EUMETSAT Updates and Collaboration with NOAA

Bojan R. Bojkov
on behalf of EUMETSAT teams
EUMETSAT is an intergovernmental organisation with 30 Member States and 1 Cooperating State.
To establish, maintain and exploit European operational meteorological satellite systems, while considering the recommendations of WMO as much as possible.

A further objective is to contribute to operational climate monitoring and detection of global climatic changes.

By fulfilling these objectives, contribute to environmental monitoring, where interactions with the ocean and the atmosphere are involved.
METOP -A and -B
(LOW-EARTH, SUN - SYNCHRONOUS ORBIT)

EUMETSAT POLAR SYSTEM/INITIAL JOINT POLAR SYSTEM

Sentinel -3a
(LOW-EARTH, SUN-SYNCHRONOUS ORBIT)

Copernicus Global Marine and Land Environment Mission
Operated by EUMETSAT

JASON-2, -3
(LOW-EARTH, 63° INCL. NON SYNCHRONOUS ORBIT)

OCEAN SURFACE TOPOGRAPHY MISSION

METEOSAT SECOND GENERATION -9, -10, -11
(GEOSTATIONARY ORBIT)

TWO-SATELLITE SYSTEM:
- METEOSAT-11: IN-ORBIT BACKUP
- METEOSAT-10: FULL DISK IMAGERY MISSION AT 0° (15 MN)
- METEOSAT-9: RAPID SCAN SERVICE OVER EUROPE AT 9.5°E (5 MN)

METEOSAT-8 (2nd GENERATION)
(GEOSTATIONARY ORBIT)

INDIAN OCEAN DATA COVERAGE MISSION
AT 40° E (TBD June 2016)
Metop: RO Wave Optics

Wave Optics PPF since Q3/2016

- Stratospheric bias structure as before; tropospheric biases improved; deeper penetration into the lower troposphere
- Upon extensive consultation/data evaluation with NWP users, preference for low correlations over smoothing
- The ECMWF and the UK MetOffice use the complete profile down to the lowest level \(\rightarrow\) positive impact.

Note: Low stratospheric standard deviations (as in v4.3) are possible, but come with larger vertical correlations
Metop: IASI v6.3 - SO$_2$ from infrared sounding

Cumulative SO$_2$ from volcanic eruptions (20 May and 30 June 2011)

*Courtesy: Clarisse, et al., doi: 10.5194/amt-5-581-2012*
Used by ECMWF/CAMS operationally for aerosol forecasting since January 2017
There will be three Metops in orbit 2018 – 2021

- Metop-A in drifting orbit; last OOP manoeuvre in August 2016 (EOL end 2021/early 2022)

- Metop-B prime satellite LTDN 9:30 LST

- Metop-C launch planned for late 2018 LTDN 09:30 LST
• Apply GSICS Simultaneous Nadir Observations (SNO) methodology to intercompare the Sentinel-3/SLSTR with Metop-IASI instruments as a first check:
  • 10 min. satellite co-location, pixel aggregation without stray-light correction

• Extremely challenging process because of the data volumes involved and the complexity of the matching of the instrument fields of views

→ this pragmatic approach to monitor the performance of the Sentinel-3/SLSTR using accepted international best practices to be implemented into the operational chain – especially in light of the launch of Sentinel-3b

I. Tomazic, Marine Applications
Sentinel-3 SLSTR and OLCI L2 operational as of July

Cloud masking still needs work on Sentinel-3
Future Programmes and Programmes under Development

MTG: Approved, under development
Sentinel-4 on board MTG-S Satellites

EPS-SG: Approved, under development
Metop-SG programme approved at ESA-CMIN12
Sentinel-5 on board Metop-SG-A Satellites

Jason-CS/ Sentinel-6
Approved in December 2015
EPS-SG A: sounding and imagery mission

Metop-SG A

1. IASI-NG
   Infrared Atmospheric Sounding
2. MWS
   Microwave Sounding
3. METImage
   Visible-Infrared Imaging
4. RO
   Radio Occultation
5. 3MI
   Multi-viewing, -channel, -polarisation Imaging
6. Copernicus Sentinel-5
   UN/VIS/NIR/SWIR Sounding
EPS-SG B: microwave imagery mission

Metop-SG B

1. SCA
   Scatterometer

2. RO
   Radio Occultation

3. MWI
   Microwave Imaging for Precipitation

4. ICI
   Ice Cloud Imager

5. ARGOS-4
   Advanced Data Collection System
Meteosat Third Generation (MTG): Mission overview

- Imagery missions (MTG-I):
  1. Full disk imagery every 10 minutes in 16 spectral bands with the Flexible Combined Imager (FCI). Fast imaging of European weather every 2.5 minutes
  2. Day/night Lightning Imager (LI)

- Sounding mission (MTG-S):
  1. 3D mapping of water vapour, temperature with Hyperspectral Infrared Sounder (IRS)
  2. Air quality monitoring and atmospheric chemistry in synergy with Sentinel-4 / Ultraviolet Visible & Near-infrared

- Start of operations in 2022 and 2024
- Operational exploitation: 2022–2042
MTG IRS preparations using IASI-L2VDP prototype

- Testing of Scaled Projected States (SPS) transformation of Migliorini (2012) using the CETEMPS (L'Aquila, IT) severe weather regional model (coop. P. Antonelli, SSEC)
EUMETSAT-NOAA areas of collaboration

- EUMETSAT and NOAA have long standing cooperation at many levels:
  - IJPS and JPS operations and data sharing
  - Instrument hosting (e.g. AVHRR on Metops)
  - System interoperability (data flows)
  - Short- to long-term staff exchanges

- The Intention, as of the 2016 EUM-NOAA hi-level bilateral meeting, is to extend the operational exchanges to scientific areas, with the goal of product interoperability for the end-user communities through common algorithms, applications and tools developments, Fiduceal Reference Measurements (FRM) developments, Cal/Val data sharing, etc.
EUMETSAT-NOAA areas of collaboration (ii)

- As of today, more than a dozen face-to-face meetings, and telecons have taken place, including a dedicated marine workshop last March

- Current activities under discussion with the NESDIS/STAR teams:
  - Joint Sentinel-3 Ocean Colour and SST product validation (protocols/tools)
  - Development of a joint NOAA-EUM Ocean Colour algorithm (under the auspice of IOCCG)
  - Development of FRM instruments and the related data collection protocols, for example the design of a European “MOBY-type” buoy
  - Joint development of the RADS altimetry QA tool for Jason(s)/Sentinel-3
  - Staff exchanges/reviews for hyperspectral IR L1 processing/intercalibration
  - Initiate the development of a joint hyperspectral IR “full physics” retrievals → with the goal of interoperability for the forecasters
  - Include NOAA experts in EUMETSAT Mission Advisory Groups such as for IASI/IASI-NG and IRS, MWI/ICI, etc.

More to be formalised in the next days and months
EUMETSAT future programmes overview – Thank you!

Mandatory Programmes

- **METEOSAT FIRST GENERATION**
  - METEOSAT-7

- **METEOSAT SECOND GENERATION**
  - METEOSAT-8
  - METEOSAT-9
  - METEOSAT-10
  - MSG-4/METEOSAT-11

- **METEOSAT THIRD GENERATION**
  - MTG-I-1: IMAGERY
  - MTG-S-1: SOUNDING
  - MTG-I-2: IMAGERY
  - MTG-S-2: SOUNDING
  - MTG-I-3: IMAGERY
  - MTG-I-4: IMAGERY

- **EUMETSAT POLAR SYSTEM (EPS)**
  - METOP-A
  - METOP-B
  - METOP-C

Optional and Third Party Programmes

- **JASON**
  - JASON-2
  - JASON-3

- **COPERNICUS**
  - SENTINEL-3a/Sentinel-3b (Q2/2018)

- **SENTINEL-4 ON MTG-S**
- **SENTINEL-5 ON EPS-SG**

Operational Development

Mandatory Programmes

- METOP-SG-A1
- METOP-SG-B1
- METOP-SG-A2
- METOP-SG-B2
- METOP-SG-A3
- METOP-SG-B3

Optional and Third Party Programmes

- **JASON CONTINUITY OF SERVICE (JASON-CS)**