MEGHA-TROPIQUES: Announcement of Opportunity

1.0 DESCRIPTION OF THE OPPORTUNITY

1.1 Overview of the Objectives

The common objective between India and France to understand the role of tropics in global weather and life has helped formation of science missions like Megha-Tropiques and SARAL as joint collaborative programs. The main purpose of these missions is to develop space-borne experimental techniques and carryout systematic observations and research to meet the defined scientific objectives.

MEGHA-TROPIQUES (MT) is an ISRO-CNES joint collaborative project. The objective of the project is to study the convective systems and their influence on tropical weather and climate. The MT satellite payloads are Microwave Analysis and Detection of Rain and Atmospheric Structures (MADRAS), a millimeter wave humidity profiler, SAPHIR and an optical-IR radiometer for radiation budget (ScaRAB). Megha-Tropiques is scheduled to be launched during the second half of 2010 onboard Polar Satellite Launch Vehicle (PSLV) from Sriharikota, India. The data from the satellite is likely to be made available to the global scientific community after necessary post-launch sensor characterization, which is expected to be completed within 8-9 months from the launch.

This Announcement of Opportunity (AO) is open to global scientific community for submitting research proposals towards utilization of data from MT Payloads in the following broad categories:

- Development of retrieval algorithms and Cal/Val experiments
- Basic research on the physics of the Tropical Climate
- Synergistic studies using multi-sensor/multi-satellite data to understand convective processes
- Techniques development for assimilation of MT radiances or derived geo-physical parameters in numerical models

It should be noted that this AO does not fund the 'projects', but only ensures that the selected Principal Investigators (PI) are provided with relevant data sets at no cost.

1.2 Who can submit a Proposal?

Proposals could be submitted by individuals or a group of scientists, academicians and research scholars belonging to recognised institutions, universities, government and non-government organisations. The proposals must be supported by the investigators' Institution, with appropriate assurance for providing necessary facilities for carrying out the AO projects.

2.0 OVERVIEW OF MEGHA-TROPIQUES MISSION

The Megha-Tropiques mission resulted from the association of two major requirements for study of the tropical climate: ocean-atmosphere interactions and energy exchange with special emphasis on clouds and precipitation. The climate in tropical regions is known to be very sensitive to internal and external changes in the ocean-atmosphere-land coupled system. The characteristics of these events are large intra-seasonal, inter-seasonal and inter-annual variations and may lead to catastrophic manifestations like floods, cycle of monsoon onset, active and decay phase, and impact of changes in cloud-radiative forcing due to anthropogenic effects, etc. The consequences of these processes is also known to impact the global climate systems as well since the regions provide much of the energy required for sustaining the system. The study will, therefore, require enhancement of the existing information by more intensive and simultaneous radiometric measurements for:

- Atmospheric water cycle
- Corresponding radiation budget for cloud-radiative interaction properties
- High temporal sampling in order to characterize the life-cycle of convective systems
- All-weather capability to provide a sustainable data base for characterization of the processes in the atmosphere and ocean.

The all weather capability is best provided by microwave instruments, and therefore, the sensors selected for Megha-Tropiques mission are:

- Microwave imager, MADRAS, aimed at measurements for precipitation, cloud micro-physics, ocean surface winds, total water vapour and liquid water content of the atmosphere.
- Millimeter wave sounder for vertical profile of humidity, SAPHIR
- And an optical-IR radiometer ScaRaB for radiation budget measurements at the top atmosphere.

The central scientific objectives of Megha-Tropiques can be divided in three classes:

1. Improving the understanding of processes related to large tropical convective systems and their life cycle,
2. Improving the determination of atmospheric energy and water budget in the tropical area at various time & space scales, and
3. Tropical climate impacts and their predictability: draught, monsoon variability, floods and tropical cyclones.

To improve the time sampling of the tropical region, the satellite will be placed in a highly inclined orbit (around 20°) and will cover a latitudinal region of $\pm 30°$ at most. The sampling will be at irregular times, but will be more frequent (3-6 visits per day in a given area). The scientific applications plan for Megha-Tropiques is based on synergistic analysis of data from Megha-Tropiques and the other satellites, with MT data providing higher temporal sampling.

2.1 Megha-Tropiques PAYLOADS

- **MADRAS (Microwave Analysis and Detection of Rain and Atmospheric Structures)**, a multi-frequency scanning microwave imager at 18, 23, 37, 89 and 157 GHz, to measure precipitation and cloud properties. Its high frequency

channels at 89 and 157 GHz respond to ice particles in cloud tops thus allowing detection of the convective rain areas over land as well as oceans. The other parameters measured are: cloud liquid water and precipitation over ocean (18 and 37 GHz), integrated water vapour over ocean (23 GHz) and surface wind speed over ocean (18 GHz).

- **SAPHIR,** a millimetre wave humidity sounder. It is a 6-channel sounder, which enables retrieving information in six atmospheric layers, from the Earth surface up to 12-km height. The horizontal resolution will be 10 km.
- **ScaRaB (Scanner for Radiation Budget),** a four-channel Earth radiation budget instrument, at 0.5-0.7 μm, 0.2-4μm, 0.2-50μm and 10.5-12.5μm. With a spatial resolution of 40 km, it measures the outgoing longwave and shortwave radiation from the top of the atmosphere.
- **GPS-ROS (Radio Occultation Sounder),** GPS receiver to measure the vertical profile of temperature and humidity at the point of radio occultation

Megha-Tropiques Mission specification and sensor characteristics are given in **Annexure1**. See also http://smsc.cnes.fr/MEGHAT/index.htm and http://www.isro.gov.in.

3.0 DATA AVAILABILITY

The ground station at ISTRAC/Bangalore will receive and process the Level-1(L1) data products for MADRAS, SAPHIR and ScaRaB. Data will be made available to the Principal Investigators (PIs) after in-orbit verification phase, which is expected to be around 2 or 3 months after launch. The data sets required for executing the AO projects would be provided at no cost after evaluation. The term 'data' refers to the L1 data products produced at the data processing facility at ISTRAC and distributed from Meteorological and Oceanographic Data Archival Centre (MOSDAC) as listed in **Annexure 1**.

Geophysical products (Level 2 and above) will be derived by both CNES and ISRO separately. The description and availability of these products are given in **Annexure 2**.

4.0 EVALUATION OF PROPOSALS

A joint Indo-French committee with parity of representation will select research proposals for which Megha-Tropiques standard products will be supplied free to the Principal Investigators.

With the overall Megha-Tropiques mission objectives briefly summarized in Section 1.0, this Announcement of Opportunity (AO) for potential Principal Investigators is aimed towards stimulating newer research in the science of clouds and tropical climate; identifying necessary support for calibration and validation of MT payloads; and for encouraging development of specific techniques for operational use of the data on a regional/ global basis. Towards this, the proposals received in response to this AO will be evaluated considering primarily the scientific/ technical merits. The principal elements considered in selecting the proposals, among other things, would be:

- The overall, scientific or technical merit of the proposal, uniqueness and innovative methods, approaches or concepts planned to be demonstrated.

- Potential for contributing to applications by making synergistic use of MT and other

contemporary satellite data

- The competence and relevant experience of the PIs and/or co-investigators for achieving the proposed objectives.

5.0 SPECIFIC AREAS OF INTEREST

Proposals are invited in the following areas of interest for utilisation of MT data:

1. RT Simulations for MADRAS and SAPHIR MW channels for geophysical parameter retrieval
2. RT Simulations for ScaRAB for Radiation flux estimation
3. Calibration and validation of MT data
4. Relationship of cloud radiative forcing and cloud evolution
5. Role of cloud ice particles in radiation budget
6. Role of deep convection in negative cloud albedo feedback
7. Diurnal variation in clouds and impact on cloud evolution
8. Vertical moist instability and evolution of meso-scale and macro-scale cloud clusters
9. Air-sea interaction /Atmospheric boundary layer studies
10. Radiation energy budget studies for monsoon with observation and model
11. Estimation of convective heating/ cooling rates from observation and model
12. Assimilation of MT data products in numerical atmospheric and ocean models.

The above-mentioned topics are only indicative and PIs are free to suggest other potential topics of direct relevance. The proposals can also be a combination of several of those areas mentioned in the topics of interest under MT. It may also happen that only a portion of the proposal is accepted, in which case, the PI will be given the opportunity to accept or decline such partial acceptance.

6.0 GUIDELINES FOR PROPOSAL PREPARATION

The potential PI should submit the proposal in a format described in the following sections. The format for the cover page is given in **Annexure 3.** The format for the detailed proposal is given in **Annexure 4.**

The format for proposal includes a Declaration (Annexure 5) to be signed by the Principal Investigator and Head of the Institution.

6.1 Instructions for Submission of Proposal

Proposals should be limited to around 10 pages in length on standard A4 size paper, typed double-spaced and in the prescribed format. Two copies of the proposal prepared in the formats given in **Annexure 3** and **Annexure 4** should be mailed to:

Dr. **Pradip K Pal**,
Associate Project Director,
MEGHA-TROPIQUES Utilisation Program
Meteorology and Oceanography Group, Bopal Campus
Space Applications Centre, Ambawadi Vistar P.O.
Ahmedabad-380 015, India.
Telephone: +91-79-2691 6044; +91-2717-23 6044

Fax: +91-79-2691 6075; +91-2717-23 6075
E-mail: pkpal25@hotmail.com / pradip@sac.isro.gov.in

In parallel, one copy of the proposal prepared in the formats given in **Annexure 3** and **Annexure 4** should also be mailed to:

Dr Didier Renaut
CNES
DSP/OT
Programmes for meteorology and climate
2 place Maurice Quentin
75039 Paris Cedex 01
France
E-mail : didier.renaut@cnes.fr

For scientific questions and investigations in the preparation of the response to the AO, please contact

Dr Rémy Roca
Laboratoire de Météorologie Dynamique
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Tour 45-55 3ème. BP 99
4 Place Jussieu
75005 Paris
France
E-mail: roca@lmd.jussieu.fr
http://megha-tropiques.ipsl.polytechnique.fr

Prof. J Srinivasan
CAOS
Indian Institute of Science
Bangalore, India
E-mail : jayes@caos.iisc.ernet.in
Tel : +91-80-22933068

6.2 Description of the Proposal

The main part of the proposal should contain a summary (briefing the objectives, methodology, deliverables of the project and the time schedule), followed by a detailed description of the objectives and the scientific rationale being addressed. The data requirement and the analysis methods should be highlighted. The methodology or approach to be followed and the expected results of the project must be presented. Targeted schedule for various stages of the project must be indicated including the completion date. Criteria for assessing the success of the project should be projected. The data requirements particularly that call for large quantum of data should be justified.

6.2.1 Project Duration

It is expected that the project will be completed within 3 years. Projects will be evaluated and short listed by May 2010. PIs are expected to present the preliminary results in a workshop to be conducted in 2011.

6.2.2 Data Requirements

As described in section 6.2, the proposal should identify MT data for the study. The MOSDAC situated at Space Applications Centre, Ahmedabad India will make the MT L1 data available to the PIs. Geophysical products will be available from different sources as mentioned in **Annexure 2.**

Only limited data sets fulfilling the project requirement will be supplied. The project should clearly indicate the type of data product (refer Annexure 1 and 2 for available data products), geographical area and period of coverage, and quantum of data. All approved PIs are encouraged to download the data products which will be available on the website and the additional data products required will be supplied directly to the PIs within 15 days of its request.

6.2.3 Personnel

The project may involve joint efforts involving many individuals from the concerned institution(s). However, only one PI will be recognized. Other participants could be designated as "Co-Investigators". PI/Co-Investigator shall provide the brief of work carried out in the related areas and list of recent publications. The PI is responsible for ensuring timely completion of the project. The assurance of necessary administrative and financial support to PI and Co-Investigators from Head of the Institution(s) is a must.

6.2.4 Facilities and Equipment

Describe available computer facilities, image analysis and other equipment in the home institution or in sister concerns and is accessible for the project.

6.2.5 Project Evaluation

It is proposed that a workshop will be conducted at the end of every year for the purpose of reviewing the progress of the AO projects and sharing the results with international scientific community. PIs of each project are expected to attend these workshops.

7.0 TERMS AND CONDITIONS

- The data sets provided must be used only for the purpose specified in the proposal. The project personnel do not have the right to copy, lease or loan the satellite data without the prior permission of ISRO/CNES. Ownership and copyright of the data lies with ISRO/CNES. In case of violation of copyright by any investigator, ISRO/CNES reserve the right to revoke in part or in whole its support for a project at any time without assigning any reason. Also, this data is supplied free of cost purely for scientific research and it should not be used for any commercial and operational applications. Commercial use is defined as that involving the sale or resale of data, as well as data derived therefrom, for more than the cost of reproduction. Operational use is defined as routine near-real-time use of the data as well as the data derived therefrom.
- The user will make available to the scientific community the salient results of the AO projects through publication in appropriate journals or other established channels. Acknowledgement of ISRO/CNES support must be made in all reports and publications arising out of the AO projects. Copies of all publications resulting from these research projects must be submitted to ISRO/CNES to the address mentioned under paragraph 6.1. ISRO/CNES

reserves the right to use the published results in its reports and publications with due reference to the publication. If the reports or publications are copyrighted, ISRO/CNES will have a royalty-free right under the copyright to reproduce, distribute, and use the copyrighted works for their purposes.

- Any print of the data/ products supplied by ISRO/CNES should carry the mark '© reserved ISRO/CNES' mark in legible letters.
- The PI is required to submit annual progress reports during the duration of the project. A detailed report is to be submitted at the end of the project.
- The PI must maintain an inventory of data products received/ obtained under the AO project(s) and the data products must be deposited with the home institution after the end of the project.

The declaration contained in the proposal format must be signed by the PI and Head of the Institution (Annexure 5). Otherwise the proposal will not be considered valid and is liable to be rejected.

8.0 SCHEDULE

Deadline for submission of proposals	**March 31, 2010**
Notification of evaluation results to Principal Investigators	**May 31, 2010**

Annexure-1

Megha-Tropiques Mission and Sensor Specifications

1. Mission Specifications

The satellite will have minimum lifetime of three years and the swath of around 2200 km in order to observe the inter-annual variability and El-Nino type event in tropics. This Megha-Tropiques satellite will carry four payloads namely MADRAS, SAPHIR and SCARAB

Sr No	Parameter	Specification
1	Altitude	867 km
2	Orbit inclination	20 deg
3	Repetivity	7 days (Approx)
4	Orbit Type	Tropical Coverage (Inclined)
5	No of Orbits Per day	14 orbits (Approx)
6	Life Time	> 3 years

2. MADRAS (Microwave Analysis and Detection of Rain and Atmospheric Structures)

The proposed MADRAS system is a five-channel, self-calibrating, microwave radiometer system. This radiometer is designed to estimate atmospheric water parameters in the equatorial belt. The choice of the channels has been driven by their potential contribution to the measurement of the parameters defined above, from the experience of processing other radiometer data.

Channel of MADRAS and their related mission objectives

Channel No.	Frequency	Polarization	NE∆T	Spatial Resolution	Mission
M1	18.7 GHz	H+V	0.7 K	40km	Rain & Wind speed over oceans,
M2	23.8 GHz	V	0.7 K	40km	Integrated water vapour
M3	36.5 GHz	H + V	0.7 K	40km	Liquid water in clouds, rain above sea
M4	89 GHz	H + V	1.0 K	10km	Convective rain areas over land and sea
M5	157 GHz	H + V	2.6 K	6km	Ice at cloud tops

3. SAPHIR microwave humidity sounder and radiometer

SAPHIR has 6 channels (at 183.31GHz) are designated S_1, S_2, S_3, S_4 ,S_5 and S_6. A complementary channel, in a window region, has to be used to correct for the surface effects in the lowest channels: the 150 GHz channel of MADRAS can be used for that. This instrument will provide humidity profile in the atmosphere with horizontal resolution of 10 km.

Instrument characteristics of the SAPHIR microwave sounder

Channel No.	Centre Frequencies (GHz)	Max. Passband (MHz)	ΔT (K) Sensitivity at 300 K Obj. Spec.	Absolute Calibration (K) Over 180 - 300K	Pol.
S_1	183.31 ± 0.2	200	1/2	± 1	H
S_2	183.31 ± 1.1	350	0.7/1.5	± 1	H
S_3	183.31 ± 2.8	500	0.7/1.5	± 1	H
S_4	183.31 ± 4.2	700	0.6/1.3	± 1	H
S_5	183.31 ± 6.8	1200	0.6/1.3	± 1	H
S_6	183.31 ± 11.0	2000	0.5/1.0	± 1	H

4. SCARAB- broadband radiation measurement instrument

The main channels are channels Solar Radiation (Sc_2) and Total Radiation (Sc_3). The long-wave irradiance is deduced from the difference between Sc_3 and Sc_2 measurements. Channels in Visible and IR window, Sc_1 and Sc_4 , are used for scene identification (surface, clouds, partially covered) and for assuring compatibility and comparisons with the images from operational satellites. The radiative fluxes will be available with a horizontal resolution of 40 km.

Radiometric characteristics of the ScaRAB Channels.

Channel	Wavelength	Signal Dynamics	Noise (Crest)
Sc_1 - Visible	0.5 to 0.7 μm	120 $W.m^2.sr.^{-1}$	< 1 $W.m^2.sr.^{-1}$
Sc_2 - Solar	0.2 to 4.0 μm	425 $W.m^2.sr.^{-1}$	< 0.5 $W.m^2.sr.^{-1}$
Sc_3 - Total	0.2 to 50 μm	500 $W.m^2.sr.^{-1}$	< 0.5 $W.m^2.sr.^{-1}$
Sc_4- IR Window	10.5 to 12.5 μm	30 $W.m^2.sr.^{-1}$	< 0.5 $W.m^2.sr.^{-1}$

5. Standard data products of MADRAS, SAPHIR and SCARAB :

Level 1A : Brightness Temperature (Madras and Saphir) and Radiance (Scarab) geo-coded in scan mode in HDF-5 format

Level 1B : Brightness Temperature (Madras and Saphir) and Radiance (Scarab) geo-coded in grid mode in HDF-5 format

Annexure 2

Geophysical products derived in the frame of the Megha-Tropiques mission

Geophysical products from MT sensors will be derived by both CNES and ISRO separately and these products will be available through different sources to the investigators of approved proposals under International Megha-Tropiques Announcement of Opportunity.

CNES products

French Geophysical products derived from Megha-Tropiques

All products are over Land and Ocean

Parameter	Range	Error	Region	Resolution	Primary Sensor
Precipitating conditions					
Type of rain profile	Conv/Strat	N/A	30°S-30°N	Instantaneous scan*	MADRAS
Surface Rain	0-60 mm/h	3 mm/hr	30°S-30°N	Instantaneous scan*	MADRAS
Convective Rain	0-60 mm/h	3 mm/hr	30°S-30°N	Instantaneous scan*	MADRAS
Liquid Cloud content profile (28 layers)	0-10 gm^{-3}	40%	30°S-30°N	Instantaneous scan*	MADRAS
Liquid precipitation content profile	0-10 gm^{-3}	40%	30°S-30°N	Instantaneous scan*	MADRAS
Ice Cloud content profile	0-10 gm^{-3}	60%	30°S-30°N	Instantaneous scan*	MADRAS
Ice Precipitation content profile	0-10 gm^{-3}	60%	30°S-30°N	Instantaneous scan*	MADRAS
Surface rain	0-30 mmh^{-1}	20%	30°S-30°N	1°/ Daily	MADRAS+GEO
MCS composite	N/A	N/A	Climatic areas	Seasonal	MADRAS+GEO
Clear sky/Non precipitating conditions					
Relative humidity profile (43 layers)	0-100 %	20%	30°S-30°N	Instantaneous scan*	SAPHIR
TOA Fluxes					
Instantaneous LW and SW fluxes	0-450 Wm^{-2}	10 Wm^{-2}	30°S-30°N	Instantaneous scan	ScaRaB
Daily LW and SW fluxes	0-450 Wm^{-2}	10 Wm^{-2}	30°S-30°N	2.5°	ScaRaB
Monthly LW and SW fluxes	0-350 Wm^{-2}	5 Wm^{-2}	30°S-30°N	2.5°	ScaRaB
Monthly Clear Sky LW and SW fluxes	0-350 Wm^{-2}	5 Wm^{-2}	30°S-30°N	2.5°	ScaRaB

* in MADRAS conical geometry on dynamical grid following the pixels MADRAS track, centered on each 89GHz pixel)

Access to the CNES geophysical products from MT:

- The products will be available through the ICARE Data and Services Center in France at the following address**: http://www.icare.univ-lille1.fr**
- Products will be available typically within two days of acquisition
- A detailed description of the products is available at the following address: **http://megha-tropiques.ipsl.polytechnique.fr**

ISRO products

Level-2 Geophysical Products from Megha-Tropiques Sensors

The major scientific objective of the Megha-Tropiques (MT) satellite is to understand the energy and water cycles in the global tropical region. With its 20° inclined-orbit, it will measure radiation emitted by the Earth-Atmosphere System in the visible, infrared and microwave spectrum through its four sensors onboard, namely, MADRAS, SAPHIR, ScaRaB. Simultaneous and frequent information of various geophysical parameters, like water vapor, cloud liquid water and surface winds over oceanic regions and the rainfall, humidity profile and radiative fluxes over land as well as over oceans, will be derived from these instruments. The pre-launch specifications of various geophysical parameters (Level-2) to be derived from MADRAS, SAPHIR, and ScaRaB sensors of MT satellite are given in Table 1.

Table 1: Specifications of geophysical parameters (Level-2) from MT

Geophysical Parameter	**Dynamic Range**	**Theoretical Error*$**	**Geograph. Region**	**Primary Sensor**
Rainfall Rate	> 0 to 35 mm/hr	1.1(1.4) mm/hr or 30%	Land(Ocean)	MADRAS
Water Vapour Content	>0 to 8 g/cm^2	0.5 g/cm^2	Oceans (Rain-free)	MADRAS
Cloud Liquid Water	>0 to 600 mg/cm^2	5.2 mg/cm^2	Oceans (Rain-free)	MADRAS
Surface Wind Speed	>0 to 25 m/s	1.6 m/s	Oceans (moderate clouds, Rain-free)	MADRAS
Humidity Profile (Six 150mb-thick layers from 1000 to 100 mb)	> 0 to 80 %	10 % to 15 %	Land and Ocean (Clear Sky)	SAPHIR
Top-of-Atm. Radiative Fluxes:	Short-wave Flux: >0 to 1000 W/m^2 Long-wave Flux: 50 to 400 W/m^2	Short-wave Flux: 20 W/m^2 Long-wave Flux: 20 W/m^2	Land and Ocean	ScaRaB

*On instantaneous basis at spatial resolution of respective sensor.
$Noise values used (1.0 K for MADRAS and SAPHIR channels, wherever applicable)

The geophysical products will be derived from radiometric data available in scan-mode (Level-1A) given in Table (2a) as well as in grid-mode (Level-1B) given in Table (2b). The Level-1A products consist of brightness temperature or radiance values for every acquired sample along with geo-location, time of acquisition, incidence angle (MADRAS and SAPHIR), sun azimuth and elevation (ScaRaB) and flags. For Level-1B data, a static grid is generated along the orbit swath and the brightness temperatures or radiances samples falling within a grid cell are averaged and presented along with cell-centre geo-location, time, incidence angle, cell population and flags. The grid sizes for different sensors for Level-1B and Level-2B products are given in Table (2). Specifications related to the scanning and swaths of MT sensors are given in Table (3).

Table 2a: Geometric Specifications of MT Sensors (Level-1A data)

Sensor	***Channel ID***	***Foot Print or Pixel Size***	
		(Across-Track) Km	**(Along-Track) Km**
MADRAS	M1-M3	40	67
	M4	10	17
	M5	6	10
SAPHIR	S1-S6	10 (nadir)	10 (nadir)
ScaRaB	Sc1-Sc4	40 (nadir)	40 (nadir)

Table 2b: Spatial grids for Level-1B data products of MT sensors:

Sensor	**Grid Size (Along-Track by Across-Track)**
MADRAS	10 Km x 10 Km (M1- M4)
	5 Km x 5 Km (M5)
SAPHIR	10 Km x 10 Km (S1-S6)
ScaRaB	40 Km x 40 Km (Sc1 – Sc4)

Table 3: Scanning and Swath Specifications of MT Sensors:

Sensor	**Scan Type**	**Scanning Range**	**Incidence Angle**	**Swath (Km)**
MADRAS	Conical	±65°	53.5°	1700
SAPHIR	Cross Track	± 43°	Variable	1705
ScaRaB	Cross Track	± 48.9°	Variable	2242

Access to the ISRO L2 products from MT:

- The products will be available through MOSDAC facility at Space Applications Centre, Ahmedabad, India through the following address**:**
  http://www.mosdac.gov.in
- None of the products will be available in NRT for AO proposals:
  L2 product will be available within the day of acquisition

Annexure - 3

Cover Page of the Proposal

Title of the Proposal

Name and Designation of PI

Telephone, Fax and E-mail Address

Name of Institution with full Address

Signature of PI with Date

Signature of Head of Institution

Announcement of Opportunity (AO) proposal

Annexure - 4

Format of the Proposal

1. Title of the Proposal:

2. Name of the Principal Investigator: Institution;

   Telephone:
   Fax:
   E-mail:
   Mailing Address:

3. Summary of the proposed work

4. Details on the preliminary work done/background experience, if any

5. List of Publications in the related field

6. Description of the project

   - Theme
   - Objectives
   - Study area (latitude/ longitude)
   - Type of data products required (season(s), periodicity and number)
   - Methodology
   - Schedule
   - Expected results and its possible uses

7. Name of Co-investigator(s) in the AO project (please include bio-data of all Investigators)

7 Available facilities and equipment at your institution

Annexure -5

Format for Declaration

Declaration

We have carefully read the terms and conditions of Megha-Tropiques AO programme and agree to abide by them.

It is certified that if the AO proposal is accepted by the Indian Space Research Organisation (ISRO) and Centre National d'Etudues Spatiales (CNES), the facilities as identified in the proposal and administrative support available at our institution and needed to execute the project will be extended to the Principal Investigator and other Co-investigators.

We certify that the data products provided would be used only for the intended AO project.

It is agreed that data products will be returned to ISRO and CNES in case the AO project does not progress / complete as scheduled.

Signature of PI with Name and Designation

Signature of Head of Institution with Name and Designation

Date:

Seal of Head of Institution

List of Abbreviations

AO	-	Announcement of Opportunity
DOS	-	Department of Space
IRS	-	Indian Remote sensing Satellite
ISRO	-	Indian Space Research Organization
PI	-	Principal Investigators
PSLV	-	Polar Satellite Launch Vehicle
MADRAS	-	Microwave Analysis and Detection of Rain and Atmospheric Structure
SAPHIR	-	Sondeur Atmospherique du Profil d'Humidite Intertropicale par Radiometrie
SCARAB	-	SCAnner for Radiative Budget
GPS-ROS	-	GPS Radio Occultation Sounder
CNES		CENTRE NATIONAL D'ETUDES SPATIALES
MOSDAC	-	Meteorological & Oceanographic Satellite Data Archival Centre
NRT	-	Near real time