EUMETSAT OPERATIONAL OCEAN COLOUR DATA SERVICES

EUMETSAT

Ewa J. Kwiatkowska

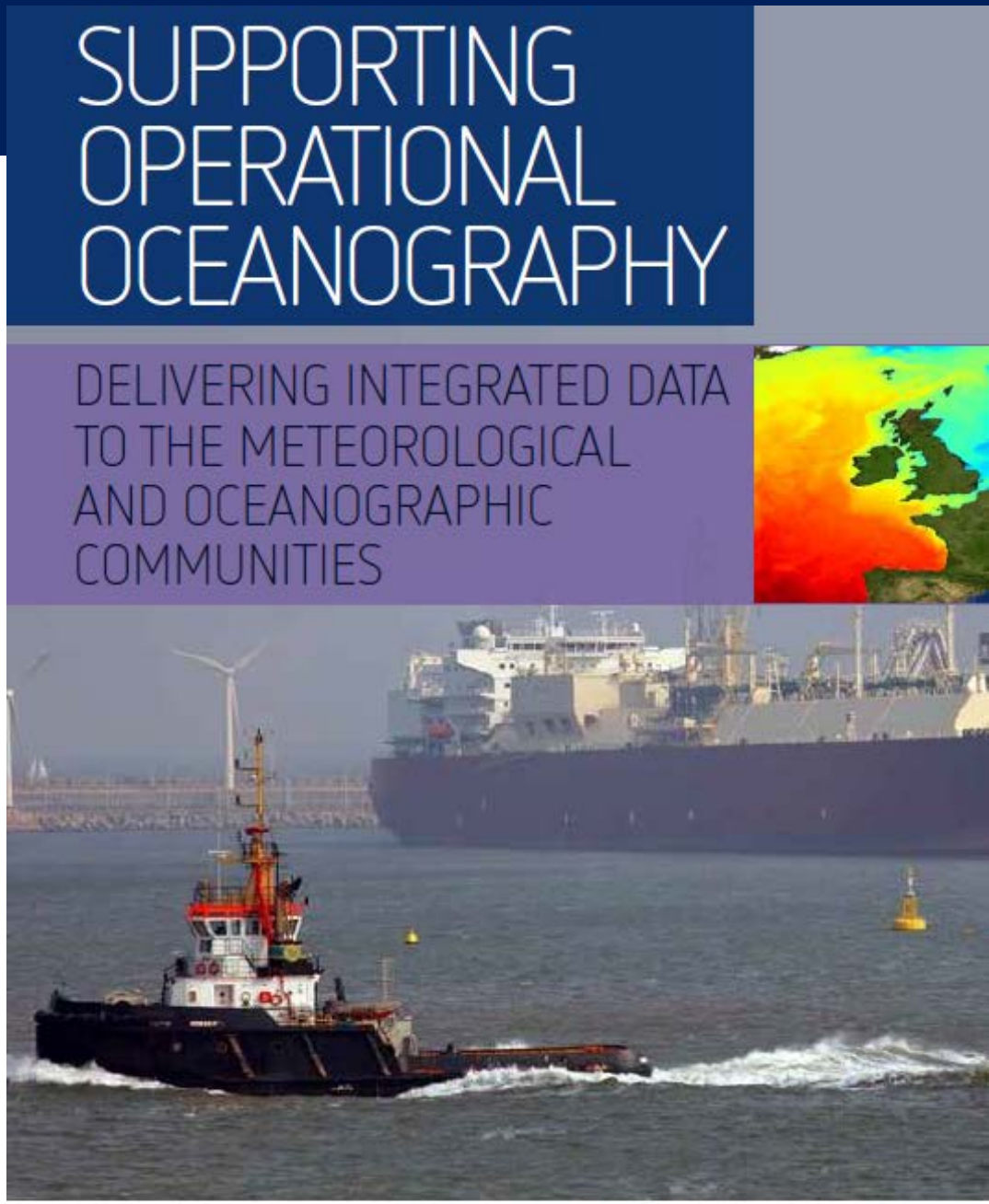
International Ocean Colour Science Meeting 2015

15-18 June 2015, San Francisco

www.eumetsat.int

- Operational satellite data provider, user-driven and service-oriented
- Mandatory, Optional and Third party satellite programmes
- Satellite Oceanography Data served Centrally and through Ocean and Sea Ice SAF
- Operator of the Sentinel-3 Marine Centre of the EC programme

Copernicus
Europe's eyes on Earth



EUMETSAT activities in support of EC Copernicus

(Committed under the current Agreement with the EU)

Marine Monitoring

Operation of satellites (Sentinel-3, Jason-3, Sentinel-6 / Jason-CS) and delivery of operational **marine** data and support services

Atmosphere Monitoring

Operation of satellites (Sentinel-4, Sentinel-5 as part of MTG and EPS-SG) and delivery of operational **atmosphere** data and support services

Delivery of selected Mission Data services, incl. **Third Party data** (building on operational cooperation established by EUMETSAT with U.S., China, India, Japan, Russia...)

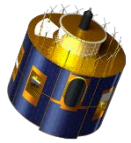
(Possible support if requested by the EU)

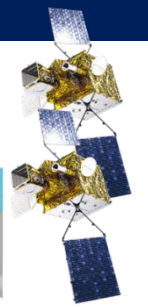
Climate Change

Support for Copernicus Climate Change monitoring service

Support for the EC for User Requirements for Copernicus Marine, Atmosphere and Climate Services

EUMETSAT support for marine service and global users

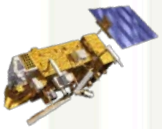




YEAR 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

METEOSAT SECOND GENERATION (MSG) | METEOSAT THIRD GENERATION (MTG)

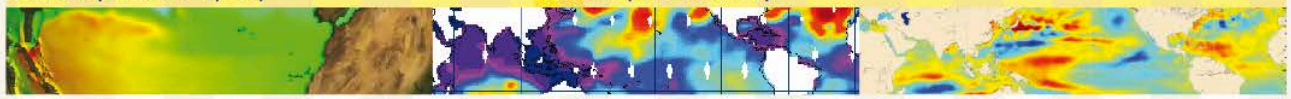
SEA SURFACE TEMPERATURE | WATER TURBIDITY SEVIRI | INCOMING RADIATIVE FLUXES | CASE-1 CHLOROPHYLL FCI



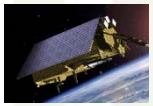
EUMETSAT POLAR SYSTEM (EPS) | EPS SECOND GENERATION (EPS-SG)

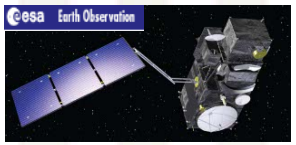
SEA SURFACE TEMPERATURE | SEA ICE | MULTI-VIEW POLARIMETER APPLICATIONS, 3MI | SEA SURFACE WIND | PRECIPITATION

HPOA (JASON-2, -3) | HPOA (JASON-CS)

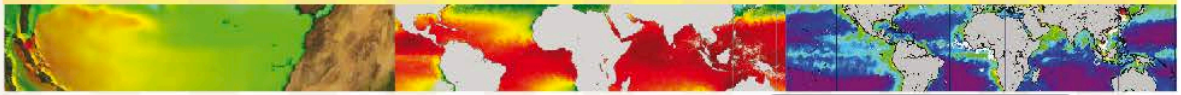


SEA SURFACE TOPOGRAPHY | WAVE HEIGHT | MEAN SEA LEVEL



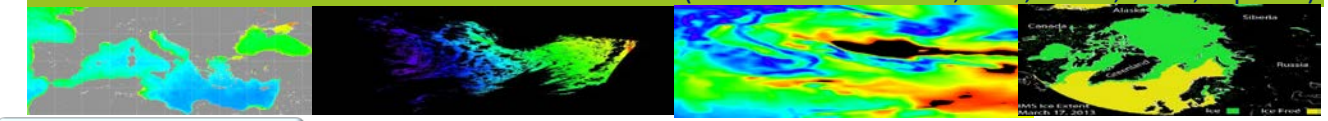


COPERNICUS SENTINEL-3 **A, B, C, D**



SEA SURFACE TOPOGRAPHY | SEA SURFACE TEMPERATURE | OCEAN COLOUR

COPERNICUS CONTRIBUTING THIRD PARTY DATA (US Suomi-NPP VIIRS, JPSS, China, India, Japan...)



OCEAN COLOUR | SEA SURFACE TEMPERATURE | SEA SURFACE WIND | SEA ICE

COPERNICUS
MARINE ENVIRONMENT
MONITORING SERVICE

Providing PRODUCTS and SERVICES
for all marine applications

esa

EUMETSAT

Copernicus Sentinel-3 Marine Mission

Marine L2 products – dissemination from the EUMETSAT Marine Centre:

OLCI
Ocean Colour
FR 300m
RR 1200m

SLSTR
Sea Surface Temperature

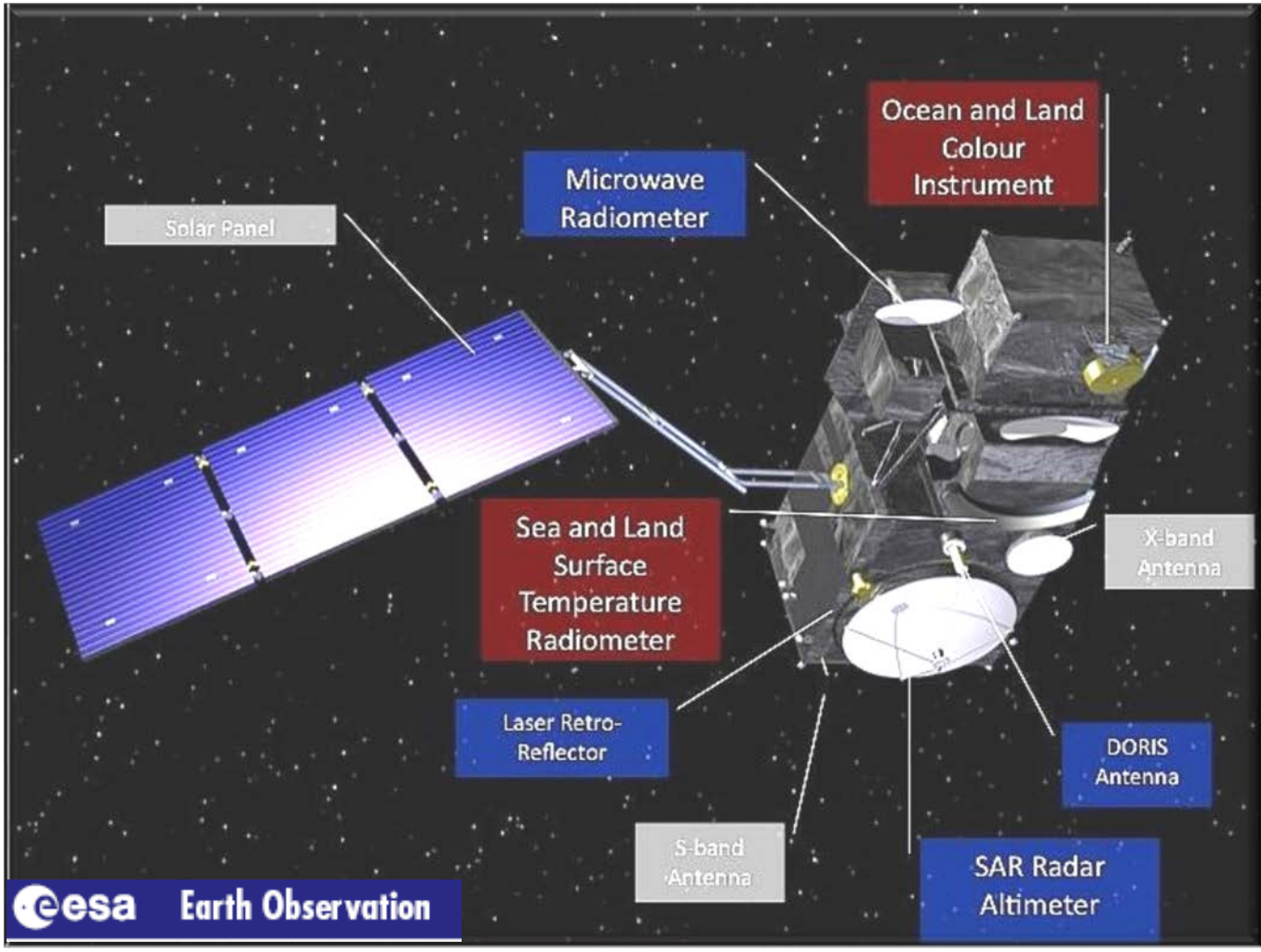
SRAL
Sea Surface Topography

Land L2 products – ESA dissemination

Global L1 products – dissemination by both ESA and EUMETSAT

Atmospheric products in development

Payload Data Ground Segment (PDGS) tested at EUMETSAT



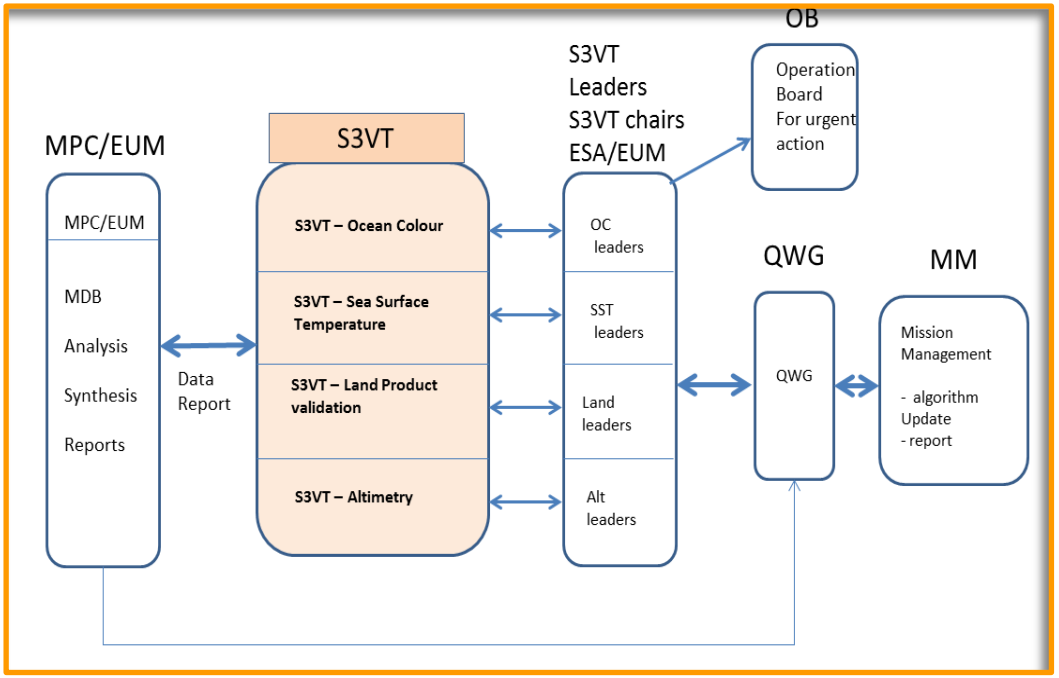
Expected S3A launch 31 Oct 2015; S3B in 2017

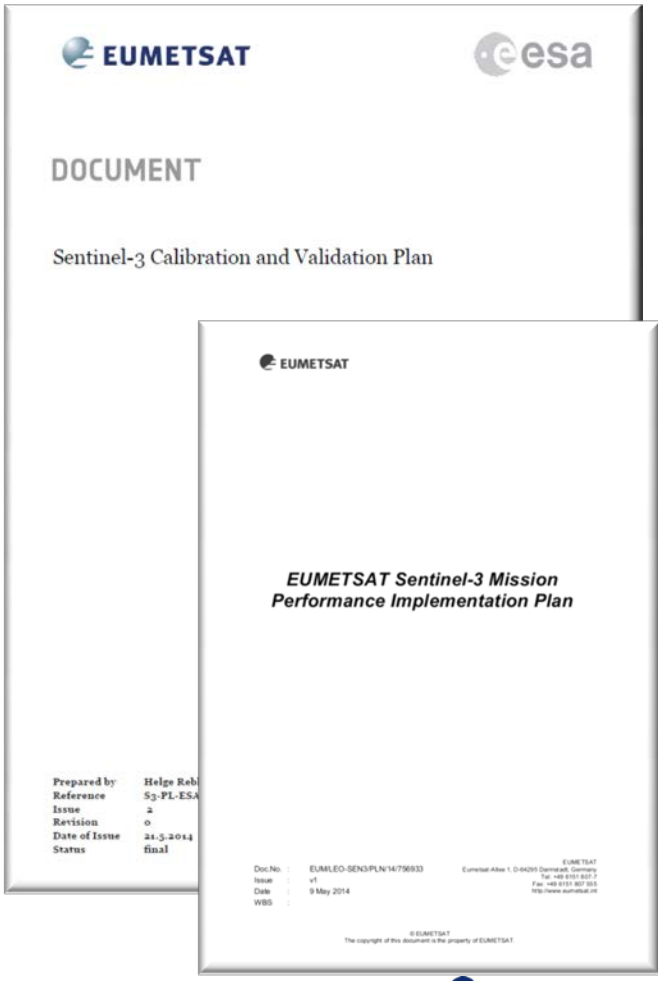
Copernicus

EUMETSAT

Sentinel-3 Mission Performance Framework

- ESA/EUMETSAT joint Quality Working Groups (including QWG-OLCI)
- Mission Performance Centre (ESA contract)
- EUMETSAT Mission Performance Activities in-house
- ESA/EUMETSAT joint Sentinel-3 Validation Team





Sentinel-3 Validation Team – Ocean Colour

"to engage world-class validation expertise and activities to complement Sentinel-3 routine validation and ensure the best possible outcomes for the Sentinel-3 Mission"

- S3VT established jointly by ESA and EUMETSAT
- Based on a rolling call, continuously open
- Provision of independent validation evidence, support to OLCI cal/val
- Coordination and recommendations on field instrument calibrations, measurement round-robins, protocols, standardization, inland waters
- Early access to Sentinel-3 data (including some internal products)

Please contact ewa.kwiatkowska@eumetsat.int or marc.bouvet@esa.int for more information or to join S3VT

Last meeting: http://www.eumetsat.int/website/home/News/ConferencesandEvents/DAT_2326254.html

esa

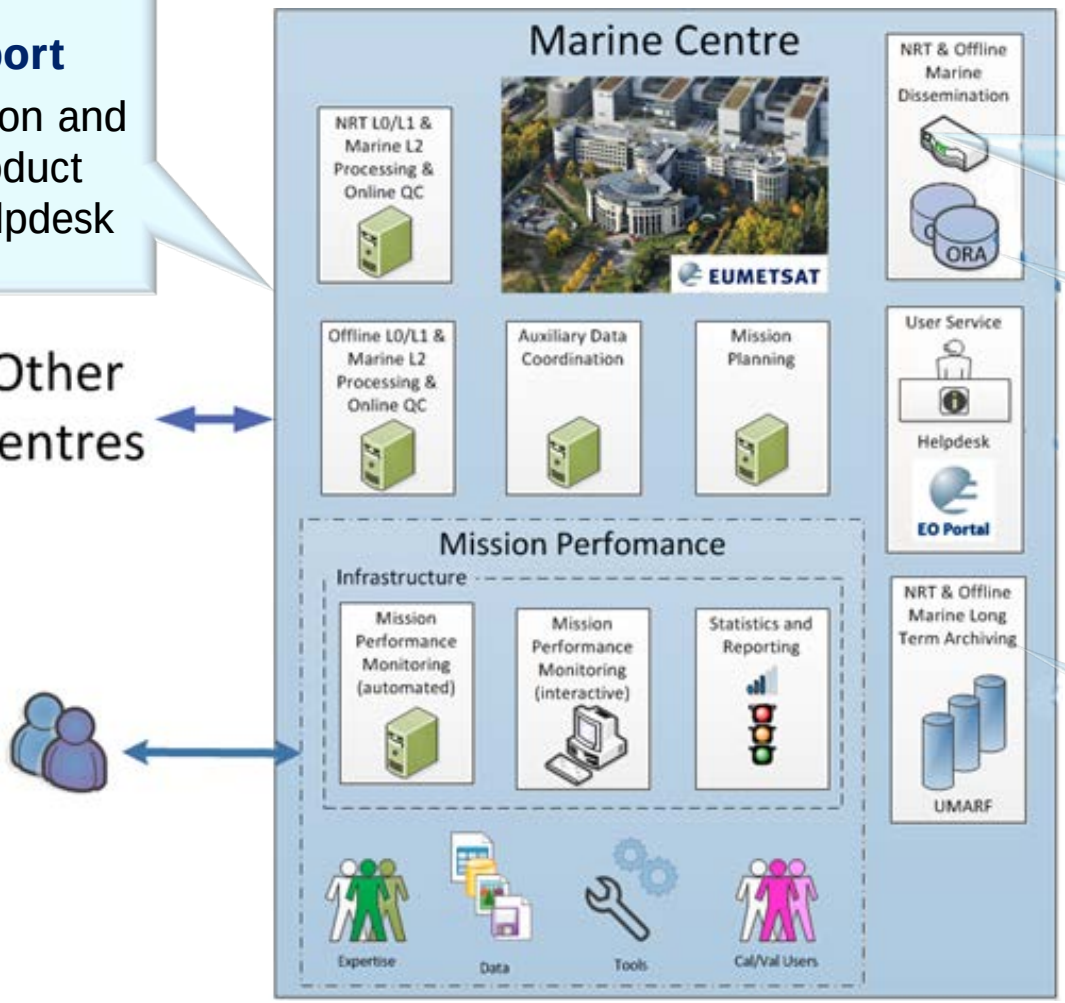
Prj ID	Project Lead	Country	Institution	Project Title
13765	Alikas Krista	ESTONIA	Tartu Observatory	Increasing quality of above water spectral measurements in lakes/turbid waters
13246	Antoine David	FRANCE	Laboratoire d'Oceanographie de Villefranche	BOUSSOLE
13653	Babin Marcel	CANADA	Universite Laval, UMI Takuvik	OLCI data validation in the Canadian Arctic
13616	Bardela Rosa	UK	Met Office	Validation of Sentinel-3 Sea Ocean Colour data in Met Office global carbon cycle models
13732	Bernard Stewart	SOUTH AFRICA	Council for Scientific and Industrial Research	Validation and Development of OLCI Products for Southern African Eutrophic Waters
13751	Bracher Astrid	GERMANY	Alfred-Wegener-Institute for Polar and Marine Research	Validation of OLCI ocean colour products with focusing on high latitudes (OCVAWI)
13760	Brockmann Carsten	GERMANY	Brockmann Consult	Pixel Classification Validation
13739	Brotas Vanda	PORTUGAL	Centre of Oceanography, Faculty of Sciences, Univ. Lisbon	Ocean colour validation on subtropical North East Atlantic
13743	Bryere Philippe	FRANCE	ACRI-ST	MCGS-OCV: Marine Collaborative Ground Segment - Ocean Colour Validation
13583	Chami Malik	FRANCE	LOV, Université Pierre et Marie Curie	Original radiometric in-situ autonomous profiling floats for OLCI vicarious calibration & validation (RADFLOAT)
13552	D'Alimonte Davide	PORTUGAL	Faculty of Science and Technology, New Univ. of Lisbon	Technical assistance for the validation of OLCI marine products in selected European basins
13772	Darecki Miroslaw	POLAND	Institute of Oceanology of the Polish Academy of Science	Validation and development of optical/biological S3 products for the Baltic optically complex waters (VABAC)
13741	DiGiacomo Paul	USA	NOAA	NOAA/NESDIS Center for Satellite Applications and Research (STAR) Validation Support for S3: Ocean Color
29283	Dogliotti Ana	ARGENTINA	Instituto de Astronomía y Física del Espacio	Validation of ocean color products in the Río de la Plata (R2P-VAL)
13716	Dorandeu Joel	FRANCE	Mercator-Ocean	MyOcean coordinated contribution to the Sentinel-3 Validation Team
13758	Fearns Peter	AUSTRALIA	Curtin University	Western Australian Sentinel 3-based Ecosystem Monitoring
13744	Fischer Jürgen		Institute for Space Science, Free University Berlin	OWAS - OLCI Water Vapour Retrieval and Correction of Atmospheric Gases
13723	Hunter Peter		[illegible]	Validation of Sentinel-3 OCLI level-2 products over UK and international lakes: GloboLakes-S3VT
13556	Icely John		Lda	Sagres Validation Ocean Colour Portugal
13742	Jamet Cédric		[illegible]	[illegible] L2 products in various complex worldwide coastal waters
14552	Kahru Mati	USA	[illegible]	[illegible]
13597	Knaeps Els	BELGIUM	VITO	[illegible] turbid waters
13729	Knox Nichola Maria	SOUTH AFRICA	South African National Space Agency	South African validation [illegible] and Surface Temperature products
13596	Kratzer Susanne	SWEDEN	Department of Systems Ecology, Stockholm University	Sentinel-3 validation in Swedish optically complex waters ([illegible] and Lake Vänern)
13721	Krężel Adam	POLAND	Depart. of Physical Oceanography (DPO), Univ. of Gdańsk	Predicting and monitoring of cyanobacterial blooms in the Baltic Sea from space
13625	Larouche Pierre	CANADA	Institut Maurice-Lamontagne	Canadian Sentinel-3 validation program (CSTVP)
13607	Lavender Samantha	UK	Pixalytics Ltd	Systematic analysis of Sentinel-3 OLCI and SLSTR data uncertainties
13717	Marticorena Stéphane	USA	Earth Research Institute - UC Santa Barbara	Ocean Color in situ experiments from 2 sites (Bermuda-BBOP & S. California-PnB) in support of OLCI sensor
13656	Meister Gerhard	USA	NASA	Global evaluation and analysis of OLCI ocean color products
13766	Morris Edward	SPAIN	Instituto de Ciencias Marinas de Andalucía, CSIC	Validation of S3 ocean colour biophysical products in the large, high sediment load Guadalquivir estuary
17234	Moses Wesley J.	USA	Naval Research Laboratory	Validation of Coastal Aquatic Biophysical Products from OLCI
13675	Oliveira Paulo	PORTUGAL	Instituto Português do Mar e da Atmosfera	S3OCV.PT - Sentinel-3 Ocean Colour Validation off Portugal
13747	Peters Steef	NETHERLANDS	Water Insight BV	GLaSS-S3VAL - Global LAkes Sentinel Services - Sentinel 3 VALidation
13452	Röttgers Rüdiger	GERMANY	Helmholtz-Zentrum Geesthacht	Validation of ocean colour data in coastal waters
13623, 13702	Ruddick Kevin	BELGIUM	Royal Belgian Institute of Natural Sciences	Belgian AERONET for Ocean Colour validation (BEL-AERONET) Hyperspectral VIS/NIR radiometers (HYPERNET-OC)
13697	Santoleri Rosalia	ITALY	CNR - Istituto di Scienze dell'Atmosfera e del Clima	Validation of OLCI Ocean Colour data in the Mediterranean Sea (MedVOLCI)
13658	Schroeder Thomas	AUSTRALIA	CSIRO Land & Water	AUS-OCIVE: Australian Ocean Coastal Inland Validation Exercise
13750	Shum C.K.	USA	Ohio State University	Land-Ice Surface Validation Experiment Using the Sentinel-3 Constellation of Radar Altimeters (LIVE-S3)
13753	Silva-Cabaza Ana	SPAIN	Environmental Hydraulics Institute of Cantabria	Monitoring the State and Evolution of Cantabria's Marine and Terrestrial Ecosystems
13654	Sørensen Kai	NORWAY	Norwegian Institute for Water Research	Norwegian Sentinel-3 OLCI and SLSTR products validation
13727	Tilstone Gavin	UK	Plymouth Marine Laboratory, UK	Validation of S3 level 2 OLCI products in the Atlantic Ocean and coastal waters of the Western English Channel
13738	Torres Jesus M.	SPAIN	University of Vigo	Regional colour algorithms for HABs prediction models (HABCOL)
13768	Wüest Alfred	SWITZERLAND	École Polytechnique Fédérale de Lausanne	Ground truthing in Alpine Lakes (GTIALP)
13652	Zhu Jianhua	China	National Ocean Technology Center	The validation of Sentinel-3 in China sea
13527	Zibordi Giuseppe	ITALY	Joint Research Centre	Pan-European Assessment of OLCI Primary Ocean Color Products

Access to products from EUMETSAT Marine Centre

User Support

User Registration and Support, Product Discovery, Helpdesk

Other Centres



EUMETCast

Main method of disseminating NRT data at EUMETSAT. Involves satellite and terrestrial methods.

Online Data Access (ODA)

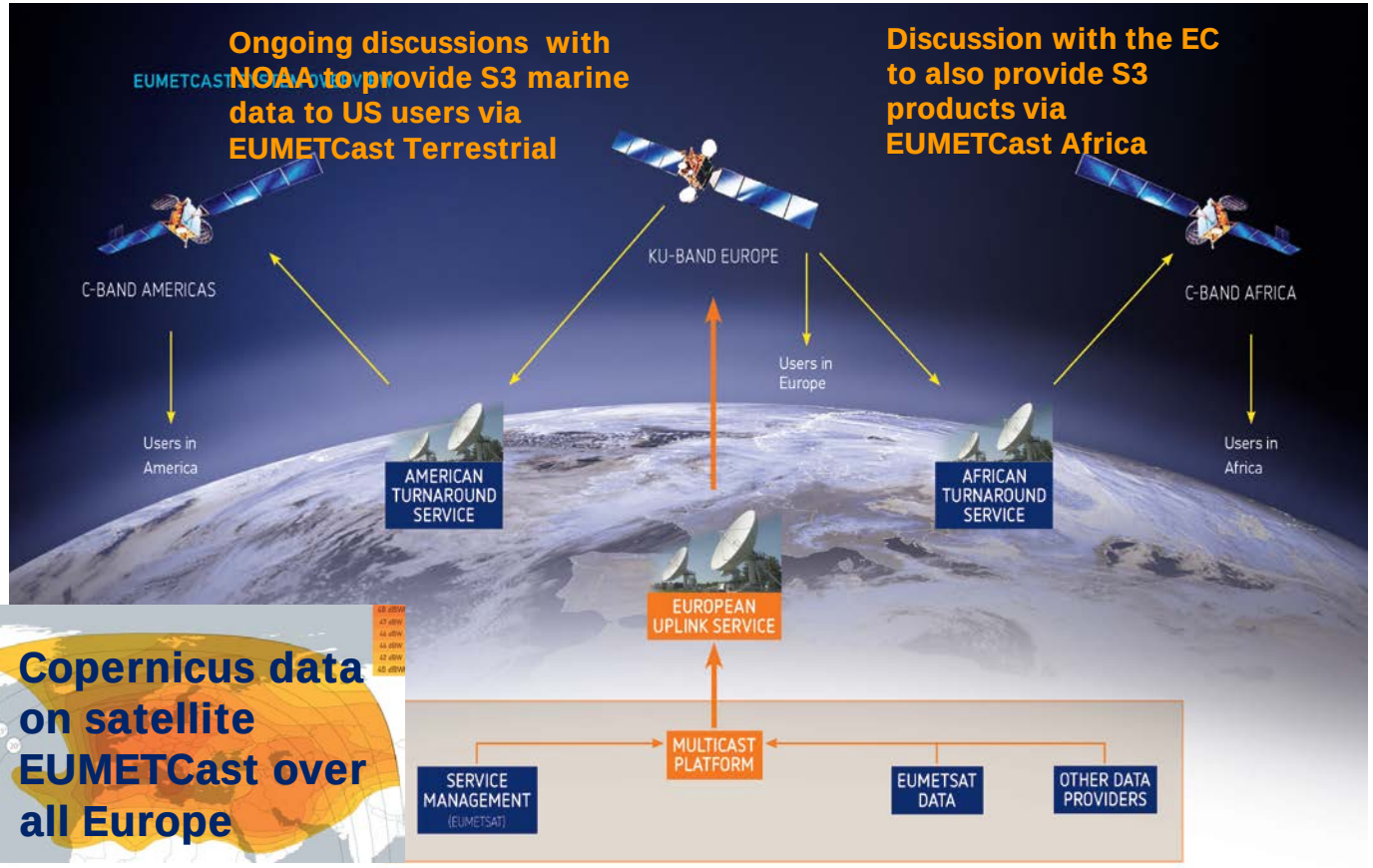
Rolling archive of 1 month of data supporting ftp/http access

EUMETSAT Data Centre

Complete historical archive of all EUMETSAT data including S-3 marine data

EUMETCast

One-stop-shop for many data streams via a single pick-up point



Satellite dissemination

- Data retransmission via telecommunication satellites
- Off-the-shelf, commercially available DVB reception components (like satellite TV)
- European coverage only, a possibility for EUMETCast-Africa

Terrestrial multicast dissemination tested

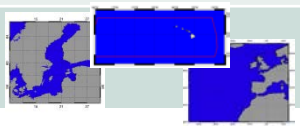
- High speed internet network
- GÉANT in Europe, Internet2 in the US, Asian partner networks
- Scalable data provision to EUMETSAT bilateral partners
- Beginning of Demonstration Service in 2016

Satellite Net Bandwidth Dec 2014:
- **22.5 Mbps EUMETCast-Europe**
- **2.55 Mbps EUMETCast-Africa**
- **1.8 Mbps EUMETCast-Americas**

Satellite Service Status Dec 2014:
- **41 Data Providers**
- **2329 European Users**

EUMETSAT Sentinel-3 data dissemination

Timeliness Categories	EUMETCast	ODA	Data Centre
Near Real Time (NRT) – 3h	√	√	√
Short Time Critical (STC) – 48h	√	√	√
Non Time Critical (NTC) – 30d		√	√
Reprocessed – ad hoc			√

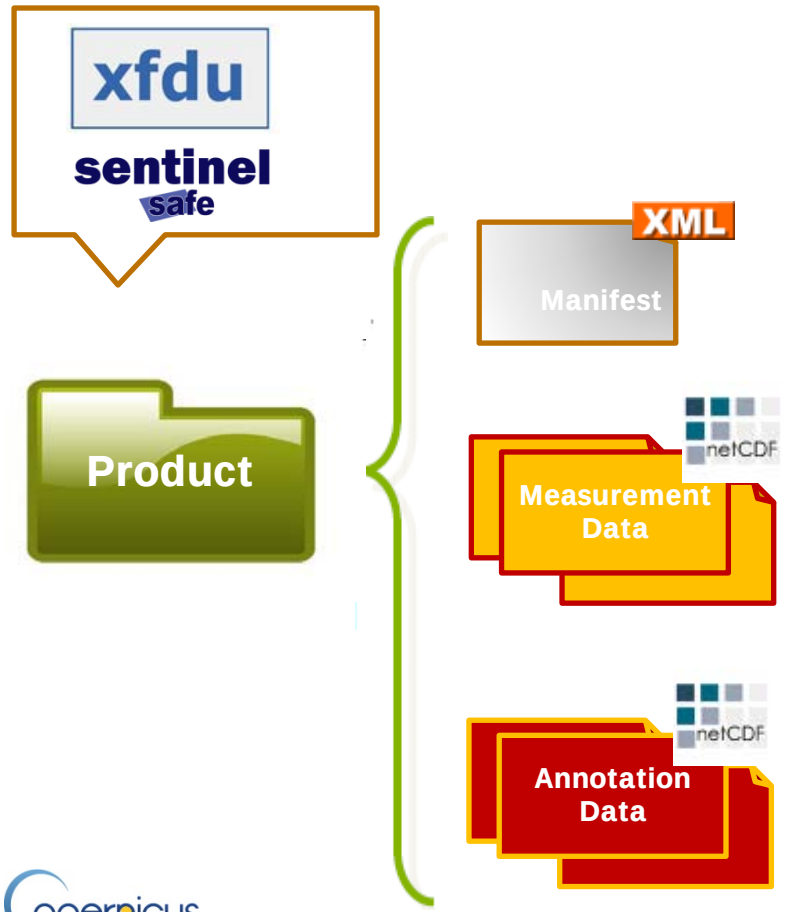
Product Types	EUMETCast	ODA	Data Centre
User Products (all users)	√ (selected)	√	√
Internal Products (authorised users)		√	√
Datasets (all users) 		√	√

EUMETSAT Sentinel-3 user marine products

Product	EUMET Cast	ODA	Data Centre	Timeliness	Resolution	Size per orbit uncompressed (GB)	Product Unit Length
SLSTR L1 RBT		✓	✓	NRT, NTC	full	69.5	Frame [3 min]
SLSTR L2 WST (GHRSST L2P)	✓	✓	✓	NRT	full	2.3	Full orbit dump
		✓	✓	NTC	full	2.3	Full orbit
OLCI L1 EFR	✓	✓	✓	**NRT**	**full**	**28.6**	**Frame [3 min]**
		✓	✓	**NTC**	**full**	**28.6**	**Frame [3 min]**
OLCI L1 ERR	✓	✓	✓	**NRT**	**reduced**	**1.9**	**Full orbit daylight [2666 sec]**
		✓	✓	**NTC**	**reduced**	**1.9**	**Full orbit daylight [2666 sec]**
OLCI L2 WFR		✓	✓	**NRT, NTC**	**full**	**28.4**	**Frame [3 min]**
OLCI L2 WRR	✓	✓	✓	**NRT**	**reduced**	**1.9**	**Full orbit daylight [2666 sec]**
		✓	✓	**NTC**	**reduced**	**1.9**	**Full orbit daylight [2666 sec]**
SRAL L1B	✓	✓	✓	NRT, STC	full	0.42	Full orbit dump
		✓	✓	NTC	full	0.42	Half orbit
SRAL L2 WAT	✓	✓	✓	NRT, STC	full	0.2	Full orbit dump
		✓	✓	NTC	full	0.2	Half orbit

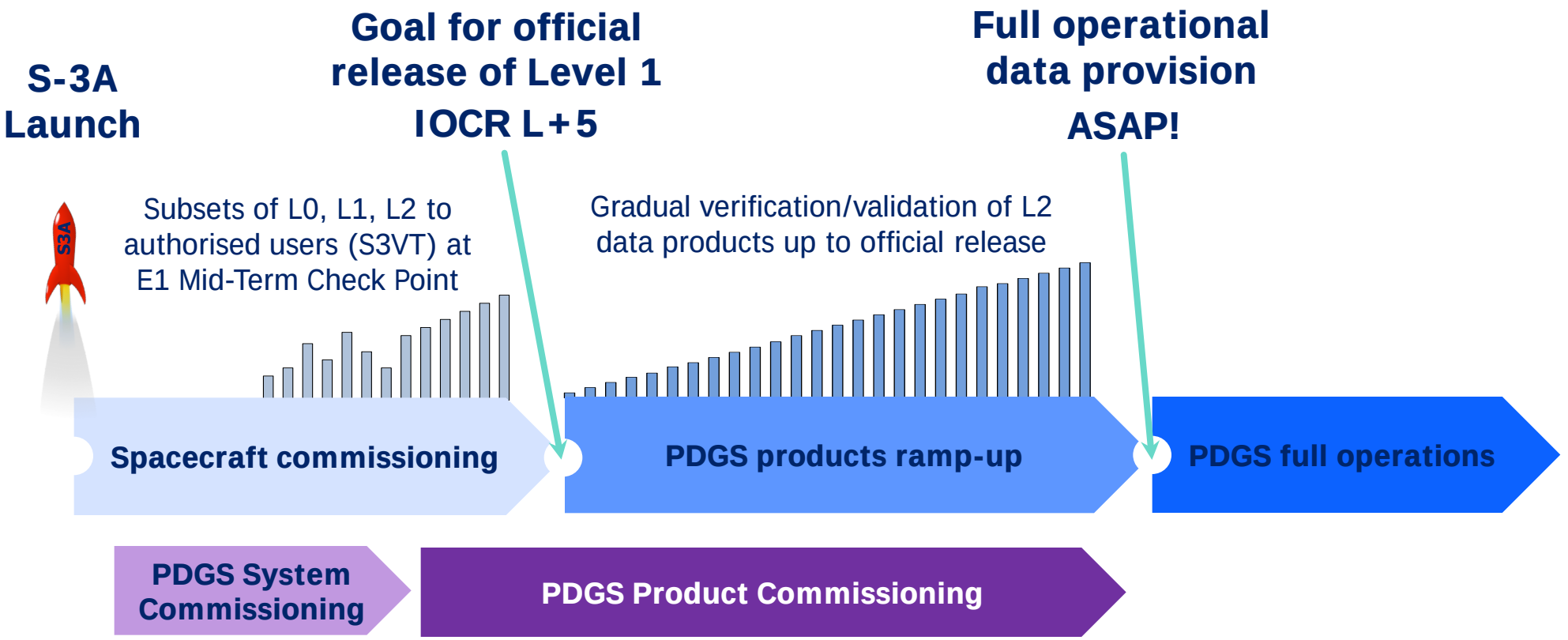
Sentinel-3 data format and Level-2 marine products

Sentinel-3 product package is a folder holding a collection of XML and NetCDF files (raw binary for some internal products)



Sentinel-3 Level-2 marine products	spatial resolution
Water-Leaving Reflectances (16 bands)	**300m, 1.2km**
Chlorophyll Concentration for open ocean waters	**300m, 1.2km**
Chlorophyll Concentration for coastal waters	**300m, 1.2km**
Total suspended matter concentration	**300m, 1.2km**
Diffuse attenuation coefficient	**300m, 1.2km**
Coloured Detrital and Dissolved Material absorption	**300m, 1.2km**
Photosynthetically active radiation	**300m, 1.2km**
Aerosol Optical Depth over water	**300m, 1.2km**
Aerosol Angstrom exponent over water	**300m, 1.2km**
Integrated Water Vapour Column	**300m, 1.2km**
Sea Surface Temperature (GHRSST L2P)	1km
1Hz, 20Hz Ku and C band parameters (LRM/SAR), waveforms	300m

Timeline for data product availability



EUMETSAT EO Portal: central registration portal

Subscription to data services

- EUMETCast
- Online Data Access
- EUMETSAT Data Centre (Long Term Archive)

EO Portal

- eoportal.eumetsat.int

Product Navigator

- navigator.eumetsat.int

User Notification emails

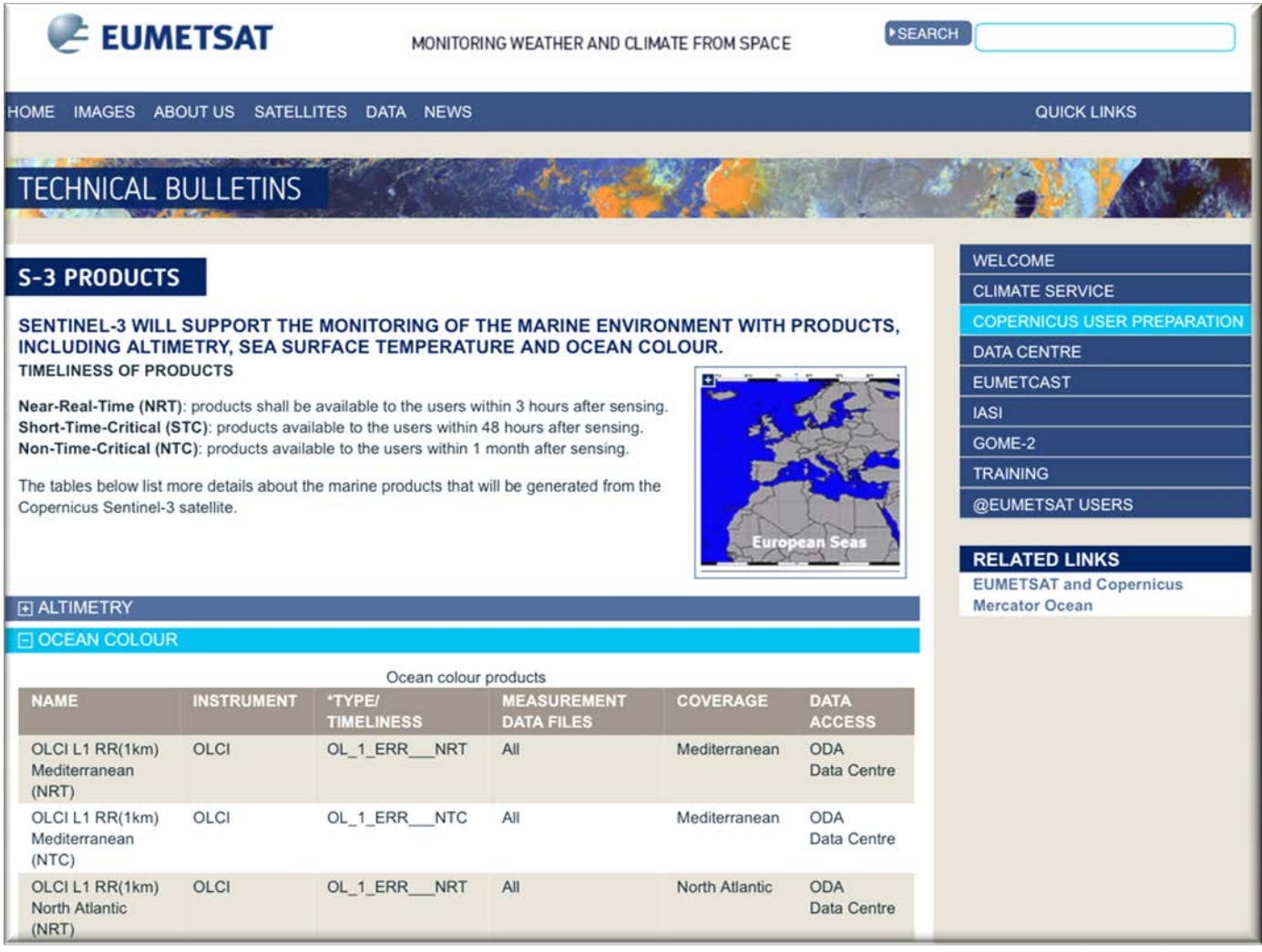
Helpdesk

- Email: ops@eumetsat.int

EUMETSAT Copernicus Sentinel-3 web

- Information on data products and formats
- Information on data access
- Test Data Sets
- Tools
- Dedicated areas for communication about mission status
- Dedicated areas for communication about mission performance; including with S3VT

www.eumetsat.int > NEWS > COPERNICUS USER PREPARATION



Launch in October!

EUMETSAT is looking forward to serving the Ocean Colour Community