Meteosat Third Generation Products and Applications

Volker Gärtner, EUMETSAT

Courtesy of Marianne König
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EUMETSAT

Current EUMETSAT satellites

METOP A-B

(LOW-EARTH, SUN – SYNCHRONOUS ORBIT)

EUMETSAT POLAR SYSTEM/INITIAL JOINT POLAR SYSTEM

JASON-2 (shared with CNES, NOAA)

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

OCEAN SURFACE TOPOGRAPHY MISSION

METEOSAT 8-9-10 (2nd GENERATION)

(GEOSTATIONARY ORBIT)

TWO-SATELLITE SYSTEM:

- METEOSAT-10: FULL DISK IMAGERY MISSION AT 0° (15 MN)
- METEOSAT- 8: BACK UP AT 3.5°E
- METEOSAT-9: RAPID SCAN SERVICE OVER EUROPE AT 9.5°E (5 MN)

METEOSAT – 7 (1st GENERATION)

(GEOSTATIONARY ORBIT)

INDIAN OCEAN DATA COVERAGE MISSION AT 57°5 E

(UNTILL END 2016)

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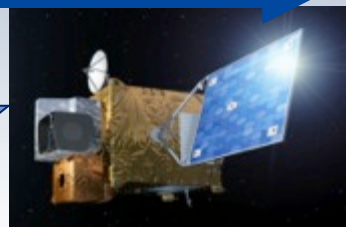
MTG to Secure Continuity and Evolution of EUMETSAT Services

1977 — 2002 — 2019 and 2021

MOP/MTP

MSG



MTG-I and MTG-S

Observation mission:
MVIRI: 3 channels
Spinning satellite
Class 800 kg

Observation missions:
SEVIRI: 12 channels
GERB
Spinning satellite
Class 2 tons

Observation missions:
Flex.Comb. Imager: 16 channels
Infra-Red Sounder
Lightning Imager
UVN
3-axis stabilised satellites
Twin Sat configuration
Class 3.6 – 3.7 tons

Implementation of the EUMETSAT Mandate for the Geostationary Programme

Atmospheric Chemistry Mission (UVN-S4): via Copernicus Sentinel 4

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MTG System Concept

MTG Space Segment Configuration

- Twin Satellite Concept, based on 3-axis platforms
  - Imaging Satellites (MTG-I)
  - Sounding Satellites (MTG-S)
- The payload complement of the MTG-I satellite consists of
  - The Flexible Combined Imager (FCI)
  - The Lightning Imager (LI)
  - The Data Collection System (DCS) and Search and Rescue (GEOSAR)
- The payload complement of the MTG-S satellite consists of
  - The Infrared Sounder (IRS)
  - The Ultra-violet, Visible and Near Infrared Sounder (UVN)

UVN is provided as Copernicus Sentinel 4 Instrument

MTG Space Segment – Twin Satellite Concept

MTG-I; 4 satellites

MTG-S; 2 satellites

ThalesAlenia Space
A Thales / Finmeccanica Company

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Operational services call for long term commitments..

MTG in Orbit Deployment Scenario

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

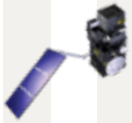
Mandatory Programmes

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
JASON CONTINUITY OF SERVICE (JASON-CS)

Optional and Third Party Programmes



COPERNICUS
SENTINEL-3
SENTINEL-4 ON MTG-S
SENTINEL-5 ON EPS-SG

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

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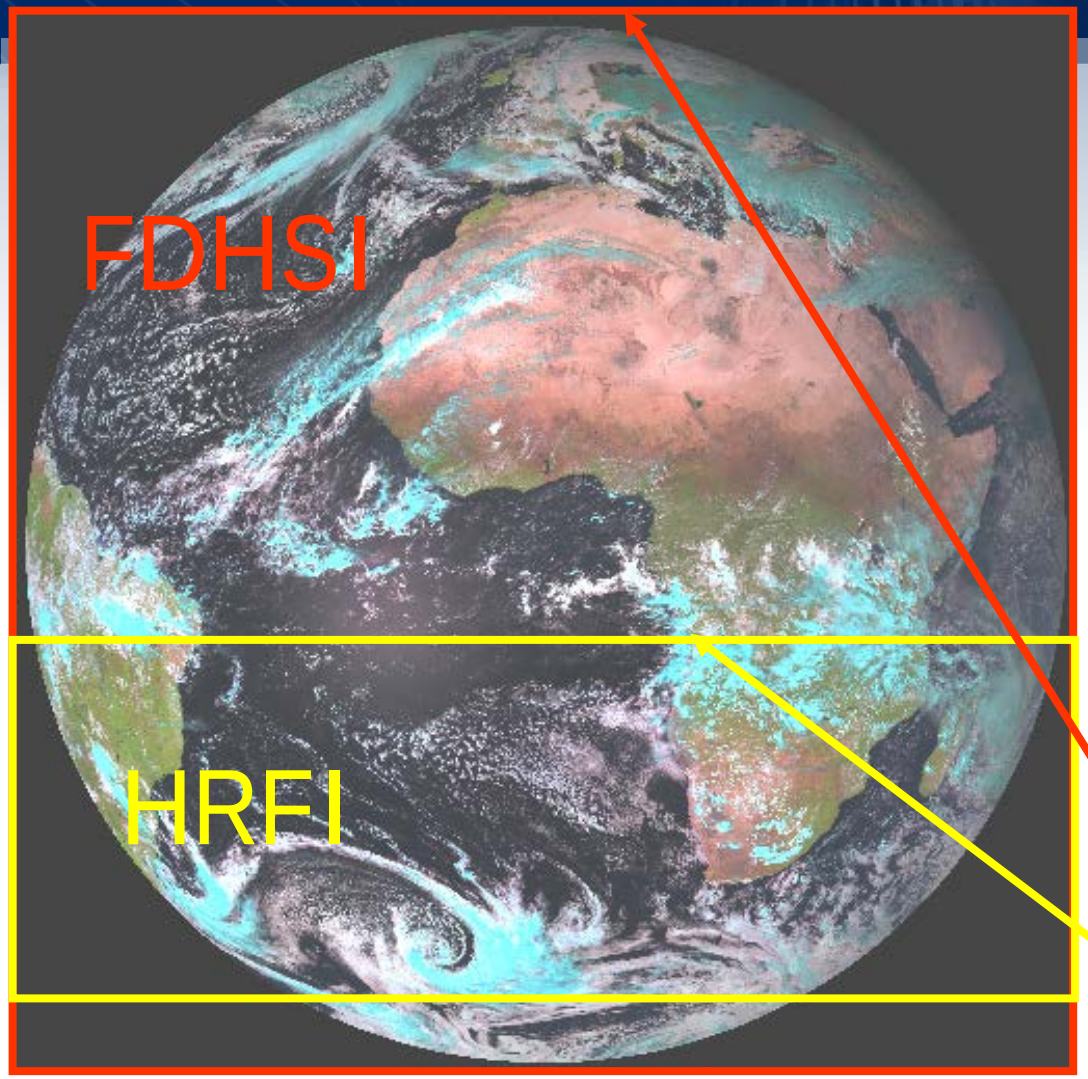
From SEVIRI to the FC Imager



MTG FCI outbids MSG SEVIRI observations on cloud, aerosol, moisture and fire:

- by adding new channels
- by improving temporal-, spatial-, and radiometric resolution

	Coverage	Repeat cycle
FDHSI mission	18°x18°	10 min
HRFI mission	1/4 FD	2.5 min

Full disc high spectral resolution imagery

High spatial resolution fast imagery

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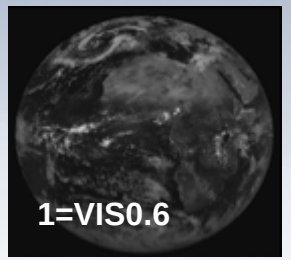
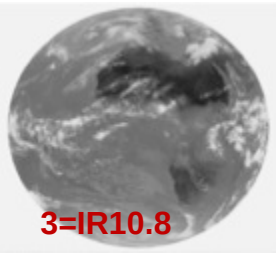
From MVIRI through SEVIRI to FCI on MTG

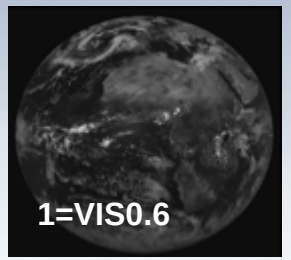


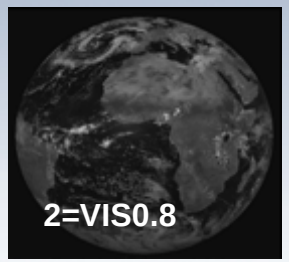
12=HRV

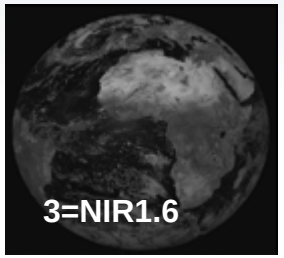


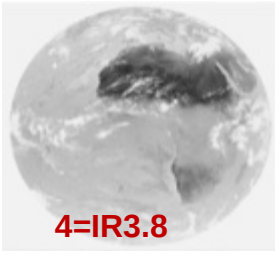
EUMETSAT

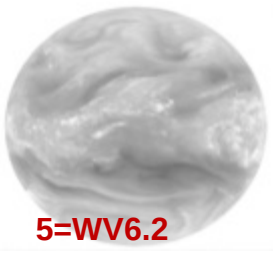
From MVIRI through SEVIRI to FCI on MTG

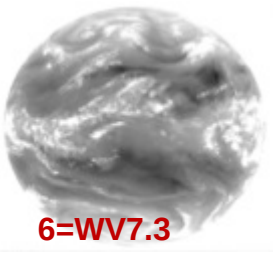


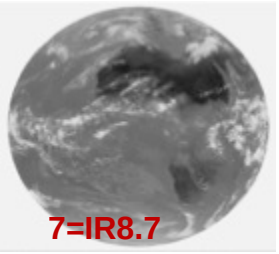


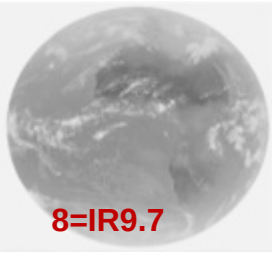


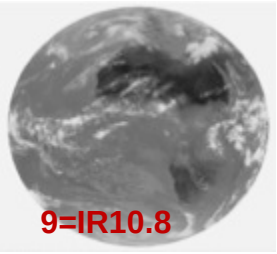


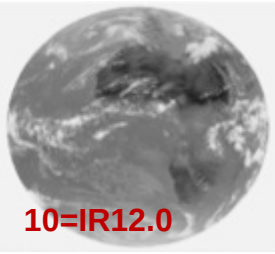


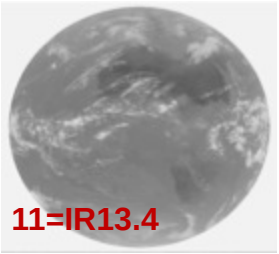












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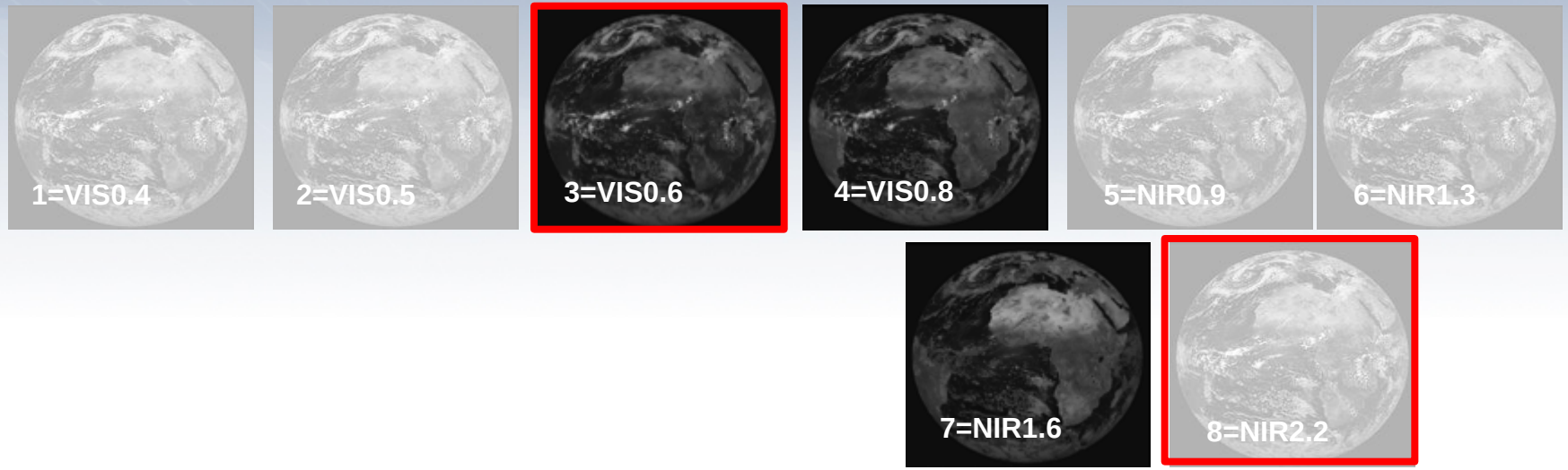
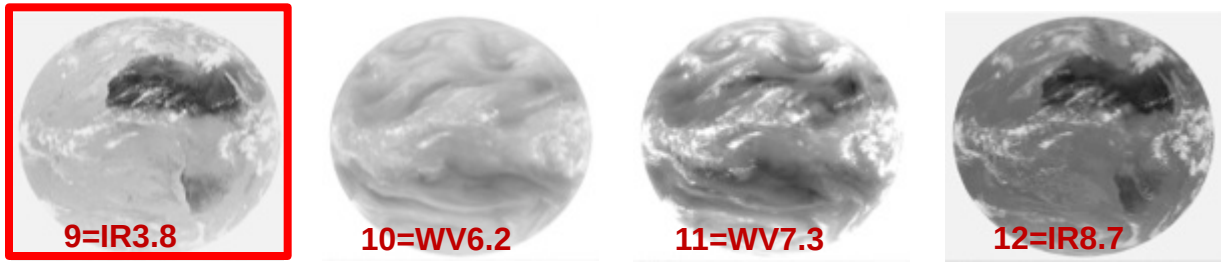
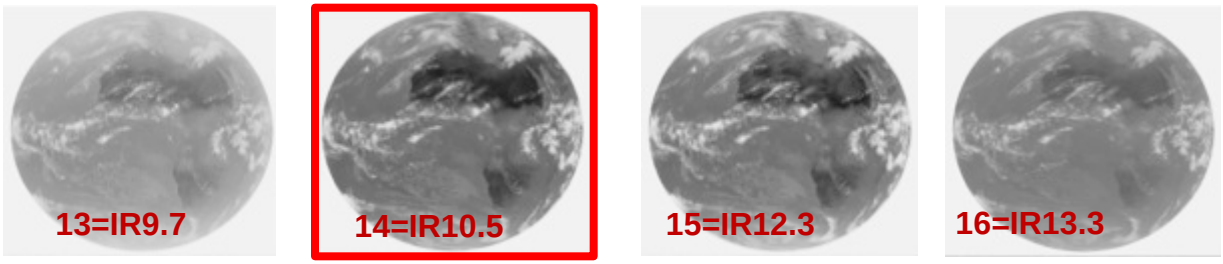
From MVIRI through SEVIRI to FCI on MTG







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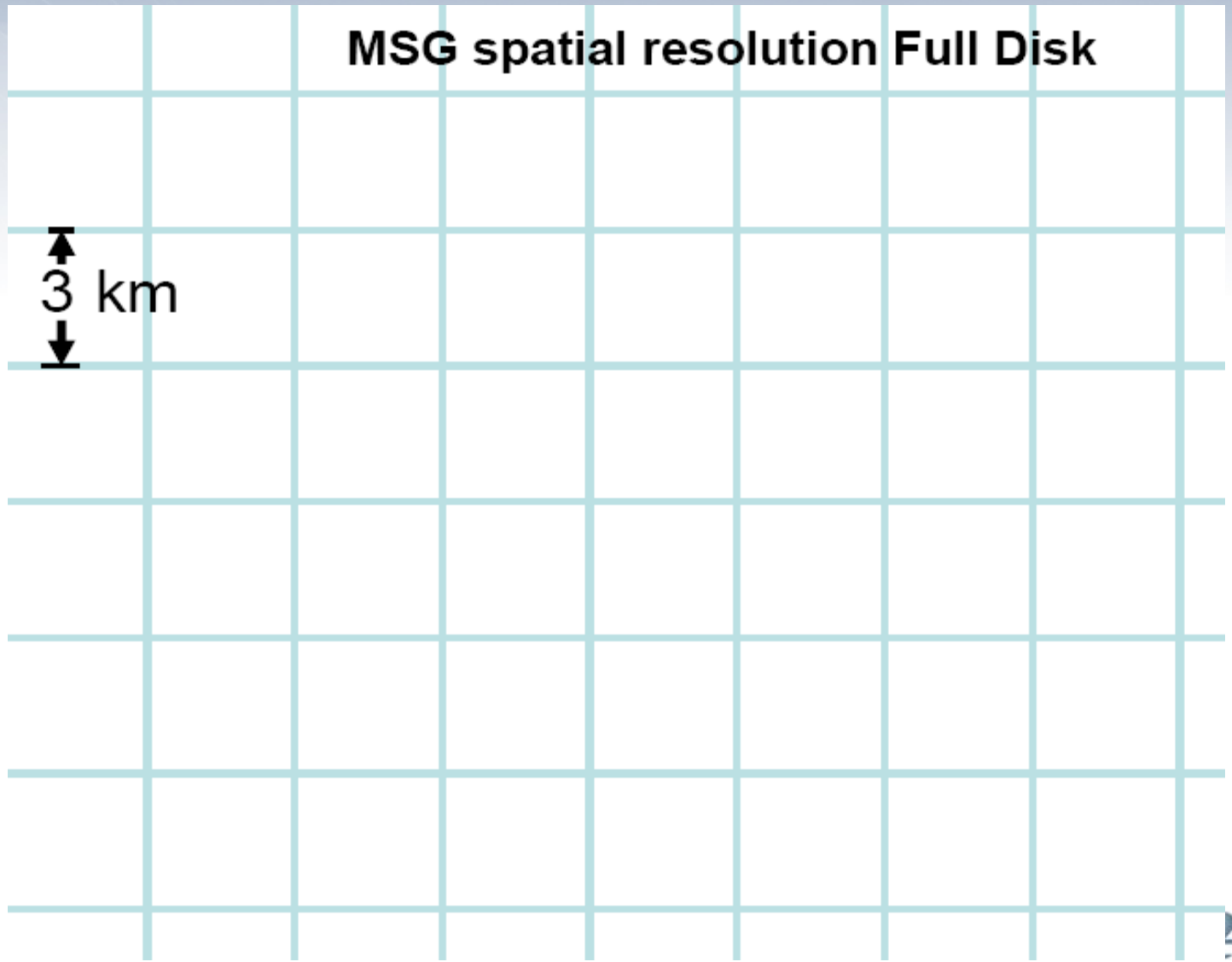
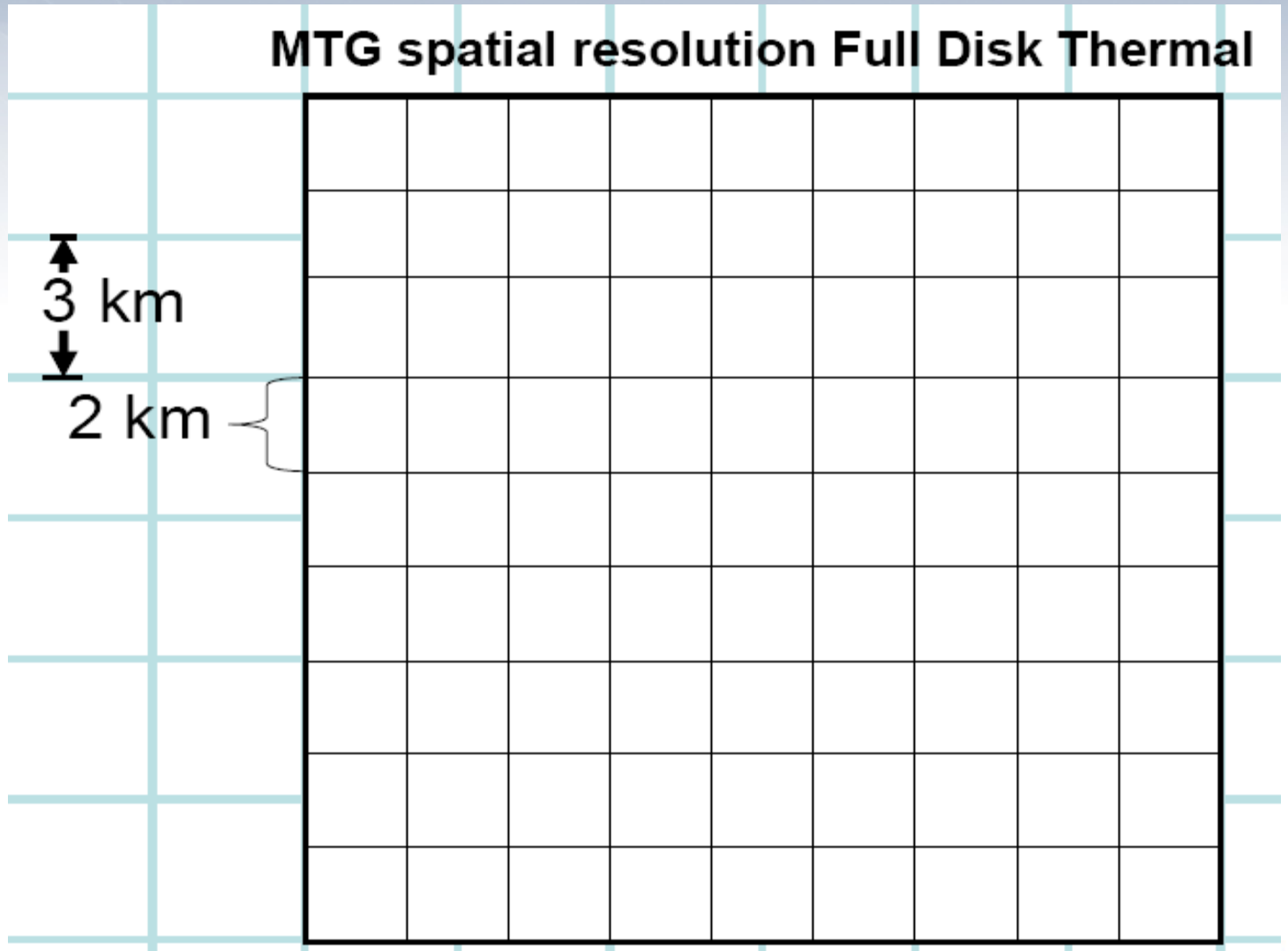
Sampling Distance Issues



Sampling Distance Issues



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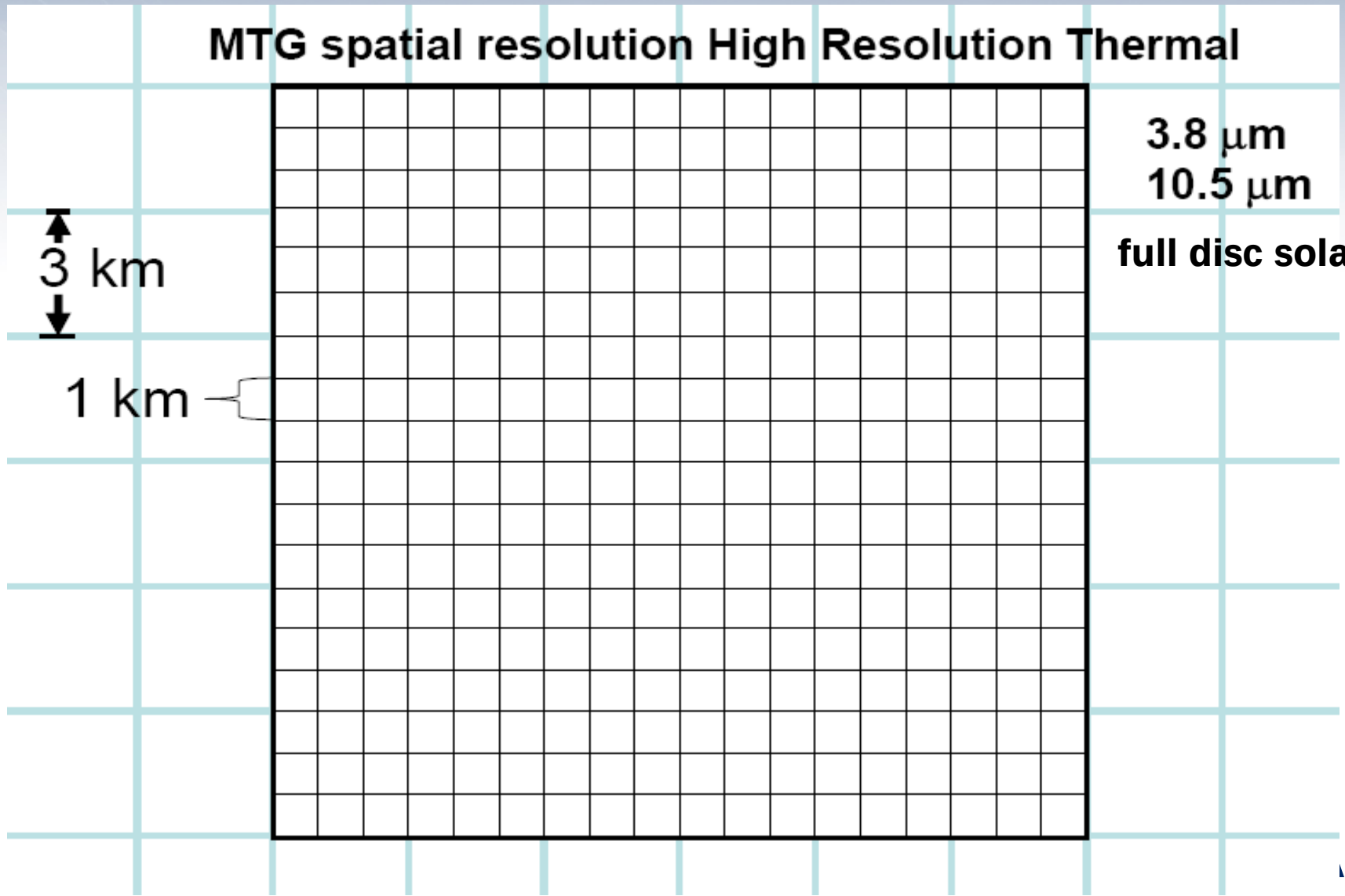

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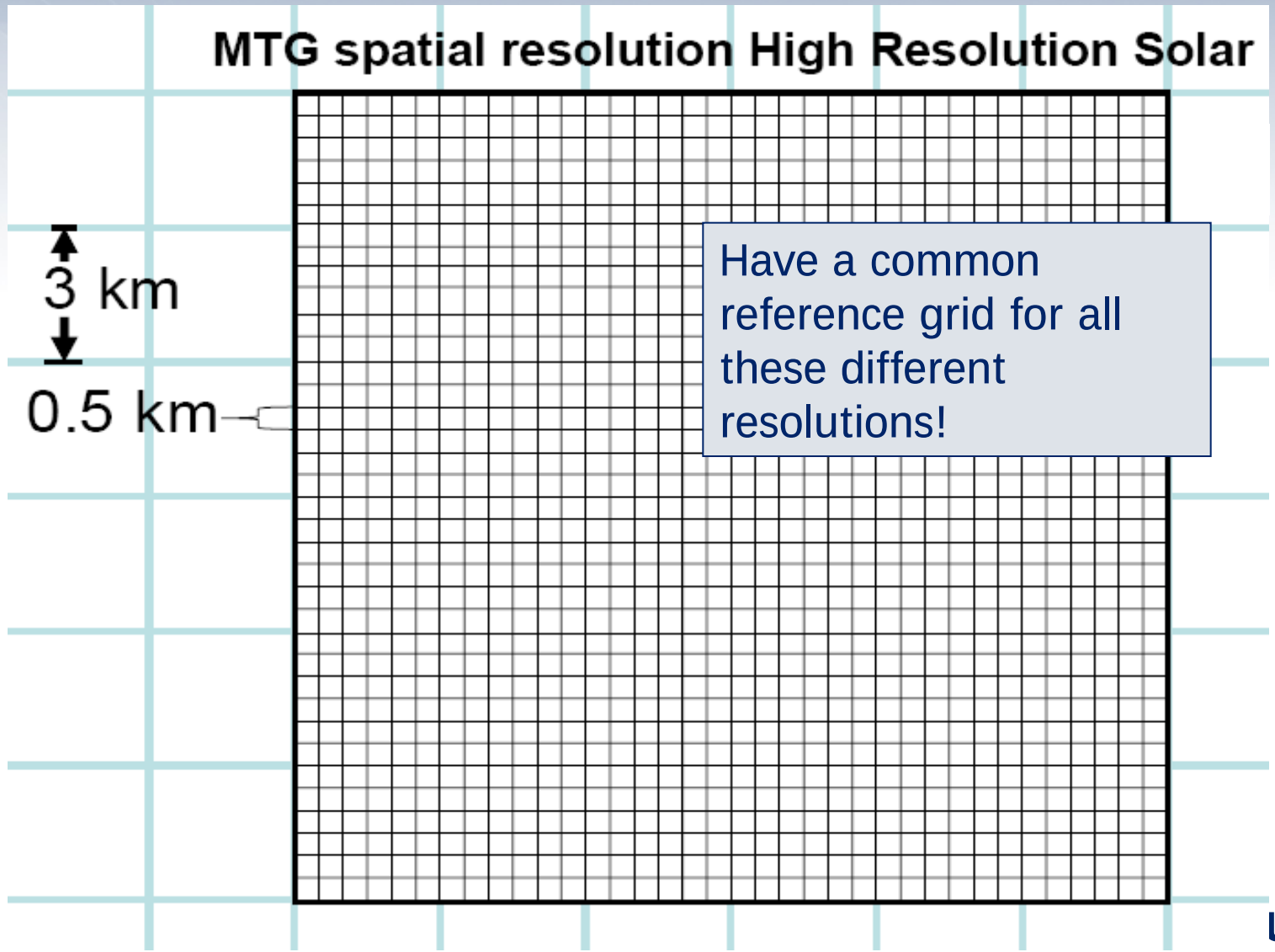


Background - Summary

MSG:

Instrument of good spectral coverage, good spatial and temporal resolution

MTG:

Better spectral coverage, esp. shortwave VIS and near-infrared

Better spatial resolution

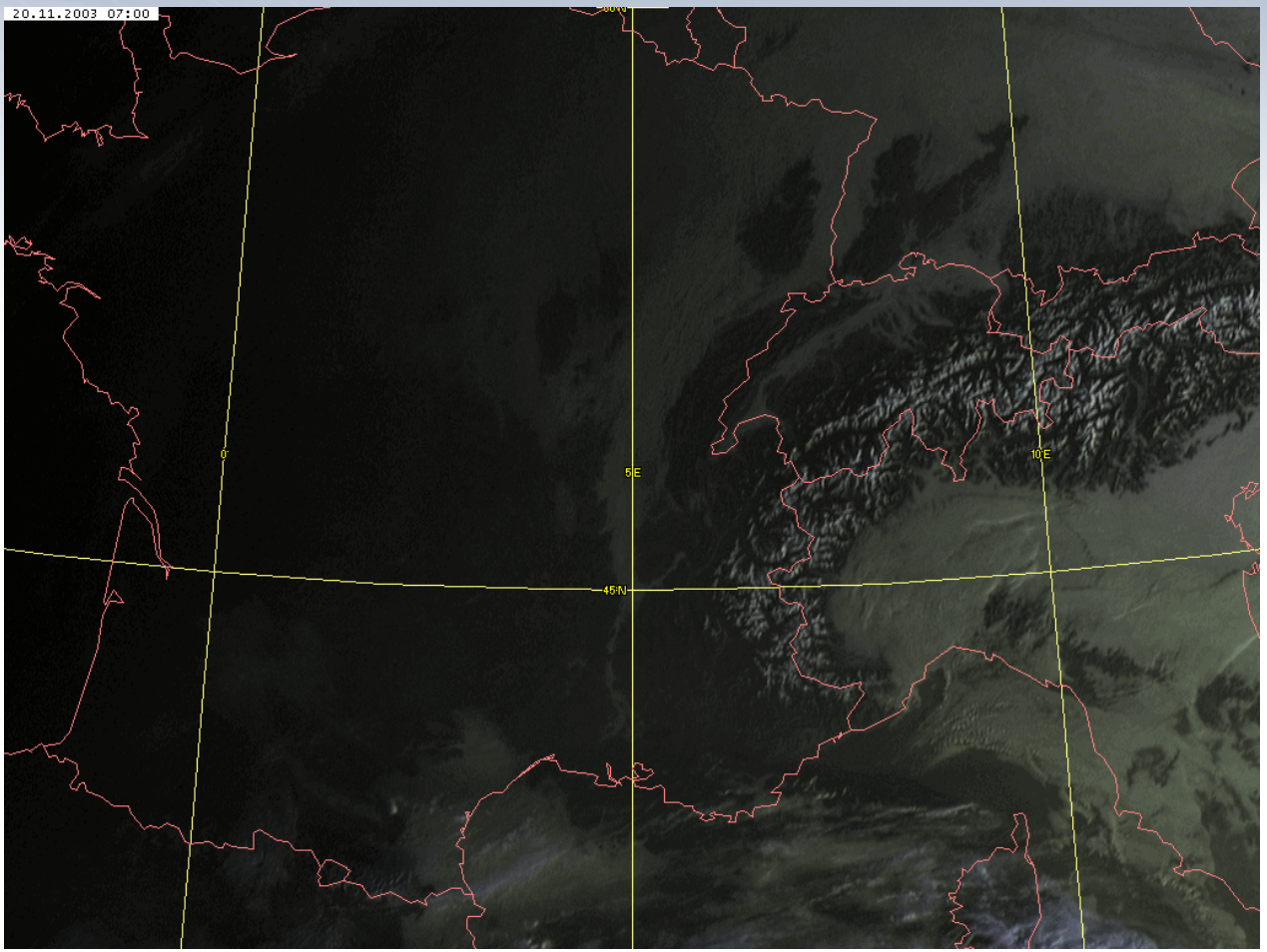
Better time resolution

MSG Products and Applications Today

Wealth of RGB applications supporting nowcasting:

- Fog
- Airmass
- Dust / ash
- Cloud microphysics / convection

Fog RGB (animated)



Application:

Nowcasting formation / dissipation of fog

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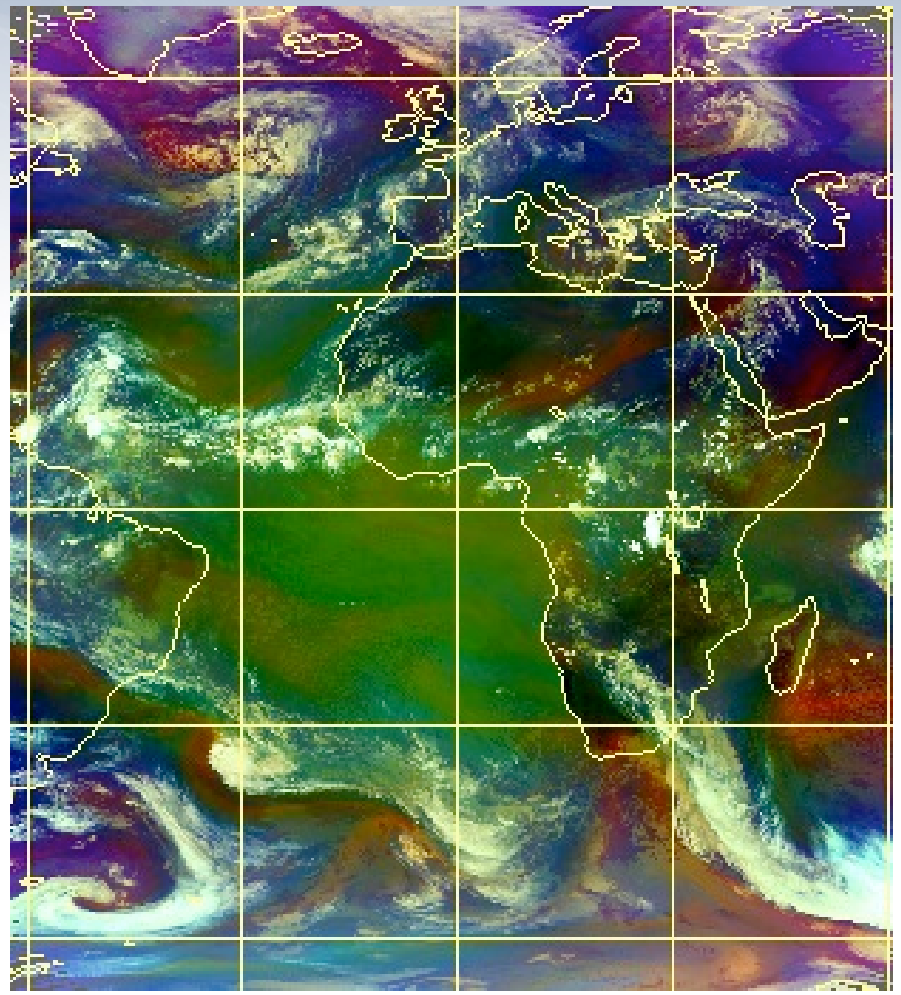
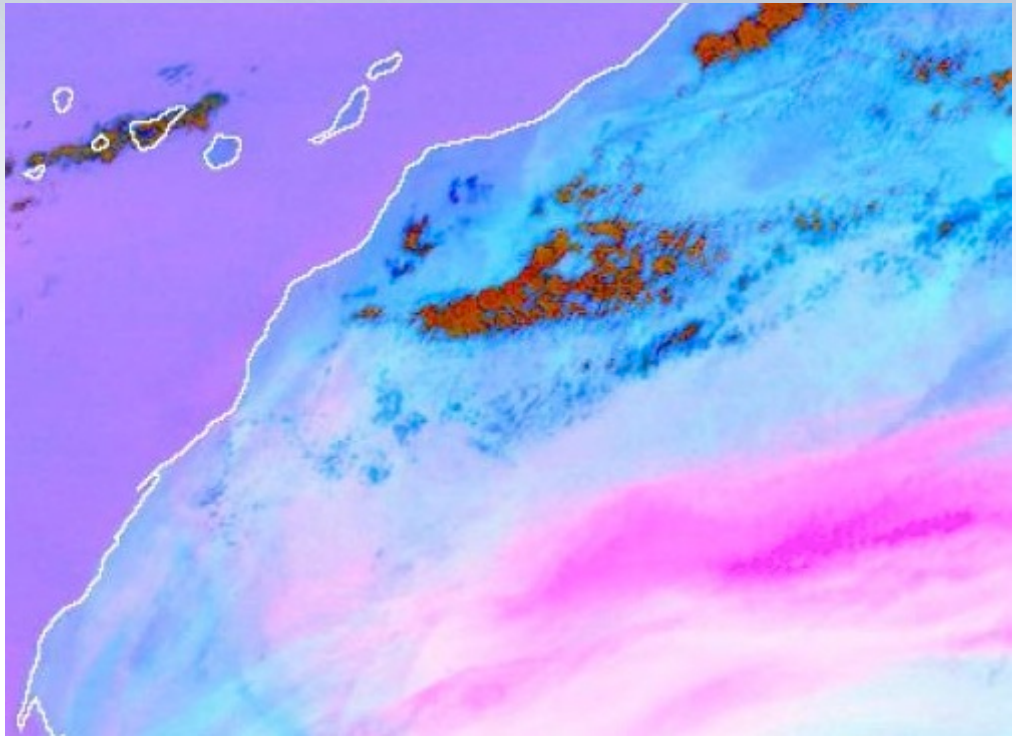
Airmass RGB

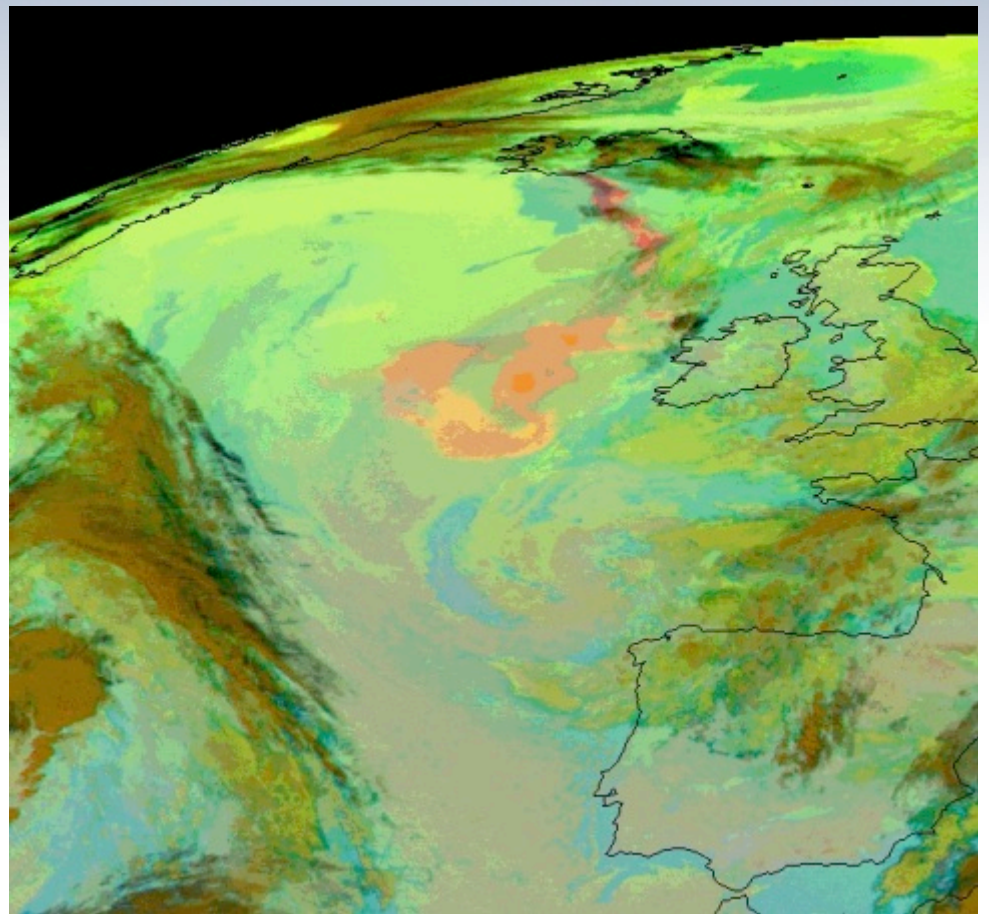


Application:

Temporal evolution and motion of midlatitude frontal systems; comparison to model forecasts

Dust / Ash RGB

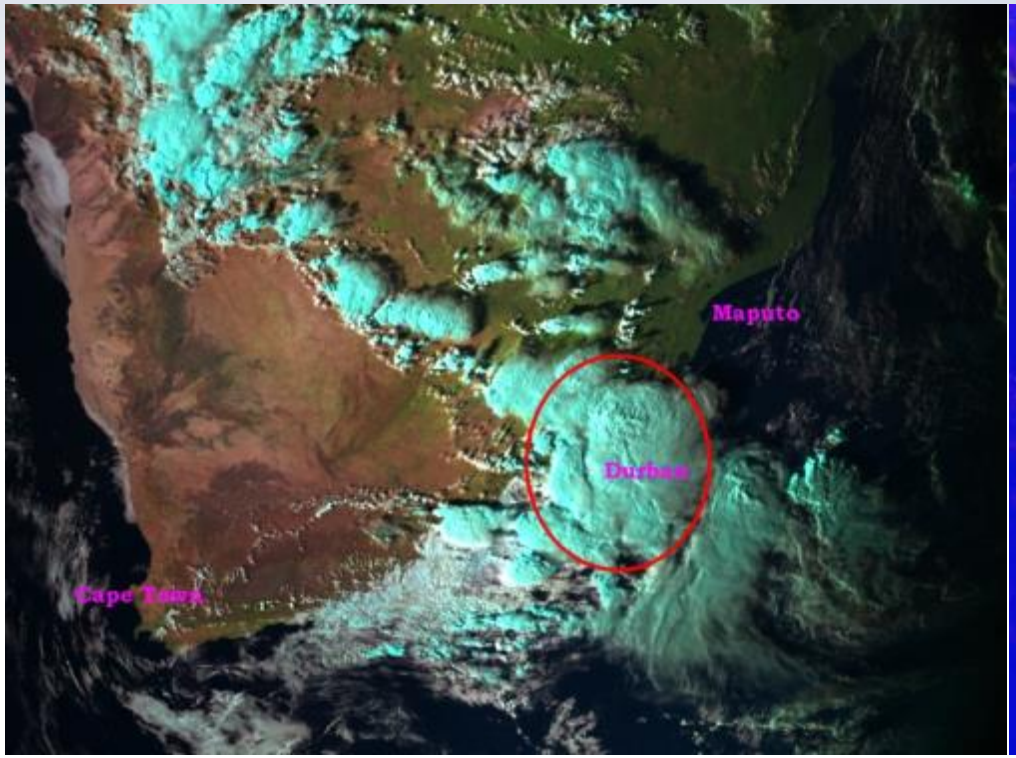


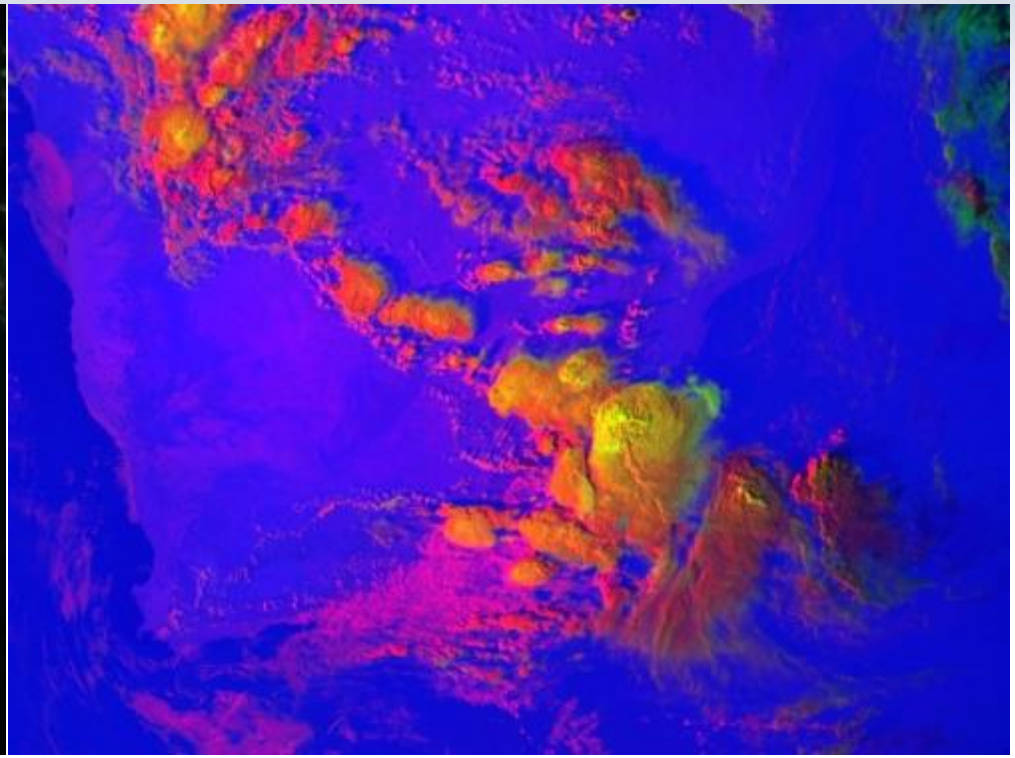


Applications:

Visibility issues
Ash warnings

Cloud Microphysics – e.g. Convection





Application:

Nowcasting most severe part of convective storms
(aviation, weather on the ground)

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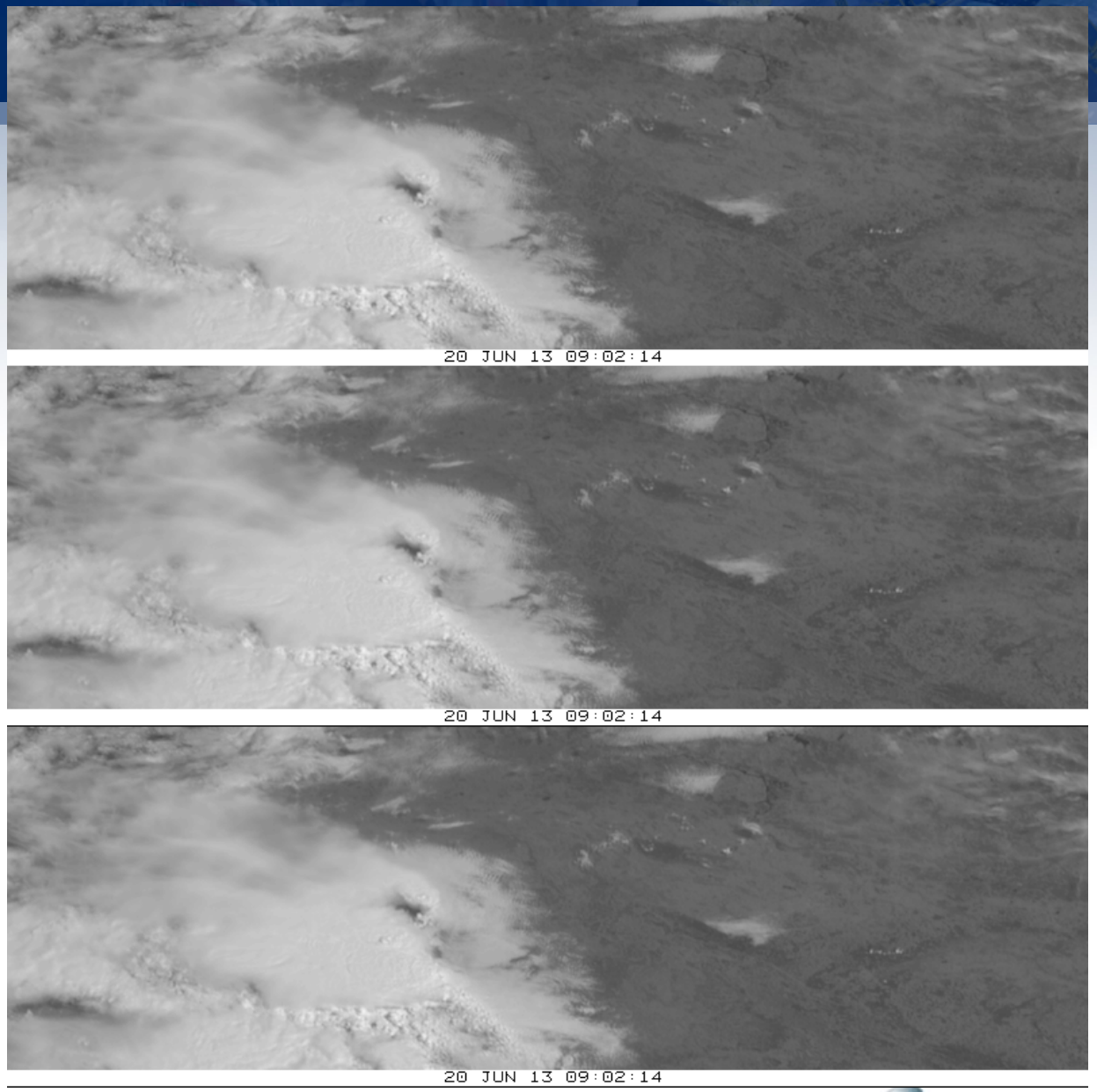
Derived Products in Support to NWP, Nowcasting, Climate

- Atmospheric Motion Vectors
- Quantitative Cloud Information (height, evolution, ...)
- Atmospheric Instability
- Land Surface Information
  (temperature, vegetation, albedo, fires, ...)

2.5 min Scans



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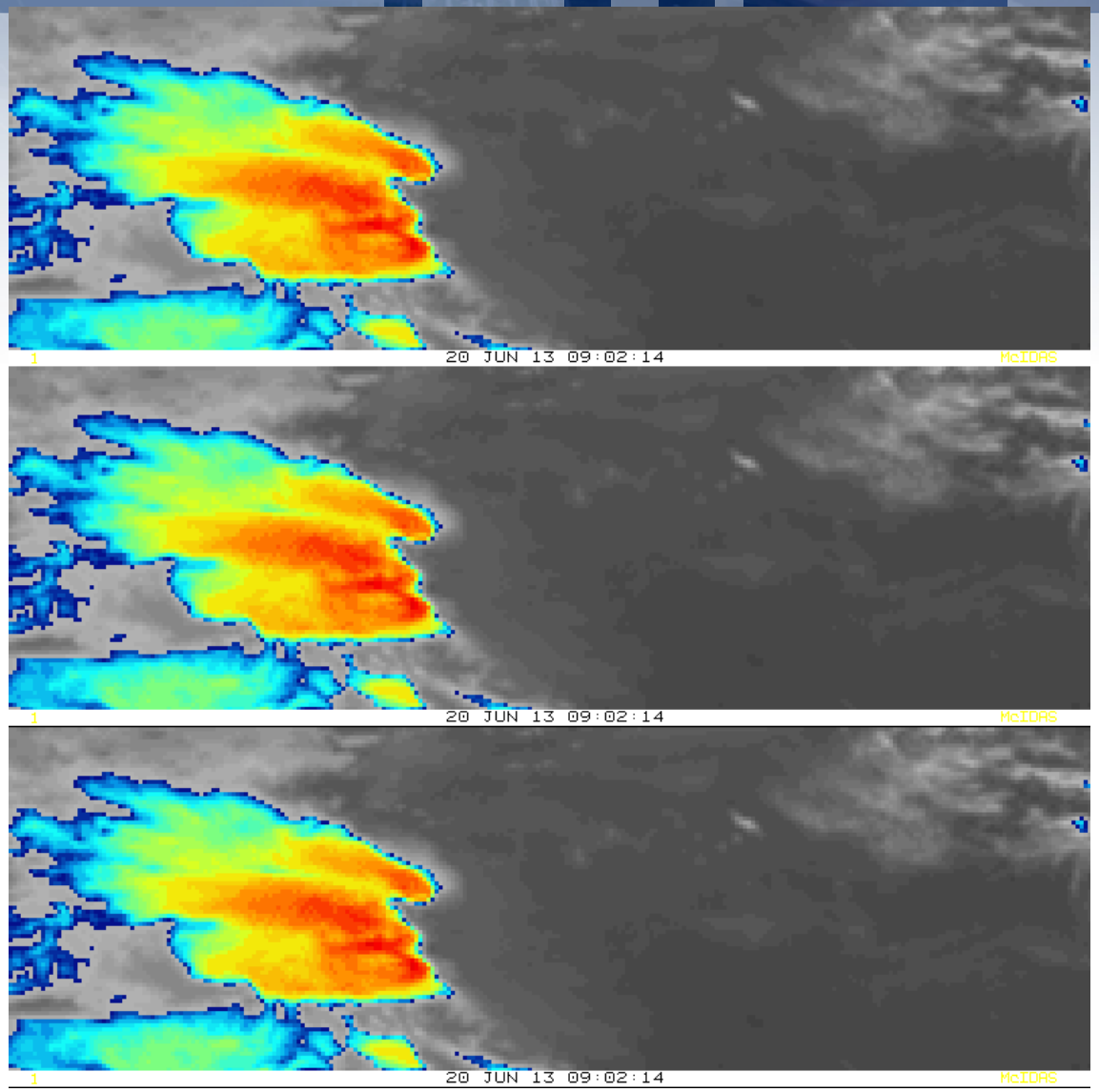
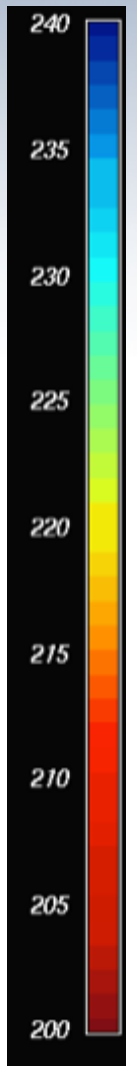
Time Resolution - IR





Temperature (K)

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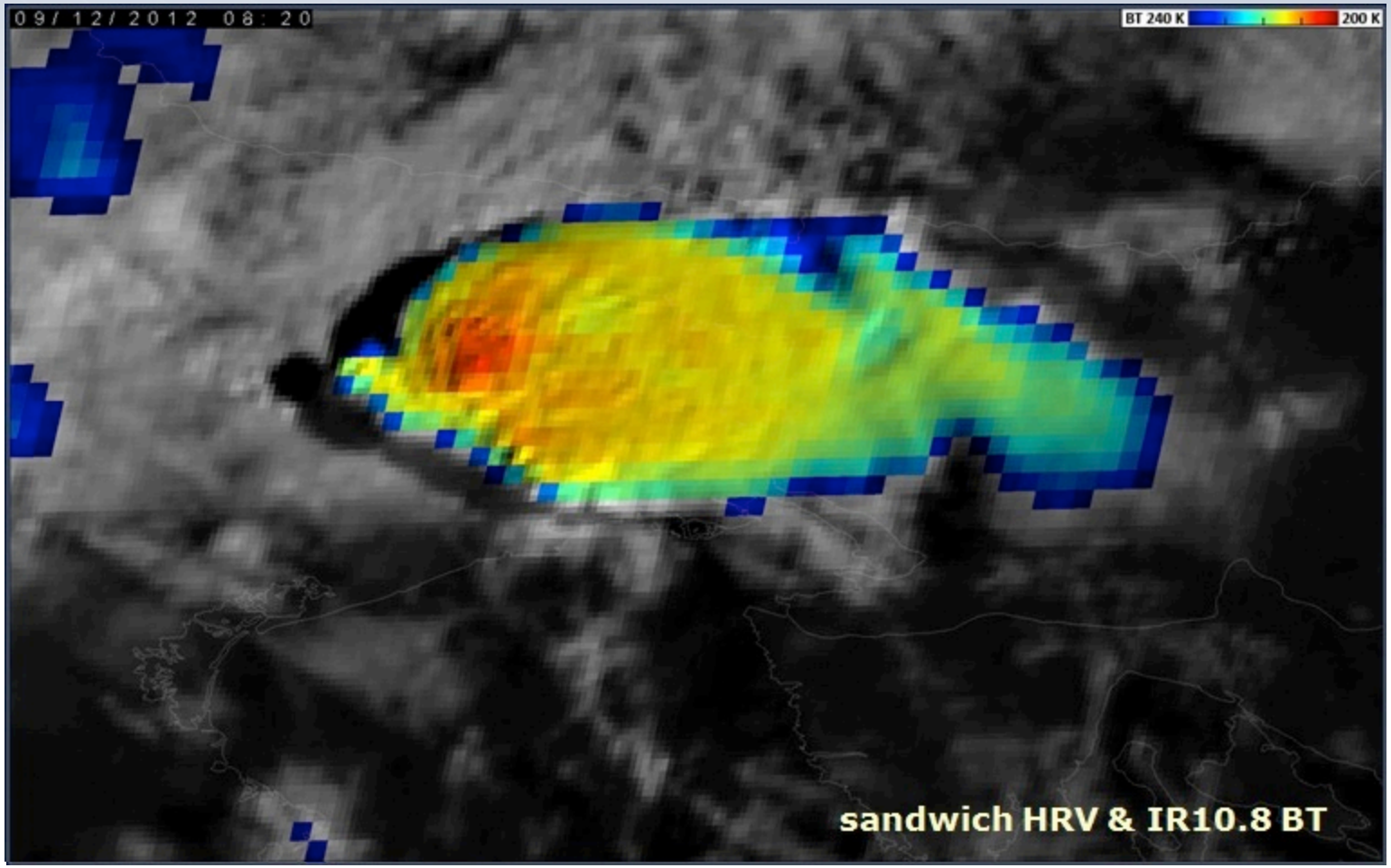
Spatial Resolution: Channel Overlays



MTG Application:

Also useful because of channel resolution differences

Courtesy M. Setvak, Czech Hydrometeorological Service

BT 240 K 200 K

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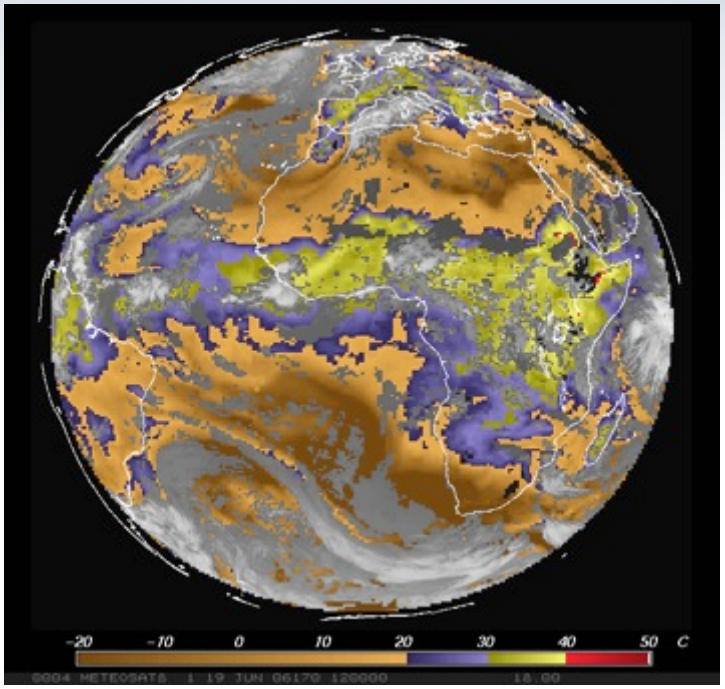
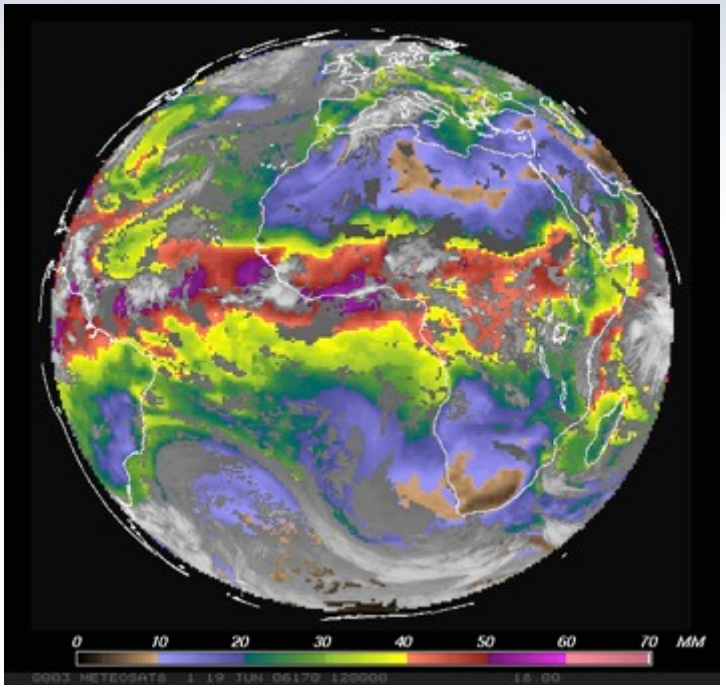
Product Using all IR Channels: Instability



K-Index



Total Precipitable Water

Physical retrieval of atmospheric profiles using 7 MSG IR channels:

Products are Instability Indices and Total Precipitable Water

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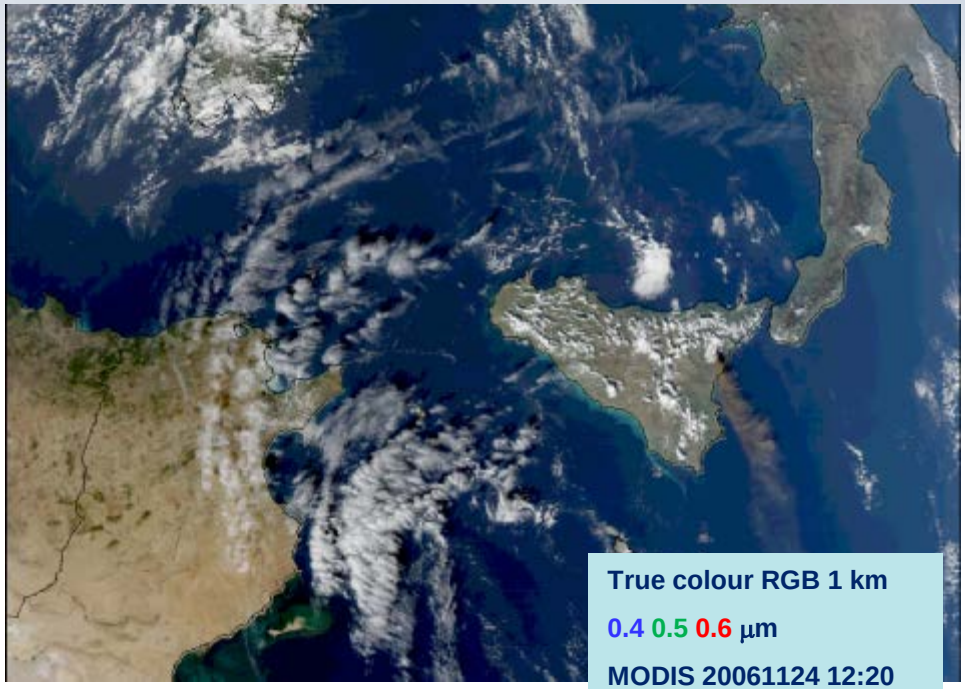
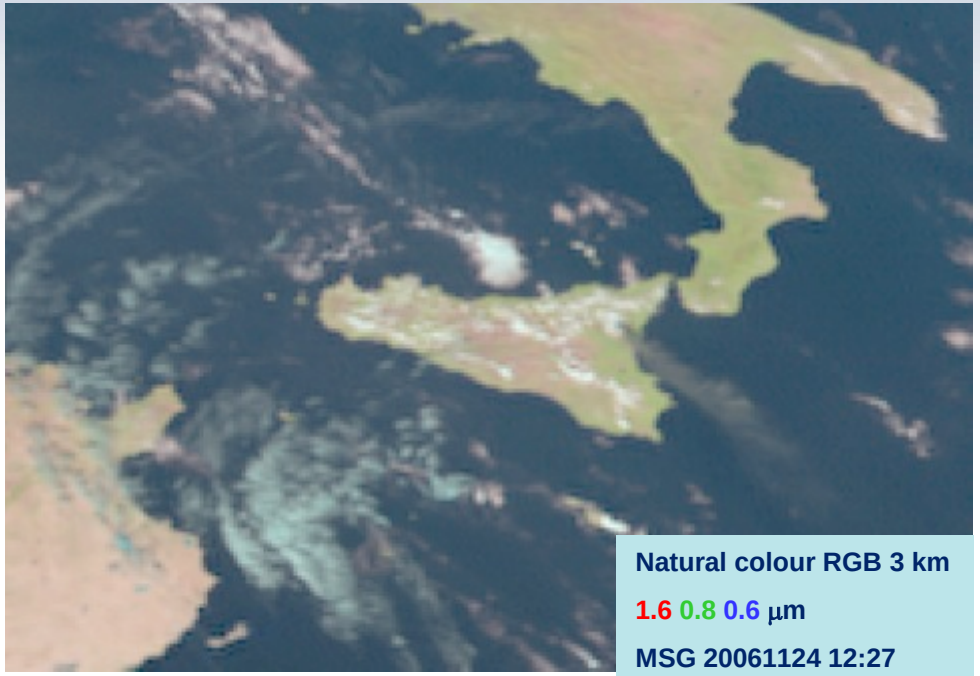
Spectral Resolution: “True Colour” RGB Possible



True colour RGB 1 km

0.4 0.5 0.6 µm

MODIS 20061124 12:20



Natural colour RGB 3 km

1.6 0.8 0.6 µm

MSG 20061124 12:27

A true “True Colour” image can be produced with VIS06/VIS0.5/VIS0.4 – this is really RGB

“True Colour” from the MSG perspective – acceptable for vegetation, less for dust/smoke

Application:

Weather forecasts for public
Quicklooks for forecasters

courtesy D. Rosenfeld, Univ. Jerusalem

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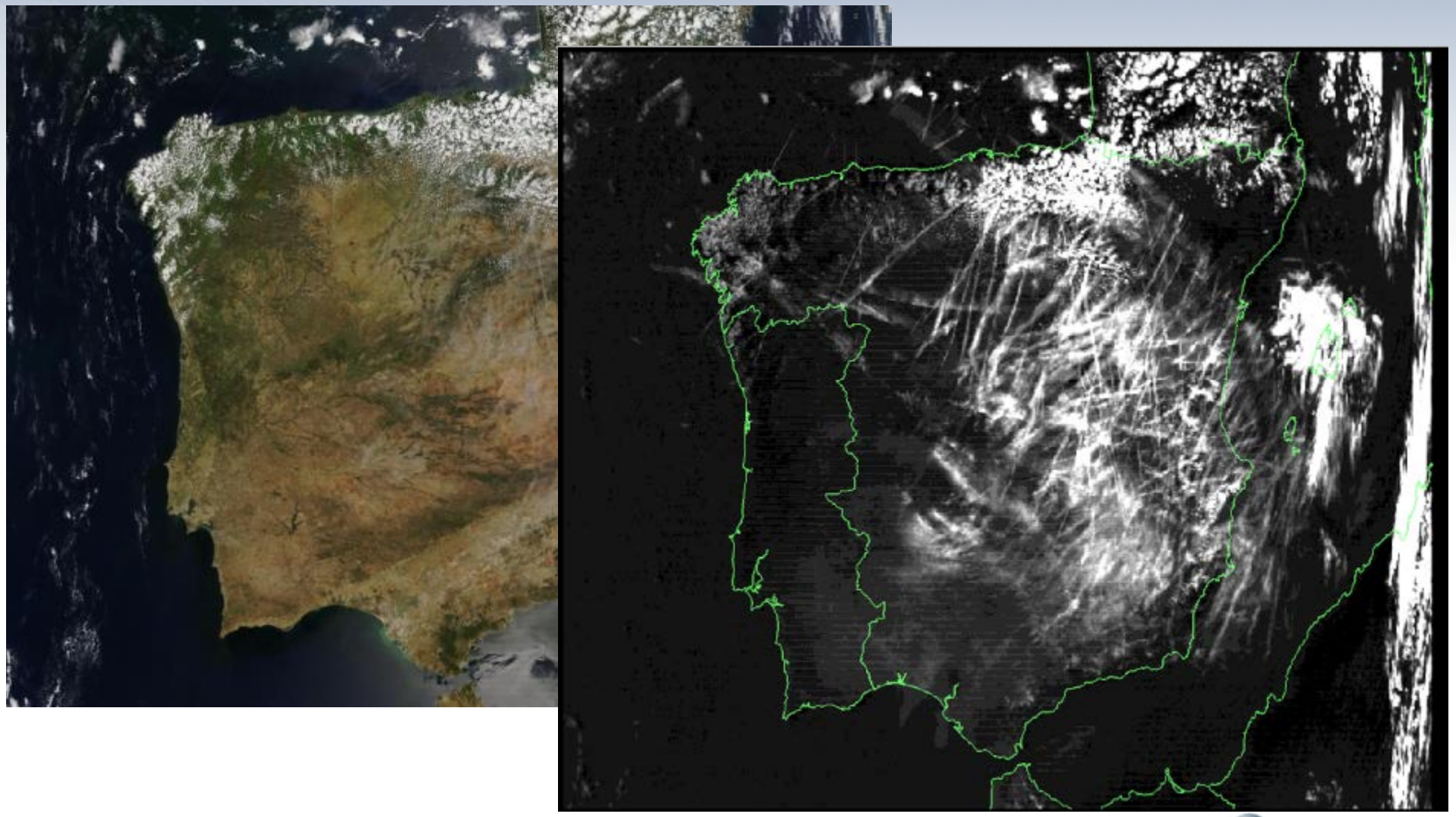
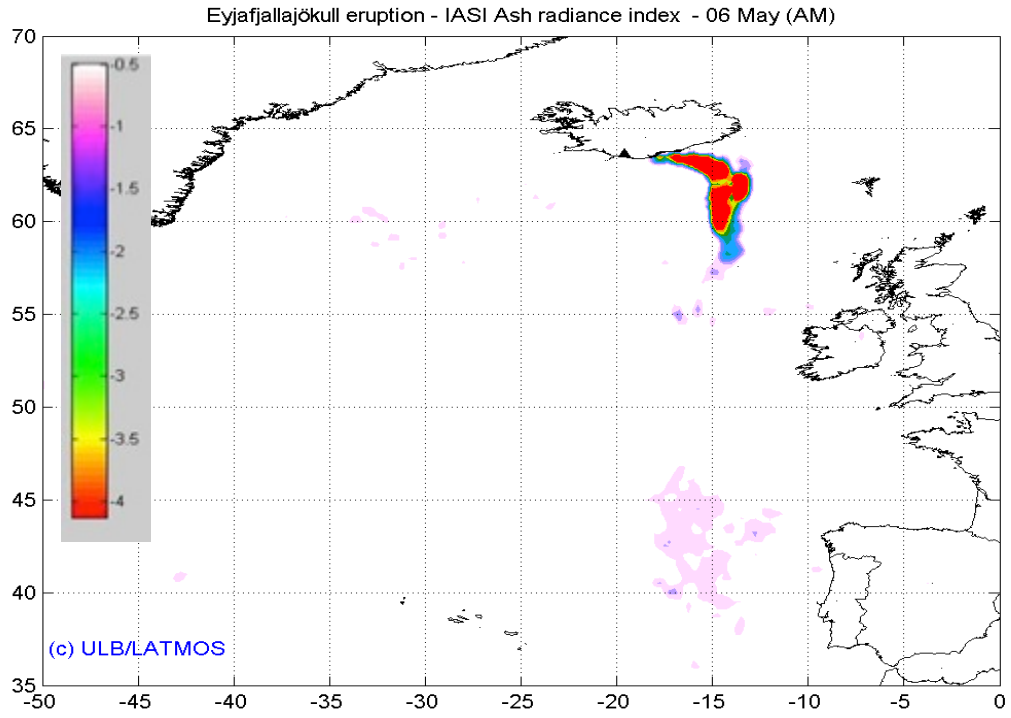
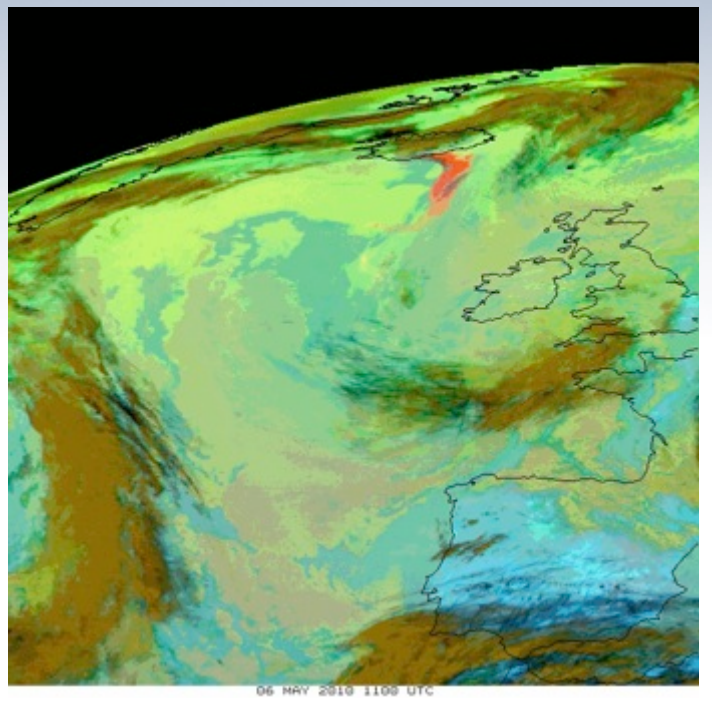
NIR1.3: Another Example



courtesy D. Rosenfeld, Univ. Jerusalem

IRS Application: Volcanic Ash





Qualitative Volcanic Ash RGB - MSG

Aerosol absorbing index derived from IASI overpasses:

Higher index – larger particles

Courtesy C. Clerbaux et al., LATMOS/ULB

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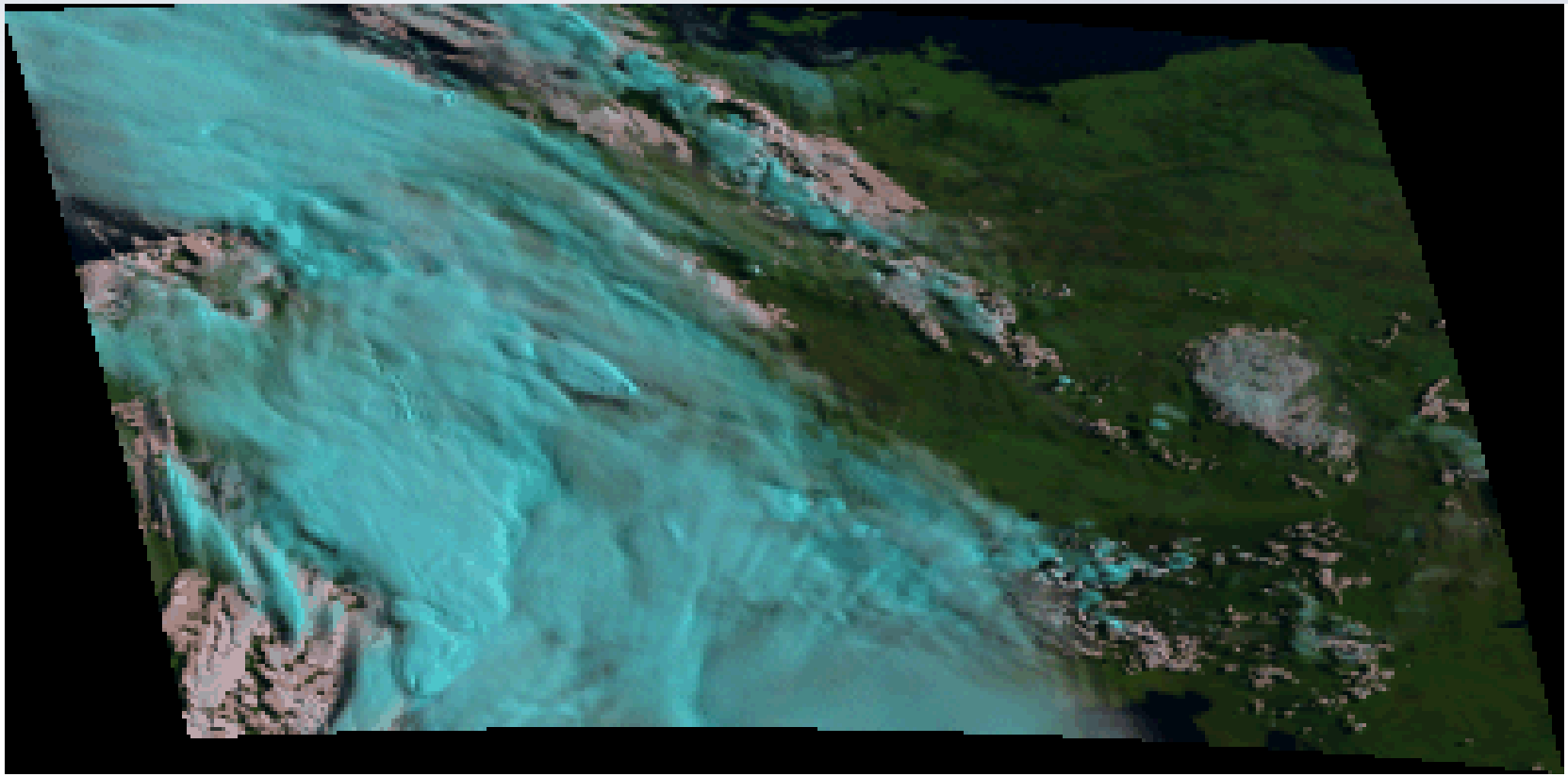
Lightning Imager

Continuous lightning observations from space:

Recording of intra-cloud and cloud-to-ground lightning

Simulations over Daylight Hours (MSG Natural Colour RGB)



MTG User Preparation Milestones

Phase I

Make available through the website all available information on the MTG satellites, services and Programme planning **On-going**

Begin interaction with selective user groups on MTG user applications and initial training events **On-going**

Interview selective NMHSs to discuss their preparation plans **Q4-2014**

Establish an internal team to work on the initial user preparation activities **Q4-2014**

Initiate discussion with SAF Managers regarding user preparation activities **Q3-2014**

Present Project Plans to EUMETSAT Delegate Bodies **Q2-2015**

MTG User Preparation Milestones

Phase II

Internal resources will be utilized according to the project breakdown and work packages **2015 onwards**

Test data to be developed, packaged according to user needs and made available **Launch -3 years**

User training material to be developed and training performed as per the agreed Training Plan **Launch -2 years**

Dedicated user information to be generated and made available through the Website / Portals / Apps **2015 onwards**

Thank you

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