Update on EUMETSAT ocean colour services

Ewa J. Kwiatkowska
EUMETSAT – space data provider for operational oceanography

- Operational data provider for services and end users: weather, climate, oceanography, atmospheric composition (research and operational use)
- User requirements drive the definition of satellite programmes (with ESA, CNES, NASA/NOAA) and data services
Ocean colour in EUMETSAT operational services

- Sentinel-3 system developed by ESA with EUMETSAT support
- EUMETSAT – future operator of Sentinel-3 under EC/ESA Copernicus programme
- Integration of ocean colour data services into the fully mature operational infrastructure with real time capabilities at EUMETSAT
- Use of EUMETSAT expertise, infrastructure, and global partnerships to provide meteo, climate and environmental data services to users
Ocean colour applications and users

- Operational ocean colour data services for diverse and evolving applications
- Copernicus MyOcean Marine service – delivers marine products and information services, developing an Ocean Monitoring and Forecasting system
- MyOcean – user of EUMETSAT satellite data services, future user of Sentinel-3 and Jason-3 data

**Coupled ocean-atmosphere and coupled physical-biogeochemical modelling and NWP link**
- air-sea heat fluxes – phytoplankton absorption, optical turbidity
- air-sea CO$_2$ exchange – carbon flux, CO$_2$ sources, sinks and transport
- ecosystem modelling

**Climate**
**Science**
**Marine environment monitoring**
- detection and early warning of harmful algal blooms
- impacts of natural disasters and human activities
- sediment load and transport, water transparency monitoring of oil spills
- eutrophication

**Marine resource management**
- fisheries management and research
- sustainable aquaculture
- tourism
- water resource forecasting
- water quality
EUMETSAT end-to-end approach towards meeting user needs

Close collaboration with users, MyOcean
Ocean colour community support (IOCS meeting)
Satellite instrument calibration (calibration task force)
State of the art science, algorithms and products (IOCCG ECV task force)
Product cal/val (Sentinel-3 Validation Team, with ESA)
Data formats and distribution, including Third Party data
International training and outreach
User consultation for future Copernicus missions (for EC: GMES PURE)
Sentinel-3 Cal/Val activities

ESA-EUMETSAT planning and preparation for the mission (launch in Nov. 2014)

ESA-EUMETSAT joint Cal/Val Plan

- benefits from community recommendations
- Cal/Val plan version 1 ready and reviewed

ESA-EUMETSAT joint Call for Sentinel-3 Validation Team (S3VT)

- rolling call
- 80 total submissions
- 40 ocean colour submissions
- first workshop 26-29 November 2013
- S3VT subgroups
  - Ocean Colour
  - Altimetry
  - Sea Ice and Sea Surface Temperature
  - Land parameters
ESA leads in the development of Sentinel-3 Space and Ground Segment; EUMETSAT supports the development

EUMETSAT operations for Sentinel-3
- monitoring and control of Sentinel-3 platform and payloads
- acquisition, processing, maintenance and distribution of instrument data and marine products
- support to the marine user community

Operations of Payload Data Ground Segment (PDGS)
- ESA – land services
- EUMETSAT – marine services

EUMETSAT Marine Centre
- Sentinel-3 ground segment under integration at EUMETSAT HQ (with ESA and Industry)
# Sentinel-3 OLCI product summary

## OLCI Products Summary for Sentinel-3A and Sentinel-3B (Auxiliary Data excluded)

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Level</th>
<th>Description</th>
<th>PDGS Product Category</th>
</tr>
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<tbody>
<tr>
<td>OL_0_EFR___</td>
<td>0</td>
<td>Full Resolution ISPs</td>
<td>Internal</td>
</tr>
<tr>
<td>OL_0_CR0___</td>
<td>0</td>
<td>Calibration with no spectral relaxation</td>
<td>Internal</td>
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<tr>
<td>OL_1_SPC___</td>
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<td>Wavelength characterization from spectral calibration</td>
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<td>OL_1_RAC___</td>
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<td>Dark offset and gain coefficients from radiometric calibration</td>
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<td>OL_1_EFR___</td>
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<td>Full Resolution calibrated top of atmosphere radiances (L1B)</td>
<td>User</td>
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<tr>
<td>OL_2_WFR___</td>
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<td>Full Resolution Marine products and Atmospheric by-products</td>
<td>User</td>
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<tr>
<td>OL_2_LFR___</td>
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<td>Full Resolution Land and Atmospheric parameters</td>
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<tr>
<td>OL_1_ERR___</td>
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<td>Reduced Resolution calibrated top of atmosphere radiances (L1B)</td>
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<tr>
<td>OL_2_WRR___</td>
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<td>User</td>
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<td>OL_2_LRR___</td>
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<td>Sentinel-3 core optical products</td>
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<td>Normalised Water Leaving Reflectances</td>
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<td>300 m, 1.2 km</td>
<td>OLCI</td>
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<td>Chlorophyll Concentration for open ocean waters</td>
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<td>OLCI</td>
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<td>Chlorophyll Concentration for coastal waters</td>
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<td>OLCI</td>
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<tr>
<td>Total suspended matter concentration</td>
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<td>OLCI</td>
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<td>Diffuse attenuation coefficient</td>
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<td>OLCI</td>
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<td>Coloured Detrital and Dissolved Material absorption</td>
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<td>OLCI</td>
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<td>Aerosol Optical Depth over water</td>
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<td>300 m, 1.2 km</td>
<td>OLCI</td>
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<td>Aerosol Angstrom exponent over water</td>
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<td>OLCI</td>
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<td>Integrated Water Vapour Column</td>
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<td>SLSTR</td>
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<tr>
<td>Land Surface Temperature</td>
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<td>1 km</td>
<td>SLSTR</td>
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<td>Fraction of Absorbed PAR</td>
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<td>Terrestrial Chlorophyll Index</td>
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<td>OLCI</td>
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<td>Surface Reflectances over Land</td>
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<td>300 m</td>
<td>OLCI+SLSTR</td>
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<tr>
<td>Aerosol Optical Depth over Land</td>
<td></td>
<td>300 m</td>
<td>OLCI+SLSTR</td>
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<tr>
<td>Aerosol Angstrom exponent over Land</td>
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<td>300 m</td>
<td>OLCI+SLSTR</td>
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<td>Vegetation-like Surface Reflectances 1 day Synthesis</td>
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<td>1 km</td>
<td>OLCI+SLSTR</td>
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<tr>
<td>Vegetation-like Surface Reflectances 10 day Synthesis</td>
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<td>1 km</td>
<td>OLCI+SLSTR</td>
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<td>Vegetation Normalised Difference of Vegetation Index</td>
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<td>1 km</td>
<td>OLCI+SLSTR</td>
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Near Real Time: EUMETCast

- Digital Video Broadcast using commercial telecommunication satellite services
- Low cost, standard VSAT (Very Small Aperture Terminal, > 4000)
- 3 hour near-real timeliness for Sentinel-3
- Access to integrated marine data stream: weather, ocean

Long-term archive

- U-MARF (Unified Meteorological Archive and Retrieval Facility)
- Two last baselines of all products

On-line data access (ODA)

- Rolling archive: last 1 month of data

EUMETSAT Sentinel-3 data dissemination: baseline
EUMETSAT Product Navigator

- Central service for all EUMETSAT data and products
  http://www.eumetsat.int/Home/Main/DataProducts/ProductNavigator/

- Data search and data ordering
  Product Dissemination Units over regions of interest
  product subsets containing user-selected parameters

- Distribution from the long term archive

- Subscription to EUMETCast dissemination services

<table>
<thead>
<tr>
<th>OLCI total volume uncompressed</th>
<th>GB/day</th>
<th>TB/year</th>
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<tbody>
<tr>
<td>Level-1 FR and RR</td>
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<td>160.75</td>
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<tr>
<td>Level-1 RR</td>
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<td>Level-2 marine FR and RR</td>
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<td>159.98</td>
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<tr>
<td>Level-2 marine RR</td>
<td>33.80</td>
<td>12.34</td>
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</table>

helpdesk
ops@eumetsat.int
Summary

- EUMETSAT: user-driven agency/programmes
- Involvement in ocean colour through Copernicus Sentinel-3 development and operations; in cooperation with ESA and the EC
- Operations and data services in support of Copernicus and worldwide user community
  - operations/exploitation of Sentinel-3 marine mission
  - delivery of ocean colour data services: Sentinel-3 and Third Party missions (e.g. VIIRS Suomi NPP with NOAA/NASA)
  - easy real time access through low cost VSAT: EUMETCast – integrated real time data stream
  - emphasis on quality of data and service; importance of user requirements and community recommendations

Looking forward to serving ocean colour users and the community!