Introduction to the 5th OSI SAF Users workshop:
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

Guenole Guevel, OSI SAF Project manager
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

1) Introduction
2) OSI SAF operational architecture
3) OSI SAF products and use of satellites
4) Some aspects of product dissemination/access
5) User support
6) Conclusion
The EUMETSAT SAF on Ocean and Sea Ice (OSI SAF), one of the 8 EUMETSAT thematic Satellite Application Facilities, is devoted to the ocean surface.

An Operational Space Oceanography project with one main mission:
produce, control and distribute operationally in near real-time Quality Controled products related to key parametres of the Sea surface (SST, Radiative Fluxes, Sea Ice and Wind), derived from available satellite data, using in priority EUMETSAT and European satellites, with the necessary R&D (including validation) and Users Support activities. Products have been set gradually in operations since 2004.

A sustainable history
- Development phase from 1997 to 2002
- Initial Operational Phase (IOP) from July 2002 to March 2007 (MSG)
- CDOP (Continuous Development and Operations Phase) from March 2007 to February 2012 (Metop)
- Next phase, CDOP-2, from March 2012 to February 2017, under preparation (MTG and EPS SG in view)
- CDOP-3 from 2017 to 2022 (MTG, EPS SG)

The main requirements taken into account are expressed through:
- WMO
- GCOS
- CEOS virtual constellations
- GMES/MyOcean
- ESA CCI
- EUMETSAT member states and co-operating states
- GHRSSST Group
- IICWG
- IOVWST
- ASCAT SAG
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

2) OSI SAF CDOP-2 OPERATIONAL ARCHITECTURE

- **Satellites data**
  - LML Sub-system
    - Météo-France/CMS processing chains
    - IFREMER FTP Server
    - NAIAD
  - HL Sub-system
    - Met.no (+DMI) processing chains
    - Met.no FTP Server
    - METSIS
  - Wind Sub-system
    - KNMI processing chains
    - KNMI FTP Server

- **Ancillary data**
  - KNMI FTP Server
  - Met.no (+DMI) processing chains

**Domain/Parameter**
- SST & Radiative Fluxes
- Sea Ice
- Winds
2) OSI SAF CDOP-2 OPERATIONAL ARCHITECTURE

The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

Format:
- NetCDF
- GRIB ed.2
- GRIB
- Grib, NetCDF, HDF
- BUFR
- NetCDF

Domain/Parameter:
- SST & Radiative Fluxes
- Sea Ice
- Winds
Sub-skin temperature,
Inputs:
• Brightness temperatures
• Cloud mask (NWC SAF)
• SDI (Saharian Dust index)

algorithm using the following IR channels:

« Split window »:
GOES-13: 3.7-3.9 µm and 10.2-11.2 µm (13.3 µm not strict window => not used, and GOES-E SST not calculated by day)
METEOSAT-9: 9.80-11.80 µm, 11.00-13.00 µm
NOAA-19: 10.2-11.2 µm and 11.5-12.5 µm

« triple window »:
Metop-A: 3.7, 11 and 12 µm

Each product contains
a SST field, a time field and a quality index field.

Required accuracy,
when compared to buoys measurements:
from geostationnary satellites: monthly bias: 0.5°C, Sdt Deviation: 1°C
from polar satellites: monthly bias: 0.5°C, Sdt Deviation: 0.8°C

The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

3) Products: SST
### Products: SST

**AHL SST** (Atlantic High Latitude)
- NOAA/AVHRR -> NPP/VIIRS -> JPSS
- Polar Stereogr. 5km
- 2-daily, L3

**METEOSAT SST**
- 60°S-60°N, 60°W-60°E
- Isolat, isolon 0.05°
- Hourly, L3

**GOES-E SST**
- 60°S-60°N, 15°W-135°W
- Isolat, isolon 0.05°
- Hourly, L3

**Global SST**
- Metop,
  - Isolat, isolon 0.05°
- 2-daily, L3

New products, declared operational in August 2011, superseding LML and MAP ones, already available or coming weeks.

**Full Resolution NOAA SST**
- NOAA/AVHRR via EARS
- 1 km, >50°N
- Continuous, L2

Planned for CDOP-2:
- SST over lakes

Sea Ice Temperature to be included in HL SST

Improvement of algorithm
- Use of RTTOV
- Bias correction
- Optimal estimation

Reprocessing of MSG SST

Usage of new satellites:
- GOES-R/ABI
- NPP/VIIRS, Then JPSS/VIIRS

Preparation for MTG

New products, declared operational in August 2011, superseding LML and MAP ones, already available or coming weeks.
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

3) **Products**: Radiative fluxes

<table>
<thead>
<tr>
<th><strong>SSI</strong> (Solar Surface Irradiance)</th>
<th>Physical method using as inputs:</th>
<th>Required accuracy of hourly values vs. land pyranometer measurements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar irradiance reaching the earth surface in the 0.3-4 µm band.</td>
<td>Visible data (0.6 µm)</td>
<td>- monthly relative bias &lt; 10%</td>
</tr>
<tr>
<td></td>
<td>Cloud types (NWC SAF)</td>
<td>- monthly std. Dev. &lt; 30%</td>
</tr>
<tr>
<td></td>
<td>Model output (h2o:Arpege)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DLI</strong> (Downward Longwave Irradiance)</th>
<th>Bulk parameterization using as inputs:</th>
<th>Required accuracy of hourly values vs. land pyrgeometer measurements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longwave irradiance reaching the earth surface in the 4-100 µm band.</td>
<td>Cloud types (NWC SAF)</td>
<td>- monthly relative bias &lt; 5%</td>
</tr>
<tr>
<td></td>
<td>Model outputs (Ta, hu) SSI</td>
<td>- monthly std. Dev. &lt; 10%</td>
</tr>
</tbody>
</table>

| **Atl. High Lat. Downward Longwave Irradiance** | NOAA & Metop /AVHRR, Polar Stereog. 5km, >60°N 2-daily |
|**Atl. High Lat. Surface Solar Irradiance** | Planned for CDP-2: continuity Usage of new satellites: NPP/VIIRS, Then JPSS/VIIRS |

| **METEOSAT Downward Longwave Irradiance** | 0.05° lat-lon, 60°S-60°N, 60°W-60°E hourly +daily, METEOSAT Downward Longwave Irradiance |
|**METEOSAT Surface Solar Irradiance** | Planned for CDP-2: Continuity Use of GOES-R/ABI |

| **GOES-E Downward Longwave Irradiance** | 0.05° lat-lon, 60°S-60°N, 15°W-135°W hourly +daily, GOES-E Downward Longwave Irradiance |
|**GOES-E Surface Solar Irradiance** | Preparation for MTG |

New products, declared operational in August 2011, superseding LML and MAP ones, Available coming weeks.
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

### Products: Satellite schedule for SST & fluxes

<table>
<thead>
<tr>
<th>SAF phases</th>
<th>CDOP</th>
<th>CDOP-2</th>
<th>CDOP-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2007</td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>MSG/SEVIRI (1) (METEOSAT 8, 9, 10, 11)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MTG-I/FCI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note (1): at 0° longitude</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note (2): from 2015, the first GOES-R in GOES-E position</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

- **Products**
  - METEOSAT SST
  - METEOSAT DLI
  - METEOSAT SSI
  - LML SST
  - LML DLI
  - LML SSI
  - MAP SST
  - MAP DLI
  - MAP SSI
  - GOES-E SST
  - GOES-E DLI
  - GOES-E SSI
  - HL SST
  - HL DLI
  - HL SSI

- GOES-E + METEOSAT
- GOES-E + METEOSAT + NOAA
- GOES-E/IMAGER (GOES-8-12-13)
- GOES-R/ABI (2)
- NOAA
- NPP/VIIRS
- JPSS
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

3) Products : Satellite schedule for SST & fluxes

Satellite schedule of OSI SAF SST and Radiative Fluxes products 2/2

<table>
<thead>
<tr>
<th>Products</th>
<th>CDOP</th>
<th>CDOP-2</th>
<th>CDOP-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global (GBL) SST</td>
<td>2007</td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>Global Metagranules (MGR) SST</td>
<td></td>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>Near Atlantic Regional (NAR) SST</td>
<td></td>
<td></td>
<td>2011</td>
</tr>
<tr>
<td>Full resolution NOAA Sea and Ice Surface Temperature</td>
<td></td>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>Metop /AVHRR</td>
<td></td>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>EPS SG</td>
<td></td>
<td></td>
<td>2014</td>
</tr>
<tr>
<td>NOAA /AVHRR</td>
<td></td>
<td></td>
<td>2015</td>
</tr>
<tr>
<td>Morning orbit</td>
<td></td>
<td></td>
<td>2016</td>
</tr>
<tr>
<td>NOAA/AVHRR</td>
<td></td>
<td></td>
<td>2017</td>
</tr>
<tr>
<td>Afternoon orbit</td>
<td></td>
<td></td>
<td>2018</td>
</tr>
<tr>
<td>NPP/VIIRS</td>
<td></td>
<td></td>
<td>2019</td>
</tr>
<tr>
<td>JPSS</td>
<td></td>
<td></td>
<td>2020</td>
</tr>
<tr>
<td>Full resolution NOAA Sea and Ice Surface Temperature</td>
<td></td>
<td></td>
<td>2021</td>
</tr>
<tr>
<td>NPP/VIIRS</td>
<td></td>
<td></td>
<td>2022</td>
</tr>
<tr>
<td>JPSS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3) Products: Sea Ice

Sea Ice Concentration
Sat: DMSP/SSM/I

Coverage: >60°N (NH) >60°S (SH)
Projection: Polar Stereographic

Required accuracy:
10% for NH product.
15% for SH product when compared to high resolution manual ice charts (yearly average)

Sea Ice Edge
Sat: DMSP/SSM/I & Metop ASCAT

20 km (yearly average) when compared to high resolution manual ice charts

Sea Ice Type
Sat: DMSP/SSM/I & Metop ASCAT

Not yet defined

Resolution: 10 km

Low Resolution Sea Ice Drift
Sat: DMSP/SSM/I, Metop ASCAT & AMSR-E

Required accuracy:
5 km yearly std deviation after 48 hours displacement (colocation with buoys)

Resolution: 62.5 km

The Sea Ice concentration was reprocessed over 1978 – 2007 using DMSP SSMR and SSM/I data.
Data set available at http://osisaf.met.no/p/ice/ice_conc_reprocessed.html

The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase
3) Products: Sea Ice

New products by end of CDOP-1 (February 2012)

- **Global Sea Ice Emissivity**
  - Sat: SSM/I, SSMIS, AMSR
  - 10 km resolution

- **Regional Sea Ice Edge**
  - Sat: AVHRR, VIIRS
  - 1.5 km resolution

- **Medium Resolution Sea Ice Drift**
  - Sat: Metop/AVHRR
  - 20 km resolution

- **Global AMSR Sea Ice Concentration**
  - Sat: AMSR
  - 10 km resolution

Planned for CDOP-2:

- Improvement of algorithms

Usage of new satellites/sensors:
- SSMI/S
- AMSR-2
- NPP/VIIRS (then JPSS/VIIRS)
- OCEANSAT/OSCAT

Updating of Sea Ice concentration
Reprocessing, continuous updates.
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

3) **Products**: Sea Ice

### Satellite schedule of OSI SAF Sea Ice products

<table>
<thead>
<tr>
<th>Products</th>
<th>OSI SAF phases</th>
<th>CDOP</th>
<th>CDOP-2</th>
<th>CDOP-3</th>
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<tr>
<td></td>
<td></td>
<td>2007</td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>Global Sea Ice Concentration</td>
<td></td>
<td>2010</td>
<td>2011</td>
<td>2012</td>
</tr>
<tr>
<td>Global Sea Ice Edge</td>
<td></td>
<td>2013</td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Global Sea Ice Type</td>
<td></td>
<td>2016</td>
<td>2017</td>
<td>2018</td>
</tr>
<tr>
<td>Global Sea Ice Drift</td>
<td></td>
<td>2019</td>
<td>2020</td>
<td>2021</td>
</tr>
<tr>
<td>Global Sea Ice Emissivity</td>
<td></td>
<td>2022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Sea Ice Edge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Resolution Sea Ice Drift</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global AMSRE Sea Ice Concentration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **DMSP/SSM/I**: 2007-2012
- **SSMI/S**: 2013-2017
- **AQUA/AMSR-E**: 2018-2021
- **AMSR-2**: 2022
- **EPS SG**: 2015-2022
- **NOAA/AVHRR**: 2018-2021
- **JPPS**: 2022
- **Metop/ASCAT**: 2022
- **Oceansat-2/OSCAT**: 2018-2021
- **NPP/VIIRS**: 2018-2021
- **JPSS**: 2022
3) **Products**: Wind

**ASCAT 25 km Wind**

- Metop/ASCAT, Wind vector at 10m height,
- Global coverage,
- Sat. Swath,
- BUFR, NetCDF

**ASCAT 12.5 km Wind**

**ASCAT coastal Wind**

Required accuracy:
Better than 2 m/s in wind Component RMS with a bias of less than 0.5 m/s in wind speed

Validation method:
Triple collocation with NWP and buoys

OSI SAF/KNMI also involved in CAL/VAL activities.

**QuickSCAT SeaWinds Winds** (100km and 25km res.) were produced till 23 November 2009. Archive available on request.

Planned for CDOP-2:
- use of OCEANSAT-2 OSCAT in 2012
- Merging of ASCAT 12.5 and coastal winds
- Reprocessing of ASCAT, ERS and SeaWinds winds
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

3) Products : Wind

Satellite schedule of OSI SAF Wind products

<table>
<thead>
<tr>
<th>Products</th>
<th>SAF phases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CDOP</td>
</tr>
<tr>
<td>SeaWinds 25km Wind</td>
<td></td>
</tr>
<tr>
<td>SeaWinds 100km Wind</td>
<td></td>
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<tr>
<td>ASCAT 25 km Wind</td>
<td></td>
</tr>
<tr>
<td>ASCAT 12.5 km Wind</td>
<td></td>
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<tr>
<td>ASCAT coastal Wind</td>
<td></td>
</tr>
<tr>
<td>Oceansat-2 50km Wind</td>
<td></td>
</tr>
<tr>
<td>QuikSCAT/SeaWinds</td>
<td></td>
</tr>
<tr>
<td>Metop /ASCAT</td>
<td></td>
</tr>
<tr>
<td>EPS SG</td>
<td></td>
</tr>
<tr>
<td>Oceansat-2 OSCAT</td>
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</tbody>
</table>
The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

4) dissemination

Satellites data

Ancillary data

Sub-system 1

Météo-France/CMS processing chains

IFREMER FTP Server

NAIAD

Sub-system 2

Met.no (+DMI) processing chains

Met.no FTP Server

METSIS

Sub-system 3

KNMI processing chains

KNMI FTP Server

EUMETCAST

EUMETSAT HQ

DATA CENTER

Formats

NetCDF (HDF)

GRIB (->ed.2)

GRIB

GRIB, NetCDF, HDF

BUFR

NetCDF

USERS

Domain/Parameter

SST & Radiative Fluxes

Sea Ice

Winds
Specific interfaces on FTP servers

Enhancing the product resolution leads to drastic increasing of files, but the user still needs to use them easily.

=> User friendly interfaces have been implemented in the framework of the OSI SAF allowing flexible access to full resolution products with re-mapping, geographical extraction, filtering, combining, automatic sending …

METSIS :
Cf demonstration
EUMETCast

- Reception based on a simple public TV like DVB antenna. Data are encrypted and accessible to registered users whose reception station are equipped with EUMETCAST client software and EUMETCAST Key unit.

The EUMETSAT ocean and sea ice SAF (OSI SAF) towards the CDOP-2 phase

4) dissemination

Global GEONETCast Coverage

Need of SST and Wind products covering around Africa and Indian Ocean
The Web site and help desk: www.osi-saf.org
Till end of June 2011 have been registered 440 users belonging to 200 entities located in 50 countries and 140 independant/personal users.

Advantages of User registration:
For the OSI SAF: better knowledge of users and product usage.
For the user: Access to the products, User Support through the Help desk and follow-up of user requests, up-to-date information about the production, and other relevant information, wide access to documentation.
For the CDOP-2 the OSI SAF will continue to produce and distribute operationally quality controlled products related to 4 key parameters of the ocean-atmosphere interface (SST, Radiative Fluxes, Sea Ice and Wind).

The OSI SAF will continue the effort of R&D, including Validation method, for maintaining and enhancing the products, taking benefit from the close co-operation, synergy and reactivity between OPS and R&D teams inside each production center.

The OSI SAF will continue to take benefit from the existing and future satellites (EUMETSAT satellites and US satellites, as well as others if relevant).

The effort on reprocessing activities, initiated in 2009-2010 (Sea Ice Concentration) will be increased for CDOP-2 and extended to SST and winds.

The (free) access to the products will continue to rely both on:
- Internet FTP servers: preferably for products in NETCDF, with flexible access to full satellite resolution data, at the intention of the Oceanography community,
- EUMETCAST and EUMETSAT Data Centre: preferably for products gridded over pre-defined areas, in GRIB and BUFR, at the intention of the meteorological community, but taking into account the growing need for NetCDF format.

The OSI SAF will continue to take into account requirements expressed at international level (WMO, GCOS, GHRSST…) as well as at European level (EUMETSAT members states, GMES/My Ocean, ESA CCI…, including in particular for African users). The OSI SAF will ensure that its domain of responsibility will remain consistent with regards to other relevant projects (all requirements fulfilled, and no useless redundancy).

The number of users is increasing regularly. The OSI SAF will increase its effort on User information and support, through the Web site and associated user help desk, and through the organization of user workshops and participation in or support to outside events.
thank you

www.osi-saf.org