



CGMS-35, ESA-WP-04
Prepared by ESA
Agenda Item: III.4
Discussed in WG3

OCEANOGRAPHIC INFORMATION PROVIDED BY ESA MISSIONS

In response to Permanent Action 6 and Recommendation 34.19

CGMS is informed about the ocean related parameters provided or planned by ESA missions: ERS, Envisat, Explorer and GMES Space program. Some of them are relevant to IOC requirements.

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1. INTRODUCTION

The IOC strategy for Remote Sensing (see CGMS-XXXI paper prepared by EOC) recalls the World Summit on Sustainable Development Implementation plan for widespread use of remote sensing from space as a tool. To this end, IOC member states need to make remote sensing a new focus for IOC's capacity building efforts.

2. REQUIREMENTS

IOC, UNEP, WMO and ICSU sponsored GOOS have designed a global ocean module and a coastal module, and defined present satellite data requirements. The marine biology and surface parameters for coastal applications need to have high spatial resolution.

3. ERS OCEAN DATA

The status of the ERS mission is to be found in paper CGMS-XXXV-ESA-WP-01. The most complete information about the ERS mission, system, instruments, its products, user services and latest news can be found at <http://earth.esa.int/ers/> .

The ERS-1 satellite, being designed originally as an oceanographic mission, provided many useful parameters from its sensors:

- SAR Synthetic Aperture Radar
- RA Radar Altimeter & Microwave sounder
- ATSR Along Track Scanner radiometer
- AMI Wind Scatterometer

The ERS-2 satellite, launched in 1995, still in operations, adds also:

GOME Global Ozone Monitoring Experiment.

Parameter	Instrument	Resolution Km	Observation cycle (*) days	Delay avail. (**) hours	Comment
SST	ATSR	1	35		
Wind speed	RA	7	35	3	
Wind vector	AMI wind	50	35	3	Incompatible with SAR operations
Ocean topography	RA	7	35		Resolution is along-track
Wave Height	RA	7	35	3	Resolution is along-track
Wave direction	SAR-wave	200	35	3	5x5 km imaggettes
Wave period	SAR wave	200	35	3	5x5 km imaggettes
Sea-ice cover	RA/AMI wind	7/25	35		
Sea ice thickness	RA	7	35	1 month	to be derived from the data product by users
Geoid	RA	4	35	6 month	ocean
Ozone total column	GOME	320	35	3	Pixel 320x40 km

*Now 35 days, but ERS-1 had many cycles.

**There is a Fast Delivery service of 3 hours for selected products. Others may vary.

There is no direct broadcasting to users; only to ESA stations. The network of receiving stations has been increased in order to cope with the unavailability of the on board recorder since June 2003.

4. ENVISAT OCEAN DATA

The status of the Envisat mission is to be found in paper CGMS-XXXV-ESA-WP-01. The most complete information about the Envisat mission, system, instruments, its products, user services and latest news can be found at <http://envisat.esa.int/>.

The Envisat satellite, launched in March 2002, is dedicated to environment monitoring, including the ocean. It provides many useful parameters from its sensors:

- ASAR: *Advanced Synthetic Aperture Radar*
- RA-2 and MWR: *Advanced Radar Altimeter & Microwave sounder*
- AATSR: *Advanced Along Track Scanner radiometer*
- MERIS: *Medium resolution Imaging Spectrometer*
- SCIAMACHY: *Scanning Imaging Absorption Spectrometer Atmospheric Chartography*
- GOMOS: *Global Ozone Monitoring by Occultation of Stars*
- MIPAS: *Michelson Interferometric Passive Atmospheric Sounder*

Parameter	Instrument	Resolution Hor/Ver km	Observation cycle days	Delay avail. (**) hours	Comment
SST	AATSR	1	35	3	
Wind speed	RA	7	35	3	
Ocean chlorophyll	MERIS	0.3	35		
Ocean topography	RA-2	7	35		Resolution is along-track
Wave height	RA-2	7	35	3	Resolution is along-track
Wave direction	ASAR-wave	100	35	3	5x5 km imagettes
Wave period	ASAR wave	100	35	3	5x5 km imagettes
Sea-ice cover	RA-2	7	35		Resolution is along-track
Sea ice thickness	RA-2	7	35	1 month	to be derived from the data product by users
Geoid	RA-2	7	35		Ocean. Resolution is along-track
Ozone total column & profile	GOMOS, MIPAS, Schiamachy	300/1 300/3 500/3 320	35	3 - 3	
Aerosols	GOMOS Schiamachy	300/1 320	35		
Ocean yellow substance absorbance	MERIS	0.3	35		
PAR	MERIS	0.3	35		

** There is a Fast Delivery service of 3 hours for selected products. Others may vary. Some products can be retrieved from a pwd protected ftp server. See CGMS-XXXV-ESA-WP-01 and CGMS-XXXV-ESA-WP-03 for details.

The High Bit Rate ASAR and MERIS data are selectively acquired by ESA and National stations. There is no direct broadcast service to users. There is a dissemination service using commercial telecom satellites as relay.

5. FUTURE OCEAN DATA

The status of the Explorers mission is to be found in paper CGMS-XXXV-ESA-WP-02. The most complete information about the Explorers mission can be found at <http://www.estec.esa.nl/explorer/>

The three relevant missions under implementation are:

- GOCE: (Gravity and steady-state Ocean Circulation Explorer)
- Cryosat: (Polar ice sheets, sea-ice and continental glacier variation Monitoring)*
- SMOS: (Soil Moisture and Ocean Salinity)

The parameters of direct relevance to Oceanography are:

Parameter	Instrument	Resolution Km	Observation cycle days	Delay avail. Hours	Comment
Salinity	SMOS	200	23 (3 days sub cycle)		
Absolute Ocean topography	GOCE geoid +RA-2	7	35	3	to be derived using both products
Sea-ice cover	CRYOSAT-2	0.3	369 (30 day subcycle)		
Sea ice thickness	CRYOSAT-2	0.3	369 (30 day subcycle)		
Geoid	GOCE	100			

* Cryosat-2 is planned for launch in March 2009

Other Explorer missions: SWARM (magnetic field) and EarthCARE (clouds and aerosols) are not of immediate relevance to Oceanography. The new Explorer mission is under selection.

ESA is actually defining the contents and arrangements of the missions that will encompass the GMES (Global Monitoring or the Environment and Security) Space Program. They are aimed to provide data for operational services to cover a number of sectors. This includes the following payloads:

- Imaging radar C-band interferometric mission, relevant to: water pollution, ocean surveillance, costal zone management and ice monitoring.
- An optical sensor suite operating at medium (250 m) to low (1000 m) spatial resolution, ranging from VIS to thermal IR part of the spectrum. It provides continuity to MERIS, AATSR and VGT sensors.
- A radar altimeter to provide continuity to ERS-1 and ERS-2.

The Sentinel-3 is the ocean monitoring mission and will embark the instruments mentioned above, except for the SAR, embarked on Sentinel-1.

6. INTERNATIONAL CONTEXT

The need for long-term altimetry missions has been confirmed within the frame for GMES; two types of altimeters are required, polar orbiting (ERS/Envisat-type) and low-inclination orbiting (Jason-type) altimeter.

Sentinel-3 fulfils the polar orbiting altimetry requirement; according to current plans, a series of Sentinel-3 missions should provide operational services until 2023+; development of the first of these satellites will start in end 2007 (Phase B2/C/D/E1) with a planned launch in 2012; further satellites require decisions in forthcoming years.

Regarding the low-inclination altimetry missions a debate is currently taking place within the High Level Coordination Group on the GMES Space Component (HLCG-GSC) how they can be implemented after Jason-2; various proposals are currently analysed by ESA, in close consultation with Eumetsat and the EC, and will be presented to the HLCG-GSC later this year; it is expected that a proposed way forward is agreed at end 2007/early 2008 which will then lead to programmatic proposals for decision (and financing) at the ESA Ministerial Conference in end 2008. CNES is involved through the Jason follow-on discussion. Launch of a Jason follow-on mission is expected around 2013.

Once the implementation modalities are clarified within GMES, cooperation with other agencies (outside Europe) will be undertaken within the frame of global coordination mechanisms such as CEOS (virtual constellation), GEO or others.

There is on-going strong coordination Eumetsat-CNES-NOAA (for Jason-2 and a possible Jason-3 proposal).