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Plans of the European Space Agency for geostationary and low Earth orbiting satellites in support of WMO's Tropical Cyclone programme

CGMS is informed of planned geostationary and low earth orbiting satellite coverage in support of WMO's Tropical Cyclone programme planned by the European Space Agency.

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1.- INTRODUCTION

The 'ESA Living Planet Programme' describes the plans of the European Space Agency (ESA) for a strategy for Earth Observation in the new millennium. It marks an era for European Earth Observation based on smaller more focused missions and a programme that is user driven, covering the whole spectrum of interests ranging from scientific and research-driven Earth Explorer missions through to application-driven Earth Watch missions. Within this programme the various types of missions considered include research and demonstration missions. Earth Watch type missions refer to missions which will finally be taken over by an operational organisation. Meteosat Second Generation (MSG) and Metop are examples of that kind. Earth Explorer type missions either address Earth Observation research topics or demonstrate a new technique scientifically as well as technically. Two types of Earth Explorer missions can be distinguished, namely 'opportunity' and 'core' missions. Opportunity missions are smaller mission which are implemented in relatively short time, i.e. launch within 2.5 years after the end of Phase B, lead by a Lead Investigator. Core missions are larger and ESA lead.

More information about the Living Planet Programme can be found at reference [1]

In view of the needs of the operational meteorological user community and the particular needs of WMO's Tropical Cyclone programme, there are three missions in preparation or planned which would provide essential observational data for ocean salinity, transports in the tropics and precipitation, namely Soil Moisture and Ocean Salinity (SMOS), Atmospheric Dynamics Mission (ADM-Aeolus) and the European contribution to GPM (EGPM).

2.- SOIL MOISTURE AND OCEAN SALINITY (SMOS)

The main scientific objectives of the Soil Moisture and Ocean Salinity (SMOS) mission are to observe two crucial variables: soil moisture over land surface and sea surface salinity over oceans. The mission should also provide information on root zone soil moisture and vegetation and contribute to significant research in the field of the cryosphere. SMOS is a demonstrator with broad and ambitious scientific objectives, as the lack of global observations of salinity and soil moisture are retarding progress in many research fields. The need for these data has been highlighted for a long time in major international scientific initiatives. The mission will give Europe a clear lead in this area. The SMOS concept may also pave the way for more ambitious concepts providing higher spatial resolution.

The baseline instrument of SMOS is a L-band (1.4GHz) 2D interferometric radiometer, Y shaped, with three arms each about 4.5m long. The instrument will be accommodated on a PROTEUS platform. The folded satellite is compatible with most launchers.

More information about SMOS can be found at reference [2]

3.- ATMOSPHERIC DYNAMICS MISSION (ADM-AEOLUS)

The prime aim of the Atmospheric Dynamics Mission is to demonstrate measurements of vertical wind profiles from space. Extensive studies at the European Space Agency over the past 15 years have culminated in selection of a high performance Doppler Wind Lidar based on direct-detection interferometric techniques. Such a system, with a pulsed laser operating at 0.35μm wavelength, would utilise both Rayleigh scattering from molecules and Mie scattering from thin cloud and aerosol particles. After allowance for the space vehicle velocity, measurement of the residual Doppler shift from successive levels in the atmosphere provides the vertical wind profiles. The lidar would be accommodated on a satellite flying in a sun-synchronous dawn-dusk orbit, at an altitude of a 400 km, providing near-global coverage; target date for launch is in 2007. Mission duration is three years.

Processing of the backscatter signals will provide about 3000 globally distributed wind profiles per day, above thick clouds or down to the surface in clear or partly cloudy air, at typically 200 km separation along the satellite track. Knowledge over large parts of the tropics and major oceans is presently quite incomplete. This is leading to major difficulties in studying key processes in the coupled data system and in making progress in numerical forecast systems. The expected improved knowledge of the global wind field is crucial to many aspects of climate research and weather prediction.

More information about ADM-Aeolus can be found at reference [3]

4.- EUROPEAN CONTRIBUTION TO GPM (EGPM)

The European contribution to GPM (EGPM) mission would be an integral part of the global precipitation measuring (GPM) mission. The goal of the GPM mission is to provide precipitation rate on ground accurately and frequently from space with global coverage. The GPM objectives aim at measuring precipitation on a global basis with sufficient quality, Earth coverage, and sampling to improve prediction of the Earth's climate, weather, and specific components of the global water cycle. This will be accomplished by making substantive improvements with respect to the present-day observations in global precipitation observations, specifically improvements in measurement accuracy and precision, sampling frequency, spatial coverage, and spatial resolution. The EGPM mission goal is to provide precipitation rate on ground accurately and regularly from space with globally with special emphasis on Europe and Canada.

EGPM is a mission consisting of a single satellite in a sun-synchronous low Earth orbit, which carries a scanning, five channel precipitation microwave radiometer at frequencies between 18.7 and 157 GHz and a precipitation radar at 35 to 36 GHz to provide global rainfall observations. EGPM would be an element of the Global Precipitation Mission (GPM), a joint NASA-NASDA mission proposal, which would

comprise a 'core' satellite, carrying a precipitation radar and a precipitation radiometer, and a number of smaller satellites with only a precipitation radiometer on each. EGPM will be placed on a sun-synchronous orbit with 14:30 LST. The EGPM satellite will be placed in an orbit of 510 km altitude for a mission duration of 5 years.

More information about EGPM can be found at reference [3] and at reference [5] about GPM.

5.- REFERENCES

[1] http://www.esa.int/livingplanet
[2] http://www.esa.int/export/esaLP/smos.html
[3] http://www.esa.int/export/esaLP/aeolus.html
[4] http://www.esa.int/export/esaLP/egpm.html
[5] http://gpm.gsfc.nasa.gov