inquiry regarding this announcement. Your interest and cooperation in participating in this effort are appreciated.

ORIGINAL SIGNED BY

Dr. Toshihiro Ogawa
Director
Earth Observation Research Center
National Space Development Agency of Japan

# NASDA RESEARCH ANNOUNCEMENT

# TROPICAL RAINFALL MEASURING MISSION (TRMM) SCIENCE:

# RESEARCH OPPORTUNITIES

## TABLE OF CONTENTS

# 1. INTRODUCTION

The National Space Development Agency of Japan (NASDA) hereby announces the solicitation of research proposals to conduct scientific investigations in precipitation science and related tropical energetics in connection with the Tropical Rainfall Measuring Mission (TRMM) launched in November 1997. TRMM's goal is to provide useful information on atmospheric heating, which drives the general circulation in the atmosphere, by estimating monthly rainfall using TRMM sensors, the Precipitation Radar (PR), the TRMM Microwave Imager (TMI) and the Visible/Infrared Scanner (VIRS). To achieve this goal, algorithms to estimate rainfall have been developed to provide instantaneous rain rates and monthly total rainfalls. Before the TRMM launch, there were great differences among the global rainfall estimates from various sources. TRMM, however, has significantly reduced the ambiguity of the global rain estimate. At the same time, new problems and issues have surfaced. The TRMM PR systematically underestimates the rainfall rate compared with the corresponding rain estimates by other means. To increase the accuracy of rain estimates from TRMM, algorithms more sophisticated than the current ones may be required. Since the lifetime of the TRMM is likely to extend to six years from the originally planned three years, more useful data will be accumulated for data analysis and precipitation studies, and there will be more opportunities to improve algorithms.

NASDA is therefore soliciting research proposals to promote development of advanced algorithms for rainfall estimation and utilization of the TRMM data for understanding the distribution and variation of tropical rainfall. Proposals are sought for new and continuing research associated with TRMM. This opportunity, which follows an earlier TRMM research announcement in 1996, is intended to support subsequent science investigations for the three-year period beginning in April 2001. NASDA will spend approximately 60 million yen during fiscal year 2000 to support scientific activities of the 25 Principal Investigators (PIs) who were selected in the previous research opportunity. However, it should be noted that the budget allocated for the new PIs' activities after fiscal year 2001 may change substantially depending on NASDA's budget situation.

Participation in this program is open to all categories of domestic and foreign organizations, including educational institutions, industry, non-profit institutions, and Japanese Government agencies. In accordance with NASDA policy, all investigations by foreign participants will be conducted without any exchange of funds, that is, investigators whose home institutions are outside Japan cannot be funded by NASDA. Proposals may be submitted at any time until September 29, 2000. NASDA reserves the right to consider proposals received after that date if in accordance with section 3-8, that is, "the selecting official deems the late proposals to offer significant scientific and/or technical advantage or cost reduction." Proposals submitted to NASDA will be evaluated through a scientific peer review. Selection is expected to be announced in January 2001.

All proposers are strongly encouraged to submit a letter of intent (see section 5) to respond to this Announcement by August 18, 2000.

## 2. TECHNICAL DESCRIPTION

The previous two Research Announcements (RAs) focused mainly on "Algorithm Development" and "Calibration and Validation" for the Precipitation Radar (PR). These efforts have significantly contributed to improving the quantitative accuracy of the rainfall products.

Field campaign experiments, such as the Ishigaki-Miyako Campaign Experiment for TRMM (IMCET), were conducted in the last RA activities. The PR rain estimates were also validated using ground-based radars, rain gauges, etc. The results showed that the TRMM PR rain estimates were qualitatively excellent. For example, horizontal and vertical rain patterns obtained from the PR were very similar to those taken from a ground-based or airborne radar. However, there were some discrepancies between PR-estimated rain volume and other rain data, even though the PR was very well calibrated using internal and external measurements. Generally speaking, PR-estimated rain rates were slightly lower than others. The discrepancy, even though small, significantly impacts the accuracy and sensitivity of the general circulation model forecast. The accuracy of current ground validation results does not reach the required level to validate the PR estimates. Thus, a more sophisticated technique with careful data processing is required. The PR rain estimation algorithm also must be improved. Currently, one of the most important issues is to find a suitable Z-R relationship based on microphysics and observations. The rain attenuation correction technique requires a rain structure model that includes size distributions of both liquid and ice hydrometers.

Algorithm development for estimating physical quantities that cannot be measured directly is a good candidate for the future study. One very important example is global mapping of profiles of latent heat release. This is one of the main goals of TRMM. Using the PR's vertical structure mapping capability together with VIRS and TMI data, TRMM has great potential for achieving this goal.

By taking advantage of PR's unique ability to measure not only the horizontal distribution of rain but also its vertical structure, scientific results relevant to precipitation distribution and variation have been obtained. Such important achievements include the study of the diurnal variations of cloud and precipitation and the study of the distribution of shallow convection over the ocean. More than two years of TRMM data have now been accumulated. This RA thus strongly encourages scientific analysis of the rain distribution, structure and variation. The analysis may use not only TRMM data but also other satellite data and/or objective analysis data.

Studies of TRMM data applications are also encouraged. Assimilation of TRMM data is an example. Applications could be extended to studies of properties other than rain. For example, global soil moisture has been mapped using TRMM PR's surface scattering signature. Such research that explores a new application of satellite data is highly encouraged.

Thus, this research announcement seeks proposals in two areas. The first area is "Algorithm Development and Validation" to enhance existing investigations related to algorithm development and validation. The other area is "Modeling and Data Analysis" to promote more application studies.

The proposer should keep in mind that, unlike the last research announcement, NASDA will not support any field campaign or ground observation experiment in this research announcement. The proposer should also keep in mind that NASDA is not a general funding body for the scientific community. This RA seeks to accomplish TRMM's goal and to explore new utilization of TRMM data. The proposal should describe plans for TRMM data usage well.

Several specific examples of research fields sought by this announcement are given below.

**Algorithm Development/Improvement and Validation of TRMM Data**

- Combined algorithm development for TRMM sensors to reduce discrepancies among the sensors.
- New algorithm development for TRMM sensors, combined with other satellites and/or ground data set.
- Development of general methods for comparing satellite and ground data and validation of higher order products.
- Development of validation methods using multi-parameter radar data.

**Modeling/Data Analysis**

- Estimation of atmospheric heating profiles by TRMM data.
- Long-term monitoring study of the global water cycle.
- Data assimilation study for TRMM data.
- New application study to estimate physical characteristics other than rain from TRMM data.

# 3. INSTRUCTIONS FOR RESPONDING TO NASDA RESEARCH ANNOUNCEMENTS

## 3.1 Proposal Contents

Investigators responding to this research announcements must provide the information below to NASDA for evaluation. Further detailed information and the forms are provided in section 4.

(1) Proposal Cover Sheet
(2) Abstract
(3) Project Description
(4) Management Approach
(5) Personnel
(6) Resource Requirements

## 3.2 Selection

Selection decisions will be made following peer and/or scientific review of the proposals. A peer review will be carried out by selected external discipline specialists in the area of the proposal. A selection committee will then be assembled in NASDA and will evaluate the proposals. The final decisions are made by a NASDA selecting official. 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 or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.
(2) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these that are integral factors for achieving the proposal objectives.
(3) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.
(4) Overall standing among similar proposals and/or evaluation against the state-of-the art.

Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

## 3.3 Resources

NASDA will reserve funds to support selected proposals conducted by Principal Investigators (PIs) whose home institutions are in Japan, subject to availability of funds.

Data sets necessary for enhancing TRMM research and owned by NASDA will basically be provided free of charge. Provision of data sets that NASDA has no authority to disclose will be discussed separately. The following policy shall be observed by participants for using satellite, in-situ and other data sets.

(1) Data sets shall be used only for research purposes that are proposed and selected under this RA.
(2) Data sets shall not be disclosed to a third party or parties.

Investigators must provide information on desired resources as part of their proposals in accordance with the forms in section 4.

## 3.4 Relationship to Award

A contract, cooperative agreement or other agreement may be applied to accomplish selected proposals.

NASDA will contract with PIs for providing funds. The contract will include the title, purpose, subjects, period, plan, usage of facilities, usage of results, interim progress report, final report, participating personnel, statement of work, cost, nondisclosure obligation and other conditions.

NASDA will conclude a cooperative agreement with PIs whose institutes are outside Japan and do not receive any funds from NASDA. The agreement will include the objective, responsibilities, usage of facilities, usage of results, data exchange, nondisclosure obligation and other conditions.
Other agreements, such as a Data Nondisclosure Agreement, may be used for both Japanese and foreign investigators who receive data sets only and utilize them for their research.

### 3.5 Report to NASDA

PI has an obligation to report both interim and final report to NASDA.

#### 3.5.1 Interim Report

Before the end of fiscal year PI is asked to submit interim report to NASDA. The interim report covers the research activity and status in the project done during the fiscal year. PI is also required to present the status report at the interim report conference.

#### 3.5.2 Final Report

PI is required to submit a final report to NASDA at the last fiscal year of the 3-year period.

### 3.6 Utilization of Results

Results derived from research activities shall generally be published.
A PI who wishes to release his or her research results to a third party organization shall
(1) Provide NASDA with a copy of the publication before release.
(2) State in the publication that he or she obtained the results through participating in the TRMM RA research.
(3) Not disclose inventions in a publication before patent application without the prior written consent of NASDA.

### 3.7 Renewal Proposals

Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. Significant findings since the most recent progress report should also be described. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.
NASDA may renew an effort either through amendment of an existing contract or by a new award.

### 3.8 Late Proposals

A proposal or modification received after the date specified in this RA may be considered if the selecting official deems it to offer NASDA a significant scientific and/or technical advantage or cost reduction.

### 3.9 Length

Proposals should be as brief as possible and concentrate on substantive material. Proposals should not exceed 20 pages in length. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal.

**3.10 Schedule**

| | |
|---|---|
| JULY 11, 2000 | Issue this research announcement |
| AUGUST 18, 2000 | Due date for letter of intent |
| SEPTEMBER 29, 2000 | Due date for research PROPOSAL |
| JANUARY 2001 | Announcement of selection |

# 4. INSTRUCTIONS FOR PROPOSAL CONTENTS

## 4.1 Language

Proposals shall be written in English.

## 4.2 Proposal Cover Sheet

Please fill out Form 1 according to the following instructions.

(1) Category. Specify into which of the two areas (Algorithm/Validation and Modeling/Analysis) the Principal Investigator prefers to be categorized.
(2) Title. A brief and scientifically valid project title.
(3) Principal Investigator's Information. PI's legal name, title, department, name of organization, address, phone number, facsimile number and E-mail address.
(4) Co-Investigator's Information. Name, organization and phone number.
(5) Budget. 3-year budget broken down by year and 3-year total amount in Japanese yen (from JFY 2001 through JFY 2003).
(6) Authorization. Signature of a responsible official or authorized representative of the proposing organization, or any other person authorized to legally bind the organization.

## 4.3 Abstract

Include a concise, one-page abstract describing the objective and the method of approach.

## 4.4 Project Description

(1) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected 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 experimental 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.
(2) When effort is expected to require more than one year for completion, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should, of course, be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.
(3) Provide the project schedule in Form 2. Include a description of the major activities of the project and their associated schedule.

## 4.5 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.

## 4.6 Personnel

The principal investigator is responsible for supervising of the work and participates in the research. A short biographical sketch of the principal investigator as well as a list of principal publications and any exceptional qualifications should be included. Give similar biographical information for other senior professional personnel who will be directly associated with the project.

## 4.7 Resource Requirements

Information of required resources will be considered during the selection process. After deciding the total amount of funding for each PI, NASDA will send more detailed forms for resource requirements to selected PIs. Before beginning the second and third years, NASDA will send the same forms for resource requirements again.

### 4.7.1 Instructions for Budget Summary (Form 3)

Provide a budget summary by cost elements (Personnel Expenses, Computers/Peripherals, Subcontracts, Expendable Materials and Supplies, Travel Expenses, Observation Equipment, Cost for Data, and Other Costs), sorted by Japanese fiscal year as in the example attached to this form. An annual summary budget should also appear on the last line of Form 1.

**(1) Personnel Expenses**

NASDA will provide some engineers and operators inside the Earth Observation Research Center (EORC) within the budget. Enter the number of working days. NASDA will convert the number of days to the cost using NASDA's standard rates. Also, 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) Computer/peripheral equipment**

NASDA will lease Work Stations (WSs) and/or peripheral equipment based on specifications pre-determined by EORC and will provide them to PIs. Currently NASDA plans to provide a WS with peripherals like a middle class SUN with 1CPU, 512 MB memory, a graphic board, a 9 GB built-in HD plus an 8mm tape drive, and a 100 GB external HD as well as related maintenance cost. The rental cost of this example set is estimated to be 1 million yen per year. Investigators who want to use other peripheral devices should enter their costs. Also, enter the costs of software here. Note that NASDA has the right to change specifications of the machine that NASDA will provide.

**(3) Cost of Subcontracts**

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

**(4) Expendable Materials and Supplies**

Enter the quantity of each item, following the example.

**(5) Travel Expenses**

Describe the proposed domestic and/or international travels including, information on destination and number of days/number of travelers.

**(6) Observation Equipment**

Enter costs of observation equipment including installation cost.

**(7) Cost of Other Satellite Data Sets**

Investigators requesting satellite data other than 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.

### 4.7.2 Instructions for Data requirements (Form 4)

NASDA owns satellite data including TRMM data, other satellite data listed below, and some gound validation data. NASDA also archives meteorological data provided by the Japan Meteorological Agency (JMA) for TRMM research. NASDA will provide requested data judged necessary for proposed research, subject to availability of data processing.

**(1) NASDA-Owned Satellite Data Sets (Form 4-1)**

NASDA has the authority to provide data sets that are received from:

- Marine Observation Satellite (MOS) (only around Japan)
- LANDSAT (only around Japan)
- SPOT (only around Japan)
- European Remote-sensing Satellite (ERS)-1, 2 (only around Japan, for Japanese researchers only)
- Japanese Earth Resources Satellite (JERS)-1 (global)

Data availability can be checked on the EUS web page.
(http://www.eoc.nasda.go.jp/homepage.html/)
To request these satellite data sets, complete Form 4-1.

**(2) NASDA-owned TRMM related Ground Validation data (Form 4-2)**

NASDA archives an X-band Doppler radar (NASDA) data obtained during GAME IOP on the Tibetan plateau, during IMCET'99 (May 15 –June 7, 1999) in Okinawa and at Tanegashima/Kyushu from September 1999 to the end of year 2000.

**(3) NASDA-archived TRMM related JMA data (Form 4-3)**

NASDA archives meteorological data that overlaps the TRMM observation period and are provided by the Japan Meteorological Agency (JMA) based on an agreement on TRMM data utilization and processing technology between JMA and NASDA.

- Global analysis data
- Decoded data
- Buoy data
- AMeDAS 10-minute rain gauge data
- Raw radar data from the following sites.
  Mt.Fuji, Kurumayama, Makinohara, Nagoya, Okinawa,
  Tanegasima, Naze, Ishigaki-jima, Muroto, Fukuoka, Matsue,
  Hirosima, Osaka, Tokyo, Fukui
- Radar-AMeDAS rainfall analysis data

## 5. LETTER OF INTENT

All prospective proposers are strongly encouraged to submit a letter of intent in response to this announcement. This will allow us to alert a peer review staff to adequately cover the proposal review process.

Please provide the following information no later than August 18, 2000
via e-mail or FAX or mail to

Mr. Toshihiro Katsumata
Earth Observation Research Center
Office of Earth Observation Systems
National Space Development Agency of Japan
1-9-9 Roppongi, Minato-ku,
Tokyo 106-0032 Japan
Telephone: (03) 3224-7066
Fax: (03) 3224-7051
Email: katsumata.toshihiro@nasda.go.jp

(1) PI and CI names and addresses
(2) Title of proposal
(3) Telephone number
(4) Fax number
(5) Email address
(6) Brief summary of your proposal

Form 1

# Proposal Cover Sheet
# NASDA TRMM Research Announcement

| | |
|---|---|
| **Proposal No.** | _____ (Leave Blank for NASDA Use) |
| **Category** | ☐ Algorithm Development/Improvement and Validation of TRMM Data |
| | ☐ Modeling/Data Analysis |
| **Title** | |

## Principal Investigator

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

## Co - Investigator

| Name | Institution | E-mail |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

## Budget (thousand yen)

| JFY2001 | JFY2002 | JFY2003 | TOTAL |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| | | | |

(Leave Blank for NASDA Use)

**Authorizing Official:** _____ _____

(Name and Title) (Institution)

Form 2

# Research Schedule

| JFY | 2001 | | | | | | | | | | | | 2002 | | | | | | | | | | | | 2003 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| Milestone | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activities | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# BUDGET SUMMARY

## 1. Personnel Expenses

### 1.1 NASDA Provide (Number of persons x days)

Engineers (at EORC): _____

Operators (at EORC): _____

### 1.2 Outside EORC

(unit: thousand yen)

| | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| | | | | |

## 2. Computer / Peripheral Equipment

### 2.1 EORC Lease Workstation

☐ Workstation

### 2.2 Peripherals / Software

(unit: thousand yen)

| Peripherals / Software | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| | | | | |

## 3. Subcontract

(unit: thousand yen)

| ITEMS | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| | | | | |

## 4. Expendable Material and Supplies

| ITEMS (unit) | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| | | | | |

**5. Travel Expenses** (unit: days / times)

| Departure Point - Destination | 2001 | 2002 | 2003 |
|---|---|---|---|
| | | | |

**6. Equipment** (unit: thousand yen)

| ITEMS | 2001 | 2002 | 2003 | Total |
|---|---|---|---|---|
| | | | | |

**7. Others**

| ITEMS | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| | | | | |

**8. Satellite Data not Acquired and Processed by NASDA** (unit: thousand yen)

| Name of Satellite / Sensors | Distributor | Purpose | Cost | | | |
|---|---|---|---|---|---|---|
| | | | 2001 | 2002 | 2003 | TOTAL |
| | | | | | | |

**9. Other Data** (unit: thousand yen)

| Name of Datasets | Distributor | Purpose | Cost | | | |
|---|---|---|---|---|---|---|
| | | | 2001 | 2002 | 2003 | TOTAL |
| | | | | | | |

| | | | | |
|---|---|---|---|---|
| TOTAL | | | | |

# BUDGET SUMMARY

## 1. Personnel Expenses

### 1.1 NASDA Provide (Number of persons x days)

Engineers (at EORC): *2x10*

Operators (at EORC): *1x15*

### 1.2 Outside EORC

(unit: thousand yen)

| | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| *Part-time job for DSD data analysis* | *300 (40x8)* | *300 (40x8)* | *200 (20x8)* | *800 (100x8)* |

## 2. Computer / Peripheral Equipment

### 2.1 EORC Lease Workstation

☑ Workstation

### 2.2 Peripherals / Software

(unit: thousand yen)

| Peripherals / Software | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| CD-RW Drive | 50 | | | 50 |

## 3. Subcontract

(unit: thousand yen)

| ITEMS | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| *Software development for DSD data analysis* | *300* | *1,500* | *600* | *2,400* |

## 4. Expendable Material and Supplies

| ITEMS (unit) | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| *8mm tape (112m)* | *60* | *50* | *50* | *160* |
| *CD-R* | *100* | *100* | *120* | *320* |
| *MO (640MB)* | *10* | *15* | *10* | *35* |
| *A4 Paper (package of 500 sheets)* | *2* | *2* | *1* | *5* |

**5. Travel Expenses** (unit: days / times)

| Departure Point - Destination | 2001 | 2002 | 2003 |
|---|---|---|---|
| *Tokyo - Washington, D.C.* | *7/2* | *7/1* | |
| *Tokyo - Paris* | | *5/1* | *8/1* |
| *Tokyo - Paris* | | | *6/1* |
| *Tokyo - Osaka* | *3/1* | | |

**6. Equipment** (unit: thousand yen)

| ITEMS | 2001 | 2002 | 2003 | Total |
|---|---|---|---|---|
| *Micro Rain Radar* | *1,500* | | | *1,500* |

**7. Others**

| ITEMS | 2001 | 2002 | 2003 | TOTAL |
|---|---|---|---|---|
| | | | | |

**8. Satellite Data not Acquired and Processed by NASDA** (unit: thousand yen)

| Name of Satellite / Sensors | Distributor | Purpose | Cost | | | |
|---|---|---|---|---|---|---|
| | | | 2001 | 2002 | 2003 | TOTAL |
| | | | | | | |

**9. Other Data** (unit: thousand yen)

| Name of Datasets | Distributor | Purpose | Cost | | | |
|---|---|---|---|---|---|---|
| | | | 2001 | 2002 | 2003 | TOTAL |
| | | | | | | |

| | | | | |
|---|---|---|---|---|
| TOTAL | *2,150* | *1,800* | *800* | *4,750* |

# NASDA DATA REQUIREMENTS

## 1. NASDA-Archived Satellite Datasets

(ADEOS, JERS-1, ERS, MOS, SPOT, LANDSAT)

Data Search : http://www.eoc.nasda.go.jp/homepage.html

| Name of Satellite / Sensors | Quantity (scene) | Purpose |
|---|---|---|
| | | |

## 2. NASDA Owned Ground Validation Data

| | Name of Dataset | Observation Period | Purpose |
|---|---|---|---|
| | GAME Tibet | | |
| | IMCET ’98 ‘99 | | |
| | Tanegashima | | |

## 3. NASDA-Archived JMA Data at for TRMM Research

| | Name of Dataset | Observation Period | Purpose |
|---|---|---|---|
| | Global analysis data | | |
| | Decorded data | | |
| | BUOY data | | |
| | AMeDAS 10minutes rain gauge | | |
| | Radar data<br>(Site: ) | | |
| | Radar AMeDAS rain analysis data | | |