

Update on EUMETSAT satellite programmes

Presented to CGMS-42 plenary session, agenda item D.1

Overview - Planning of EUMETSAT satellite systems

YEAR... 03 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 40



METEOSAT FIRST GENERATION

METEOSAT-7

METEOSAT SECOND GENERATION

METEOSAT-8

METEOSAT-9

MSG-3/METEOSAT-10

MSG-4/METEOSAT-11*

METEOSAT THIRD GENERATION

MTG-I-1 : IMAGERY

MTG-S-1: SOUNDING

MTG-I-2: IMAGERY

MTG-I-3: IMAGERY

MTG-S-2: SOUNDING

MTG-I-4: IMAGERY



Mandatory Programmes

EUMETSAT POLAR SYSTEM (EPS)

METOP-A

METOP-B

METOP-C

EPS-SECOND GENERATION (EPS-SG)

METOP-SG: SOUNDING AND IMAGERY

METOP-SG: MICROWAVE IMAGERY



JASON

JASON-2

JASON-3

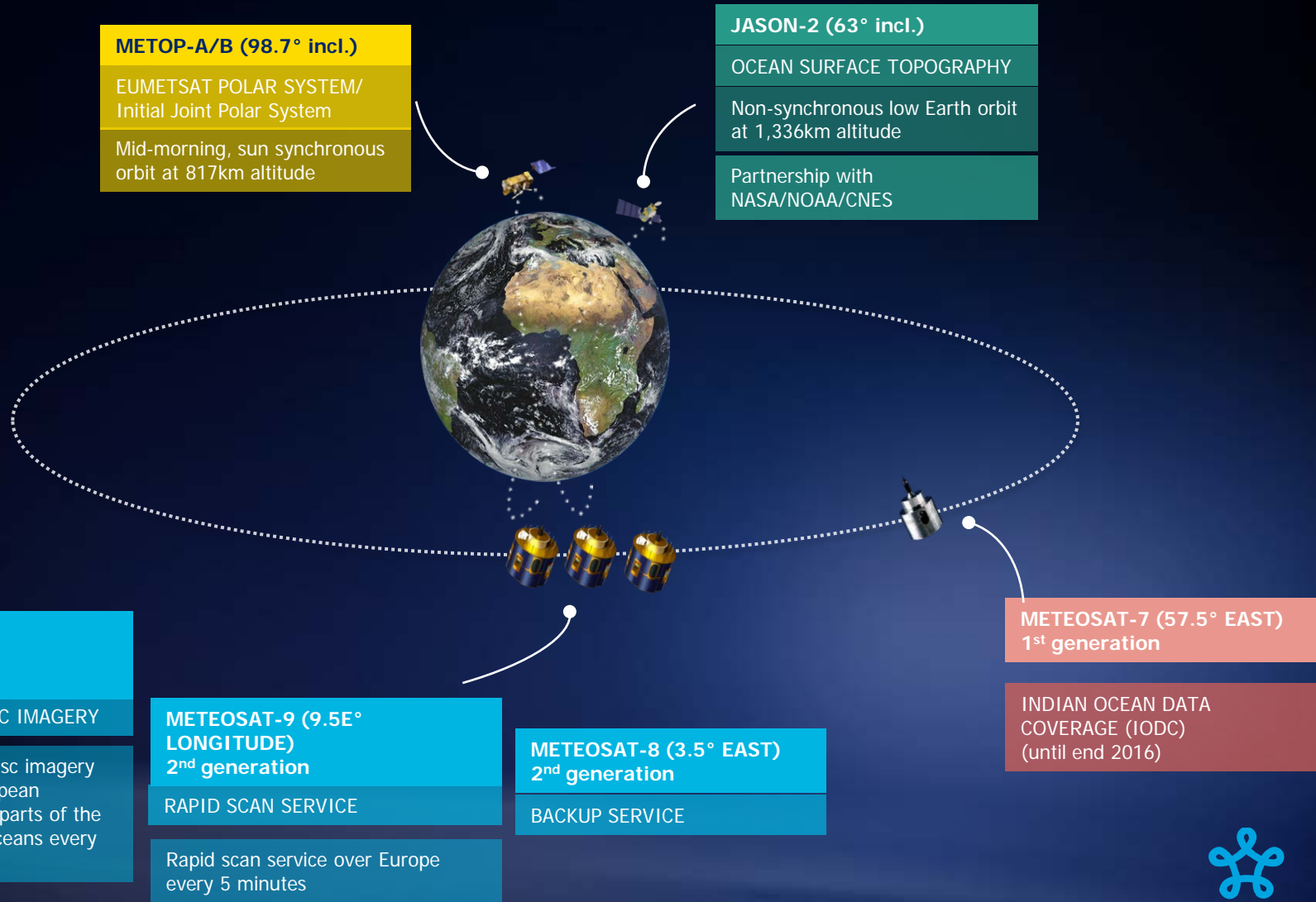
SENTINEL-6 (JASON-CS)



Optional Programmes

YEAR... 03 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 40

CURRENT SATELLITES IN ORBIT



**Coordination Group for
Meteorological Satellites**

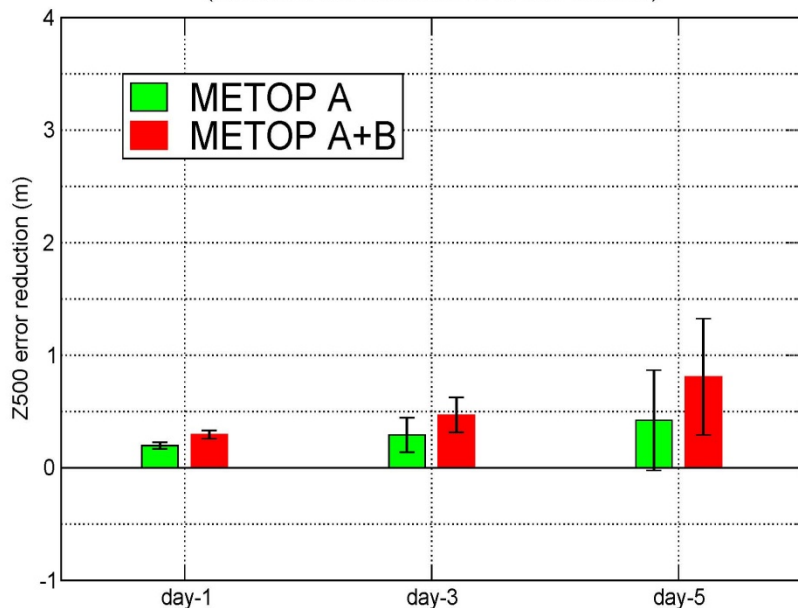


CURRENT LEO SATELLITES – DUAL METOP OPERATIONS

Benefits of dual Metop operations : NWP

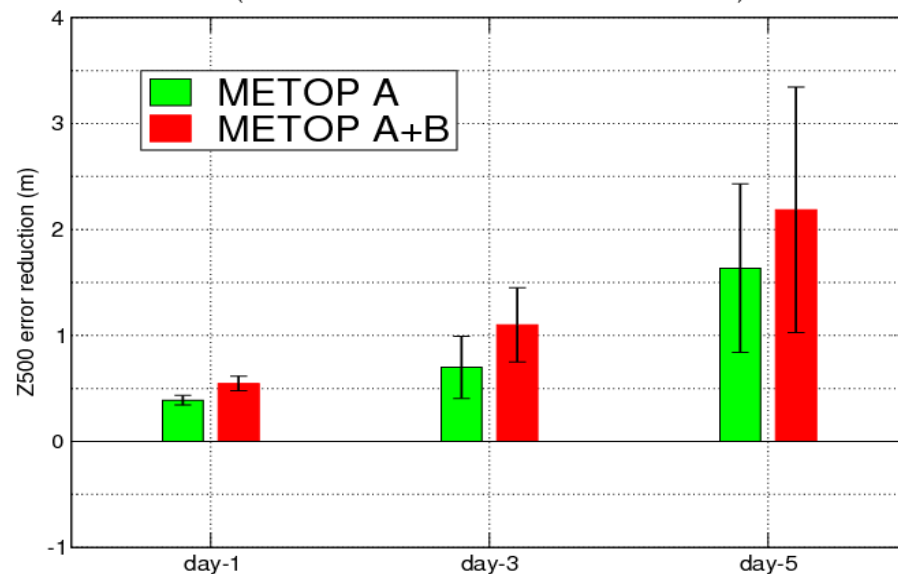
Northern Hemisphere

(increase of skill relative to NO-METOP baseline)



Southern Hemisphere

(increase of skill relative to NO-METOP baseline)

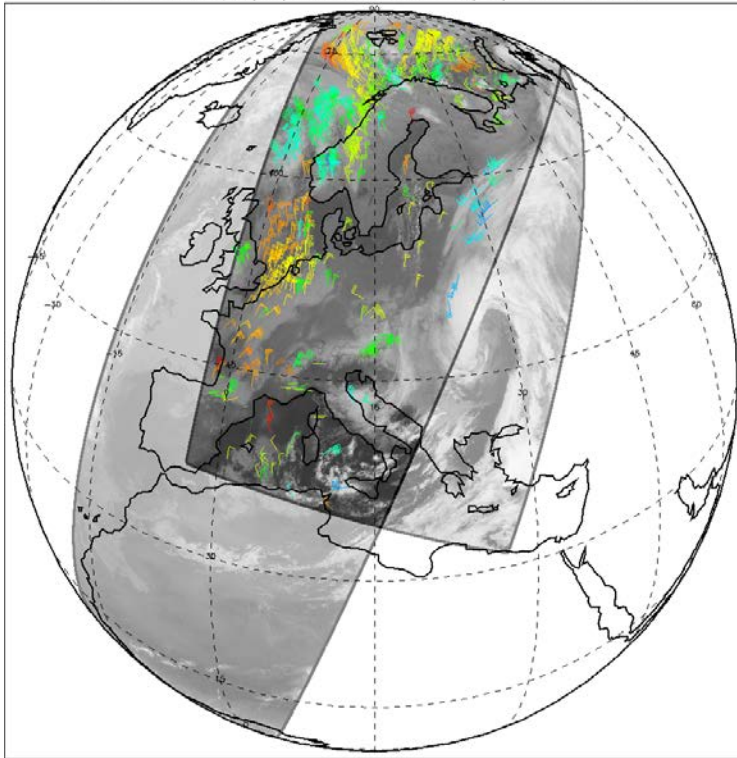


CURRENT LEO SATELLITES – DUAL METOP OPERATIONS

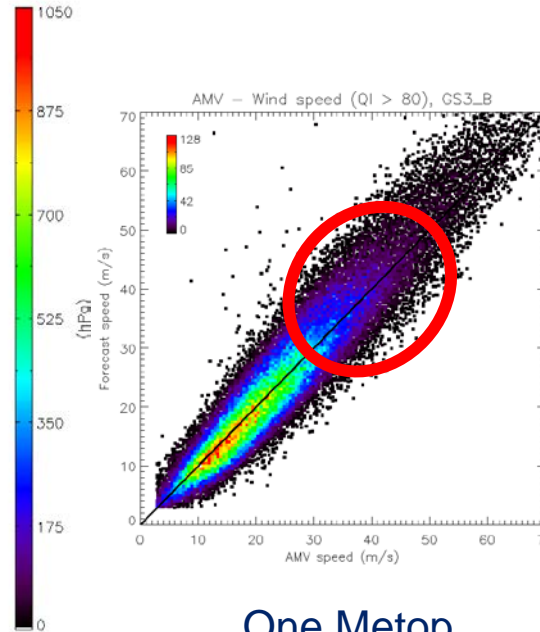
Dual Metop winds: Global coverage and quality improvement

Global winds

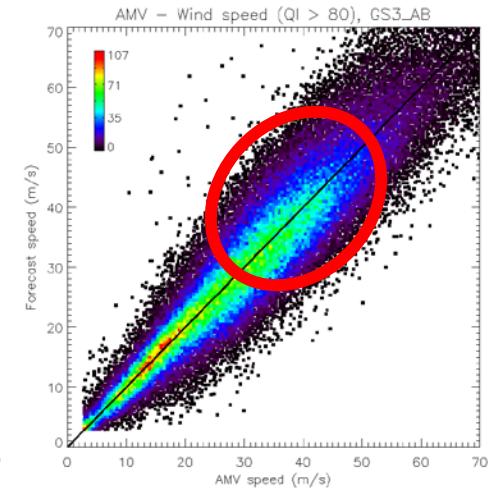
AMV - Pressure, 25/11/2013 at 09:49:03 - 25/11/2013 at 09:58:03



Improved polar winds South Pole (QI>80)

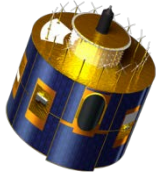


One Metop



Dual Metop

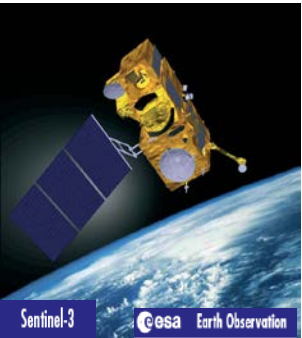
NEAR FUTURE - GEO AND LEO SATELLITES



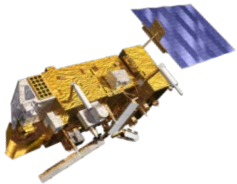
- **MSG-4** launch autumn 2015 (for in orbit storage)



- **Jason-3** launch (with NOAA, CNES, NASA) in March 2015

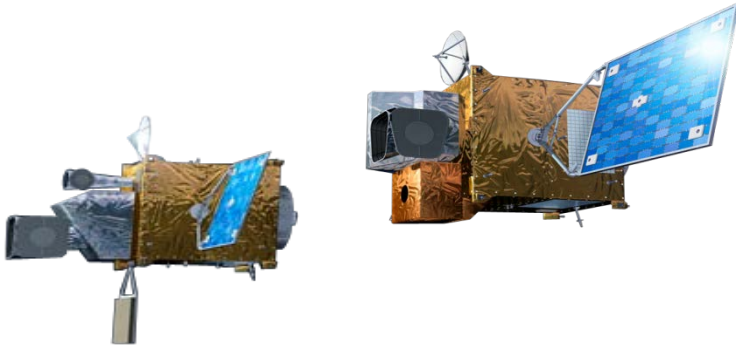


- EUMETSAT will operate **Copernicus Sentinel-3** (Marine Mission) after commissioning by ESA, early 2016



- **Metop-C** launch planned in 2018

Future satellites and programmes: Observations in 2019 – 2040



MTG: Approved, under development
Sentinel-4 onboard MTG-I satellite



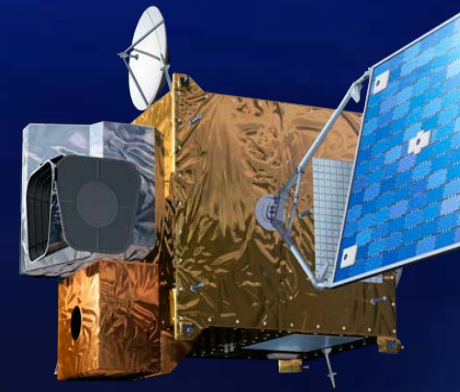
Jason-CS/Sentinel-6:
Proposed, *to be approved in 2015*
Phase B2 approved at ESA CMIN12



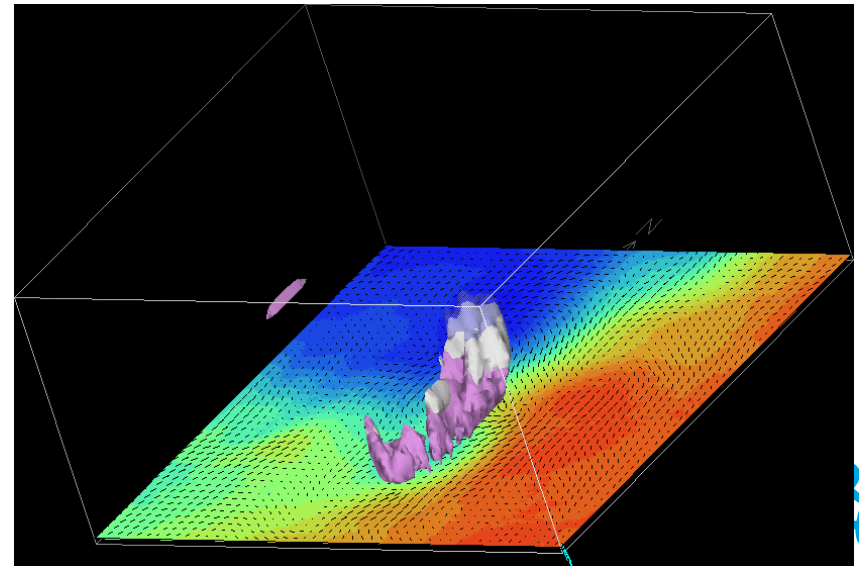
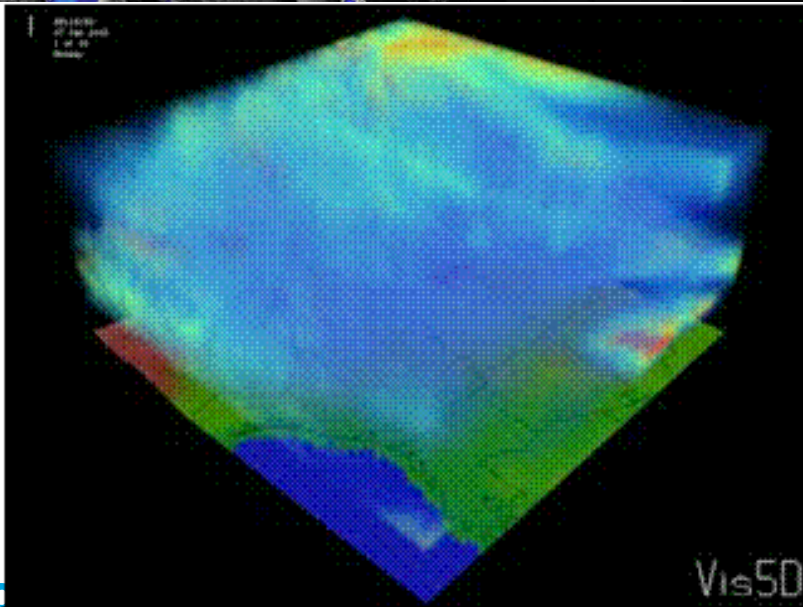
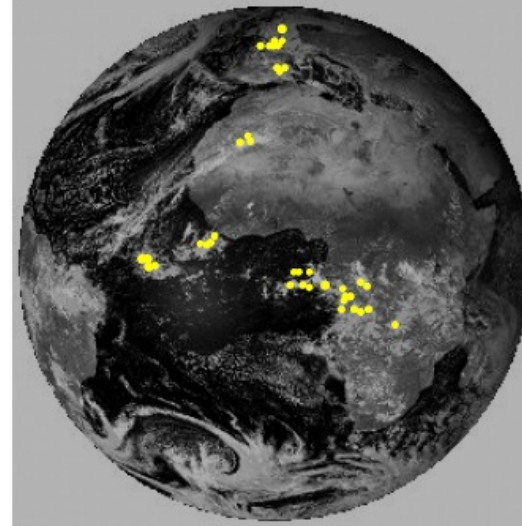
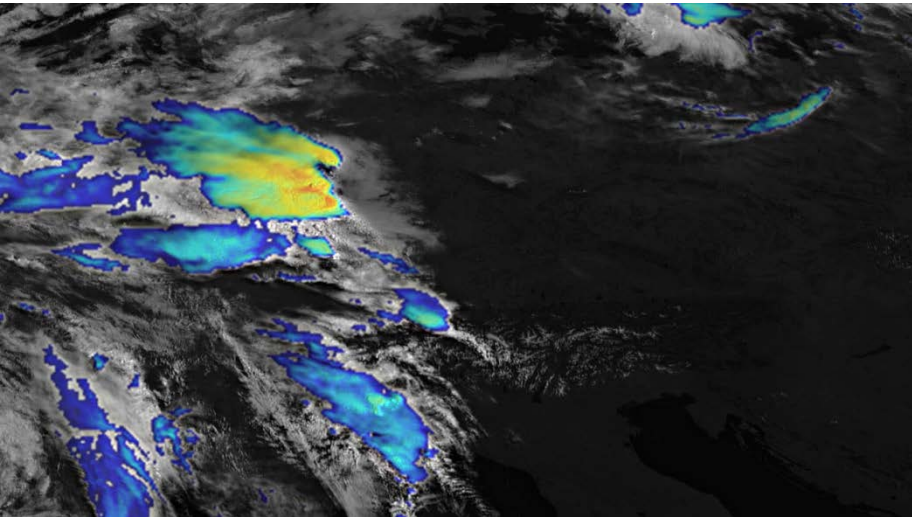
EPS-SG: *to be approved in 2014*
Metop-SG programme approved at ESA CMIN12
Sentinel-5 onboard Metop-SG approved at ESA CMIN12

Meteosat Third Generation: MTG-I and MTG-S missions

- MTG-I imagery mission implemented by a two-satellite system:
 - Advanced imager (FCI)
 - Full disk imagery every 10 minutes in 16 spectral bands
 - Fast imaging of European weather every 2.5 minutes
 - New Lightning Imager (LI)
- MTG-S hyperspectral infrared (IRS) sounding mission:
 - 3D mapping of water vapour, temperature, O₃ every 1 hour
 - Air quality monitoring and atmospheric chemistry (synergy with Copernicus Sentinel-4 Ultraviolet sounder)



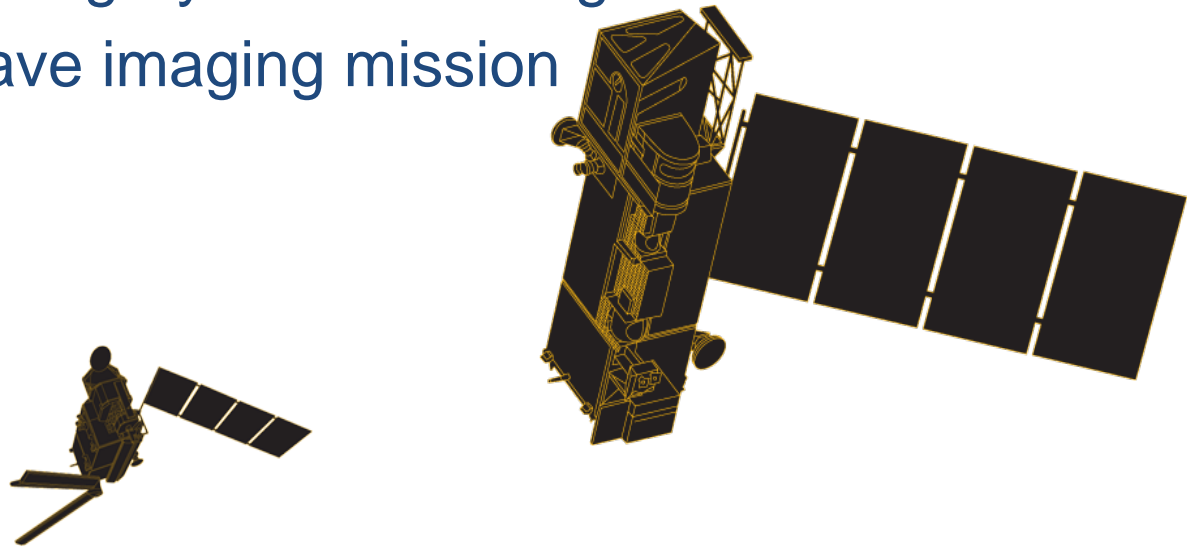
MTG challenge: nowcasting with NWP



Courtesy W.L. Smith
Meteorological Satellites

EPS Second Generation: Two series of co-orbiting satellites

- Metop-SG 1: optical imagery and sounding mission
- Metop-SG 2: microwave imaging mission



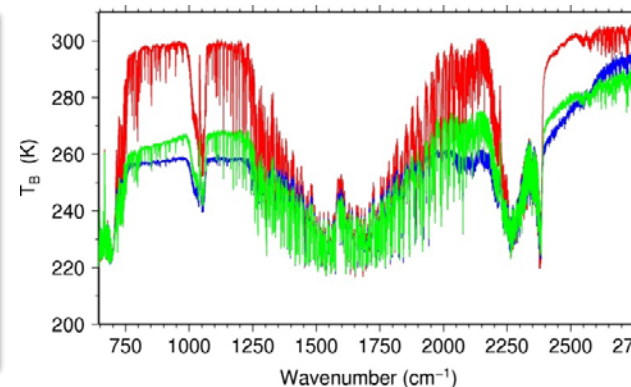
- Continuation of mid morning polar orbiting service in 2021-2042 (3+3 satellites)

IASI-NG, MWS & Sentinel-5/Metop-SG A: The sounding mission

IASI-NG Objectives

- T and Hu Profiles
- Trace gases (O₃, CO, CH₄, CO₂.)
- Aerosols, volcanic ash
- Reference IR instrument for climate monitoring

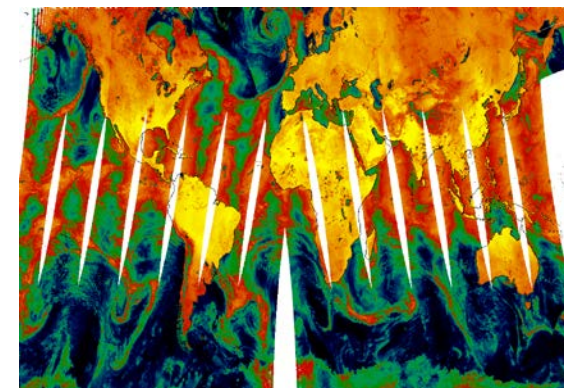
- Radiometric performance & spectral resolution doubled
- Improved Temperature and Moisture profiles (in PBL)
- Chemistry: vertical profiles and new species



MWS Objectives

- T and HU profiles (all weather)
- Cloud liquid water total column

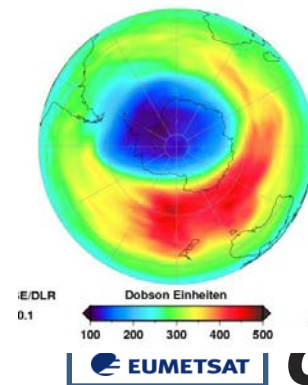
- Addition of a window channel at 229 GHz: Cirrus cloud information
- Spatial oversampling to further reduce noise: more accurate soundings



Sentinel 5 Objectives

- O₃ profiles
- CO₂, SO₂, NO₂, H₂O, CO, CH₄, BrO, HCHO, OCHCHO

- Horizontal resolution: 7 km
- Extension of spectral range (NIR et SWIR): aerosols, CH₄ et CO in PBL

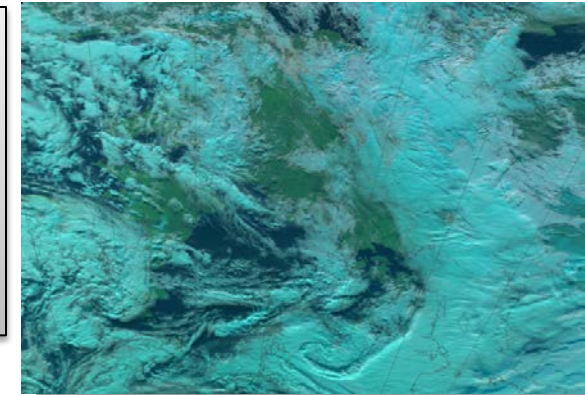


Metop-SG-A Visible to IR imagery mission: MetImage and 3 MI

MetImage objectives

- Clouds, incl. microphysics
- Aerosols
- AMVs (high latitudes)
- Vegetation, snow, fires
- Surface Temperature

- 20 channels
- Horizontal Resolution 250 - 500 m
- Radiometric performances higher than AVHRR

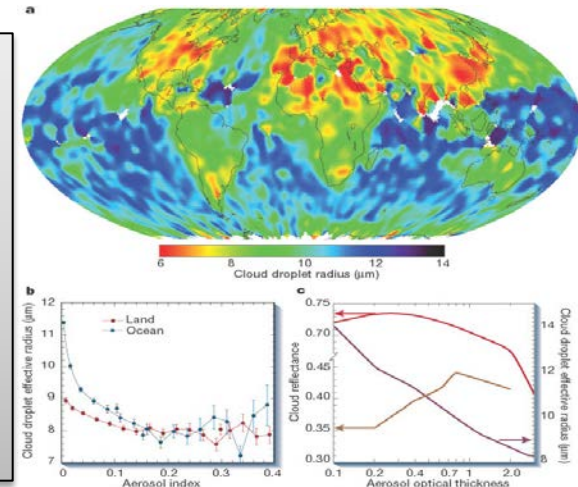


3MI objectives

- Aerosols
- Phase, altitude, optical properties of clouds
- Albedo, radiative budget (BRDF)

Improvements wrt POLDER

- Horizontal Resolution: 4 km
- 11 channels, extension to SWIR: Better aerosol characterisation
- Higher angular resolution (14 view angles)



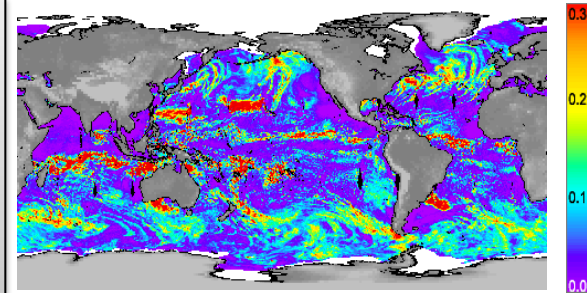
MicroWave Imager (MWI) & Ice-Cloud Imager (ICI) on Metop-SG

MWI objectives

- Precipitation and clouds
- Imagery and H₂O profiles
- Sea ice, surface snow

19 channels (18.7 - 183 GHz)

- Continuity wrt SSMI/S
- Addition of sounding channels
 - Improve estimation of precipitation
 - Water vapour and clouds



Cloud Liquid Column mm

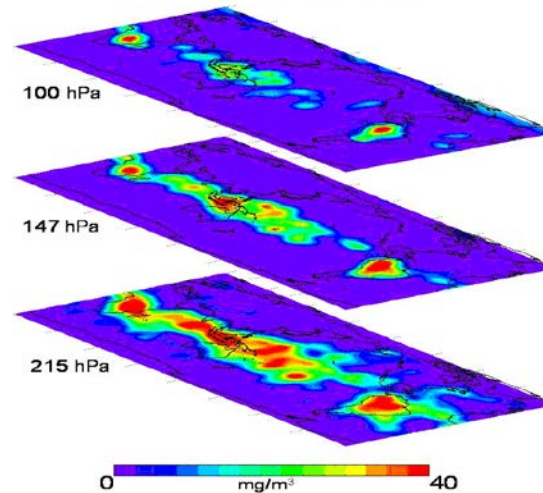
ICI objectives

- Clouds (ice phase)
- Detection of snow

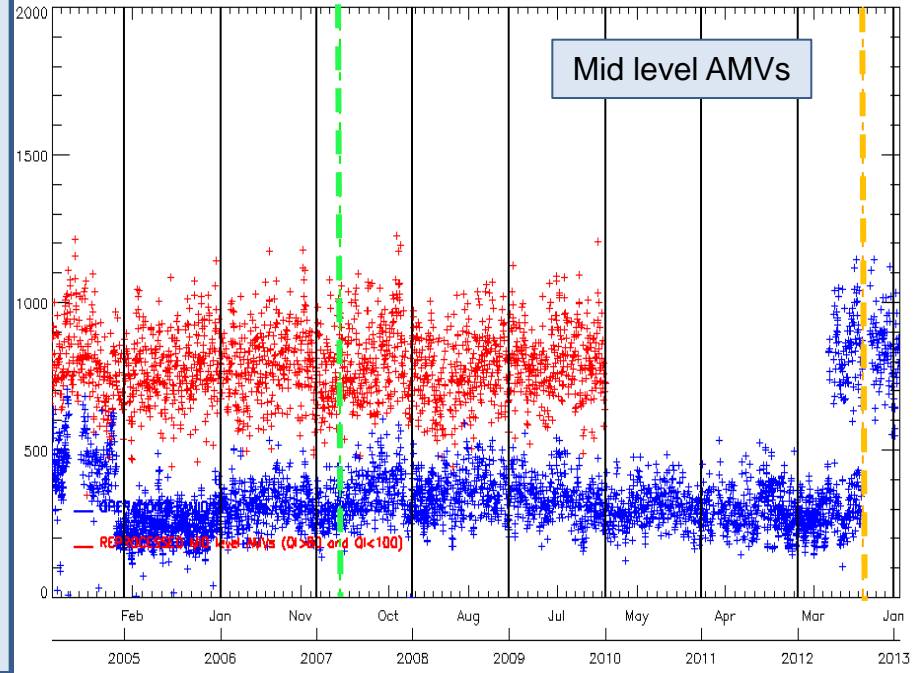
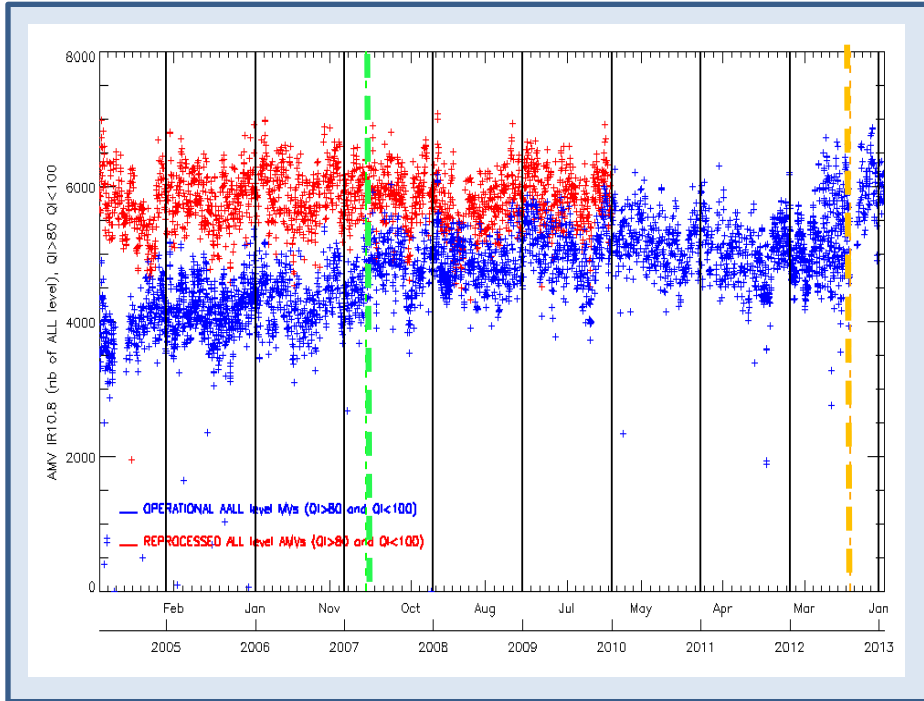
11 channels (183 – 664 GHz)

- First operational ice cloud imagery mission
- Meteorology and climate (Cirrus)

Mean Cloud Ice, December, 2004



Meteosat Climate Data Record



Number of reprocessed AMVs

Number of operationally produced AMVs