

# PSLV-C18 - Megha-Tropiques Mission

12 October, 2011

## THE MISSION

PSLV-C18 carrying on-board the Megha-Tropiques Satellite lifted-off from the Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota at 11:00 PM (IST) on October 12, 2011. PSLV-C18 will inject Megha-Tropiques satellite into an orbit of 867 km altitude at an inclination of 20° with respect to Equator. Along with the primary satellite, three other auxiliary satellites, SRMSat from SRM University, Chennai, Jugnu from Indian Institute of Technology, Kanpur and VesselSat-1 from Luxembourg were launched by PSLV-C18.

Megha-Tropiques is an Indo-French Joint Satellite Mission for studying the water cycle and energy exchanges in the tropics. The main objective of this mission is to understand the life cycle of convective systems that influence the tropical weather and climate and their role in associated energy and moisture budget of the atmosphere in tropical regions.



## PSLV - C 1 8

### THE LAUNCH VEHICLE

PSLV-C18 in its 20<sup>th</sup> flight used the 'Core-Alone' version without the use of solid strap-on motors. This is the 7<sup>th</sup> time the 'Core-Alone' variant of PSLV has been flown.

### SPECIFICATIONS

|                      |  |  |
|----------------------|--|--|
| <b>Height</b>        | 44 m   |  |
| <b>Lift-Off Mass</b> | 230 t  |  |
| <b>No of Stages</b>  | 4  |  |
| <b>Payloads</b>      | <ul style="list-style-type: none"> <li>Megha-Tropiques</li> <li>SRMSat</li> <li>Jugnu</li> </ul> | <b>International Customer Satellite</b><br>VesselSat-1 |
| <b>Launch Pad</b>    | First Launch Pad (SDSC, SHAR)  |  |



| STAGE CHARACTERISTICS   |  |   |   |  |
|-------------------------|--|---|---|--|
|                         | Stage-1  | Stage-2   | Stage-3   | Stage-4  |
| <b>Nomenclature</b>     | PS1  | PS2   | PS3   | PS4  |
| <b>Propellant</b>       | Solid (HTPB based)   | Liquid (UH25 + N <sub>2</sub> O <sub>4</sub> )  | Solid (HTPB based)  | Liquid (MMH + MON-3)   |
| <b>Mass (t)</b>         | 138.0  | 41.7  | 7.6   | 0.82   |
| <b>Max Thrust (kN)</b>  | 4800   | 799   | 247   | 7.3 x 2  |
| <b>Burn Time (sec)</b>  | 100  | 148   | 108   | 163  |
| <b>Stage Dia (m)</b>    | 2.8  | 2.8   | 2.0   | 2.8  |
| <b>Stage Length (m)</b> | 20   | 12.8  | 3.6   | 2.6  |
| <b>Control</b>          | <ul style="list-style-type: none"> <li>Secondary Injection Thrust Vector Control for Pitch &amp; Yaw plane</li> <li>Reaction Control Thrusters for Roll Control</li> </ul> | <ul style="list-style-type: none"> <li>Engine Gimbal Pitch &amp; Yaw plane</li> <li>Hot Gas Reaction Control System (RCS) for Roll Control</li> </ul> | <ul style="list-style-type: none"> <li>Flex Nozzle for Pitch &amp; Yaw plane</li> <li>PS4 RCS for Roll Control</li> </ul> | <ul style="list-style-type: none"> <li>Engine Gimbal for Pitch &amp; Yaw plane</li> <li>RCS for coast phase Control</li> </ul> |



## MEGHA TROPICUES

### THE SATELLITE

Megha-Tropiques provides scientific data on the contribution of the water cycle to the tropical atmosphere, with information on condensed water in clouds, water vapour in the atmosphere, precipitation, and evaporation. With its circular orbit inclined 20° to the Equator, the Megha-Tropiques is a unique satellite for climate research that should also aid scientists seeking to refine prediction models.

**There are four Science instruments in the Megha-Tropiques Satellite:**

- **Microwave Analysis and Detection of Rain and Atmospheric Structures (MADRAS)**





A Scanning Microwave Imager developed jointly by ISRO and CNES to measure precipitation and cloud properties.

- **Sounder for Probing Vertical Profiles of Humidity (SAPHIR)**

A Scanner developed by CNES for measuring Earth Radiation Budget.

- **Scanner for Radiation Budget (ScaRaB)**

A Sounder developed by CNES for Atmospheric Profiling of Humidity in the inter-tropical Region.

- **Radio Occultation Sensor for Vertical Profiling of Temperature and Humidity (ROSA)**

GPS Radio Occultation Sensor procured by ISRO from Italy.

Megha-Tropiques satellite has been put in its final orbital configuration in 3-axis stabilised mode with respect to Sun and Earth. The satellite is in good health. The four science instruments were energised in the following manner:

- **ROSA** payload was switched on October 12, 2011
- **SAPHIR** payload was switched on the forenoon of October 13, 2011
- **MADRAS** payload was switched on the afternoon of October 13, 2011
- **ScaRaB** payload was activated on October 13, 2011. However, for degassing, it is required to wait for 21 days before the collection of data



## SPECIFICATIONS

|                          |  |
|--------------------------|--|
| <b>Weight</b>            | 1000 kg  |
| <b>Power</b>             | 1325 W, Two 24 AH Ni-Cd Batteries  |
| <b>Stabilisation</b>     | Three axis body stabilised with 4 Reaction Wheels, Gyroscopes and Star Sensors, Hydrazine based RCS  |
| <b>Type of Satellite</b> | Earth Observation  |
| <b>Payloads</b>          | <ul style="list-style-type: none"><li>• Microwave Analysis and Detection of Rain and Atmospheric Structures (MADRAS)</li><li>• Sounder for Probing Vertical Profiles of Humidity (SAPHIR)</li><li>• Scanner for Radiation Budget (ScaRaB)</li><li>• Radio Occultation Sensor for Vertical Profiling of Temperature and Humidity (ROSA)</li></ul> |
| <b>Mission Life</b>      | 3 Years  |



## Jugnu

### THE SATELLITE

The Nanosatellite Jugnu weighing 3 kg is a Student Satellite designed and developed by Indian Institute of Technology, Kanpur under the guidance of ISRO. The satellite is intended to prove the indigenously developed camera system for imaging the Earth in the near infrared region and test image processing algorithms, evaluate GPS receiver for its use in satellite navigation and test indigenously developed MEMS based Inertial Measurement Unit (IMU) in space.



## SRMSat

### THE SATELLITE

The Nanosatellite SRMSat weighing 10.9 kg is a Student Satellite developed by the students and faculty of SRM University attempts to address the problem of Global warming and pollution levels in the atmosphere by monitoring Carbon Dioxide (CO<sub>2</sub>) and Water Vapour (H<sub>2</sub>O). The satellite uses a grating Spectrometer, which will observe absorption spectrum over a range of 900 nm -1700 nm infrared range.



## VesselSat- 1

### THE SATELLITE

The Microsatellite weighing 28.7 kg is developed and built by LuxSpace of Luxembourg. The satellite carries AIS (Automatic Identification System) for ship receivers to detect signals automatically transmitted by Vessels at sea in the region covered by the satellite footprint. The satellite carries two of such receivers, each with a Dipole Antenna composed of two 1.7 m deployable elements.

