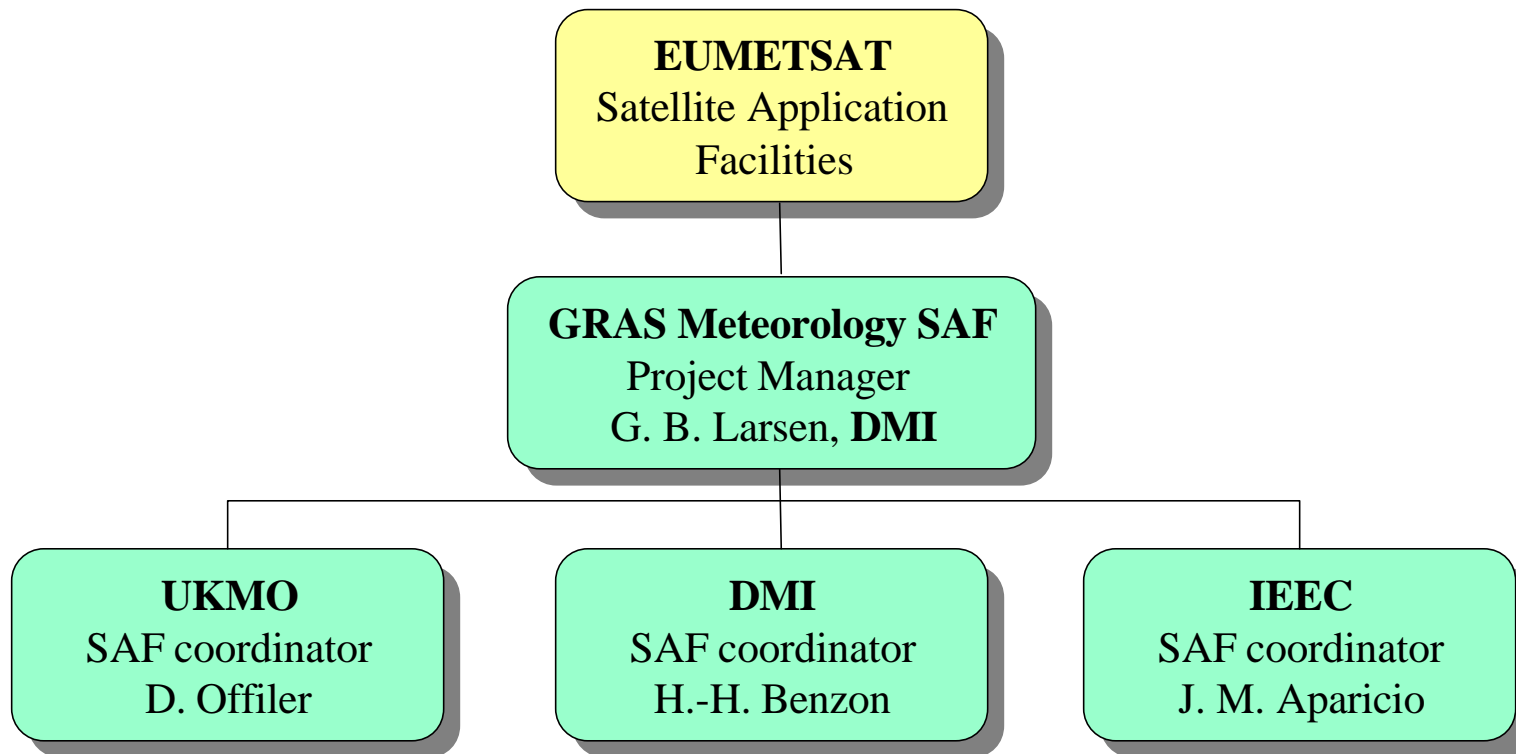
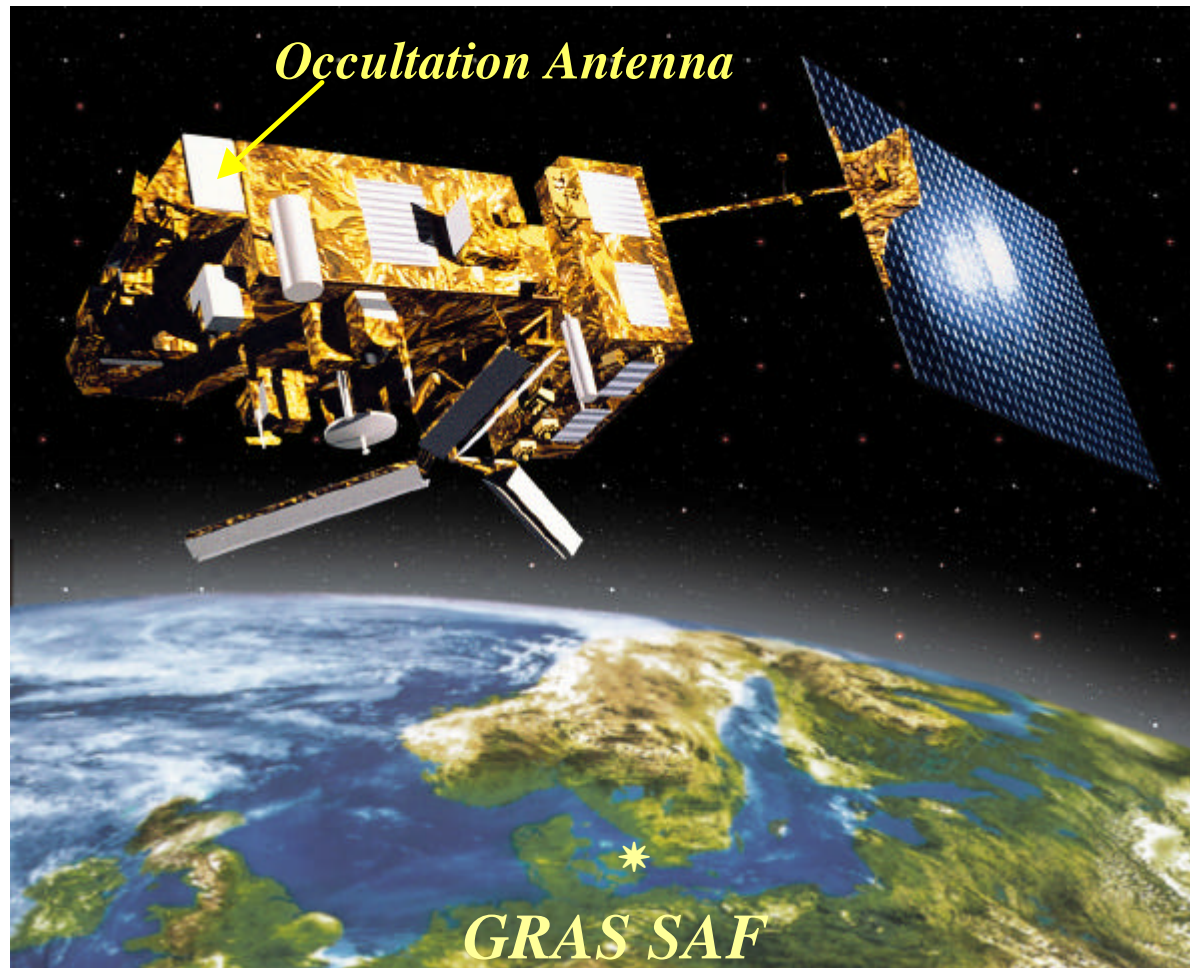


# GRAS Meteorology SAF

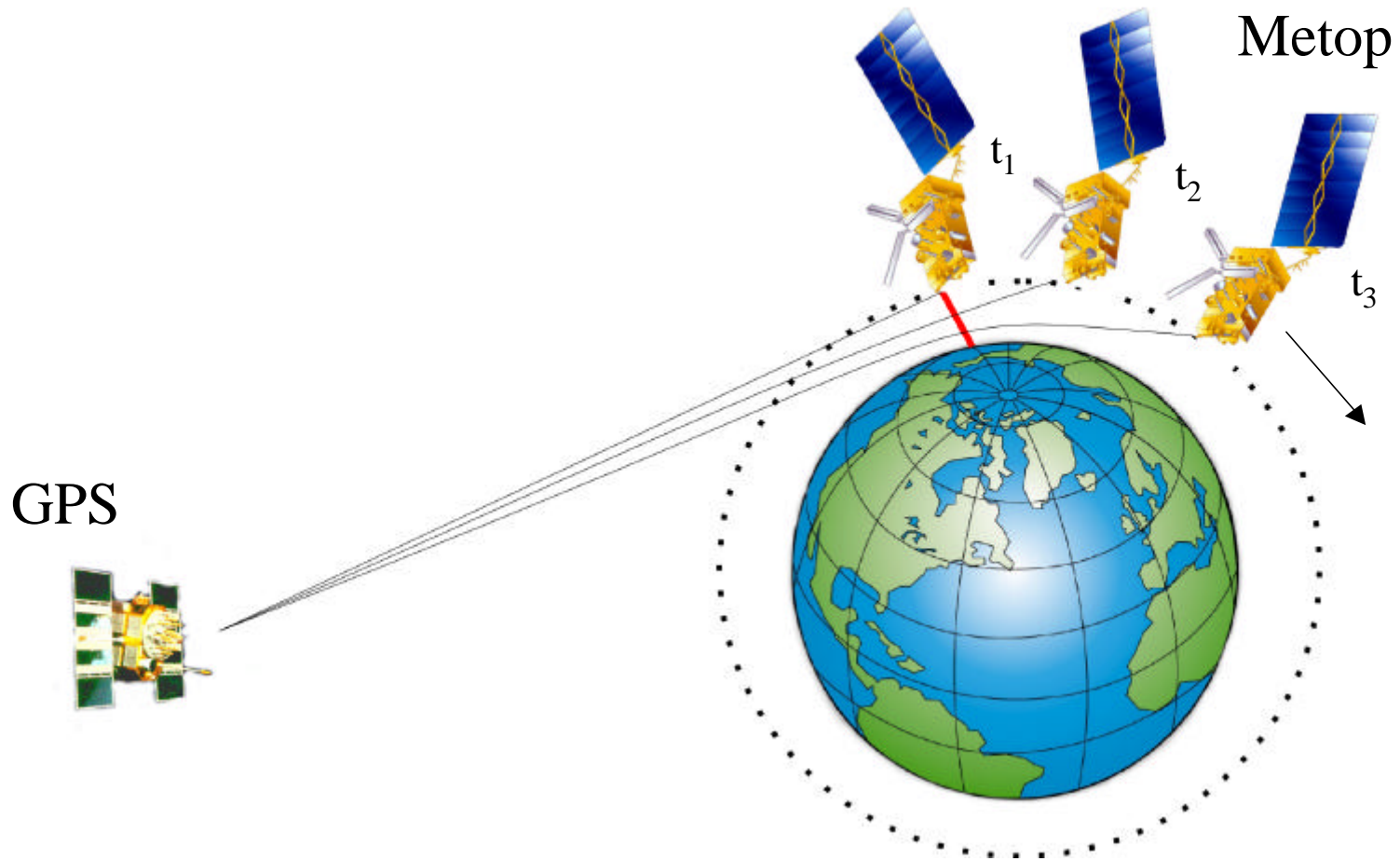


# The GRAS instrument on EPS



EUMETSAT Meteorological Satellite Data Users' Conference, Copenhagen, September 1999

# GRAS Atmosphere profiling



# GRAS SAF Data Products (A)



## A. Sounding products

- A.1 Residual phase observations for both frequencies at each time sample of the occultation
- A.2 Space and time identification of the occultation, closest impact height, and identification of the GNSS satellite involved
- A.3 Bending angle profile as function of the sounding data time sample for each frequency
- A.4 Ionosphere corrected bending angles as function of the ray impact parameter of the occultation

# GRAS SAF Data Products (B)



## B. Refractivity products

- B.1 Refractivity profile as function of height and location of the occultation
- B.2 Error profile estimates of the observables
- B.3 Time information for the occultation
- B.4 Latitude and longitude position of the occultation in geodetic coordinates

# GRAS SAF Data Products (C)



## C. Atmosphere products

- C.1 Pressure profile and error estimate profile for each occultation as function of altitude and location of the occultation
- C.2 Temperature profile and error estimate profile on the temperature for each occultation as function of altitude and location of the occultation
- C.3 Humidity profile and error estimate profile for each occultation as function of altitude and location of the occultation
- C.4 Vertical integrated water vapour estimates for each occultation based on the derived humidity profile.

# Generic User Requirements for NWP



	<b>Temperature</b>	<b>Humidity</b>
<b>Horizontal Domain</b>	Global	Global
<b>Horizontal Resolution</b>	50-100 km	50-100 km
<b>Vertical Domain</b>	surface to 1 hPa (0-50 km)	surface to 100 hPa (0-15 km)
<b>Vertical Resolution</b>	0.5-1.0 km	0.5-1.0 km
<b>Time Resolution</b>	1-6 hrs	1-6 hrs
<b>Absolute Accuracy</b>	< 1.0 K	< 10 %
<b>Timeliness</b>	2-3 hrs	2-3 hrs

**Table 3.1:** Generic User Requirements for Operational Meteorology

GRAS-SAG Report  
May 1998

# GRAS Metop User Requirements



	Temperature	Humidity	Bending Angle
<b>Horizontal Domain</b>	Global	Global	Global
<b>Horizontal Sampling<sup>(1)</sup></b>	< 1000 km	< 1000 km	< 1000 km
<b>Vertical Domain</b>	500 hPa to 10 hPa (5-30 km)	surface to 300 hPa (0-10 km)	surface to 80 km
<b>Vertical Resolution</b>	0.5-1.0 km	0.5 km	< 0.5 km or equivalent in time sampling
<b>Time Window<sup>(2)</sup></b>	< 12 hrs	< 12 hrs	< 12 hrs
<b>Absolute Accuracy</b>	< 1.0 K	< 10 % or < 0.2 g/kg <sup>(3)</sup>	< 1 $\mu$ rad or 0.4 % <sup>(3)</sup>
<b>Timeliness</b>	< 3 hrs	< 3 hrs	< 3 hrs

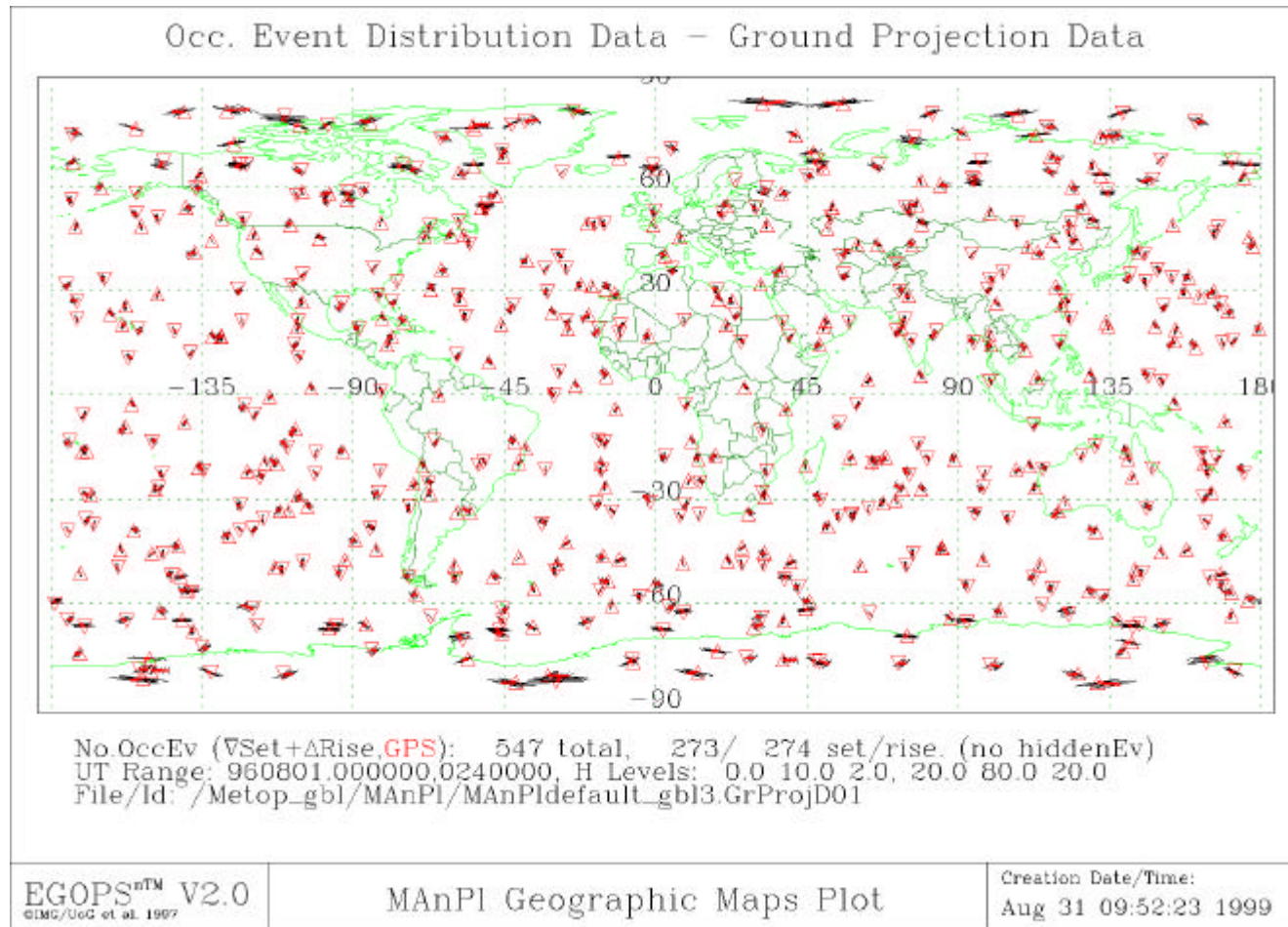
**Table 5.1:** GRAS/Metop Requirements for Operational Meteorology

- Notes:**
- (1) This should be interpreted as the mean distance of individual soundings globally over the specified time window.
  - (2) This would be the time to achieve global coverage.
  - (3) whatever is larger.

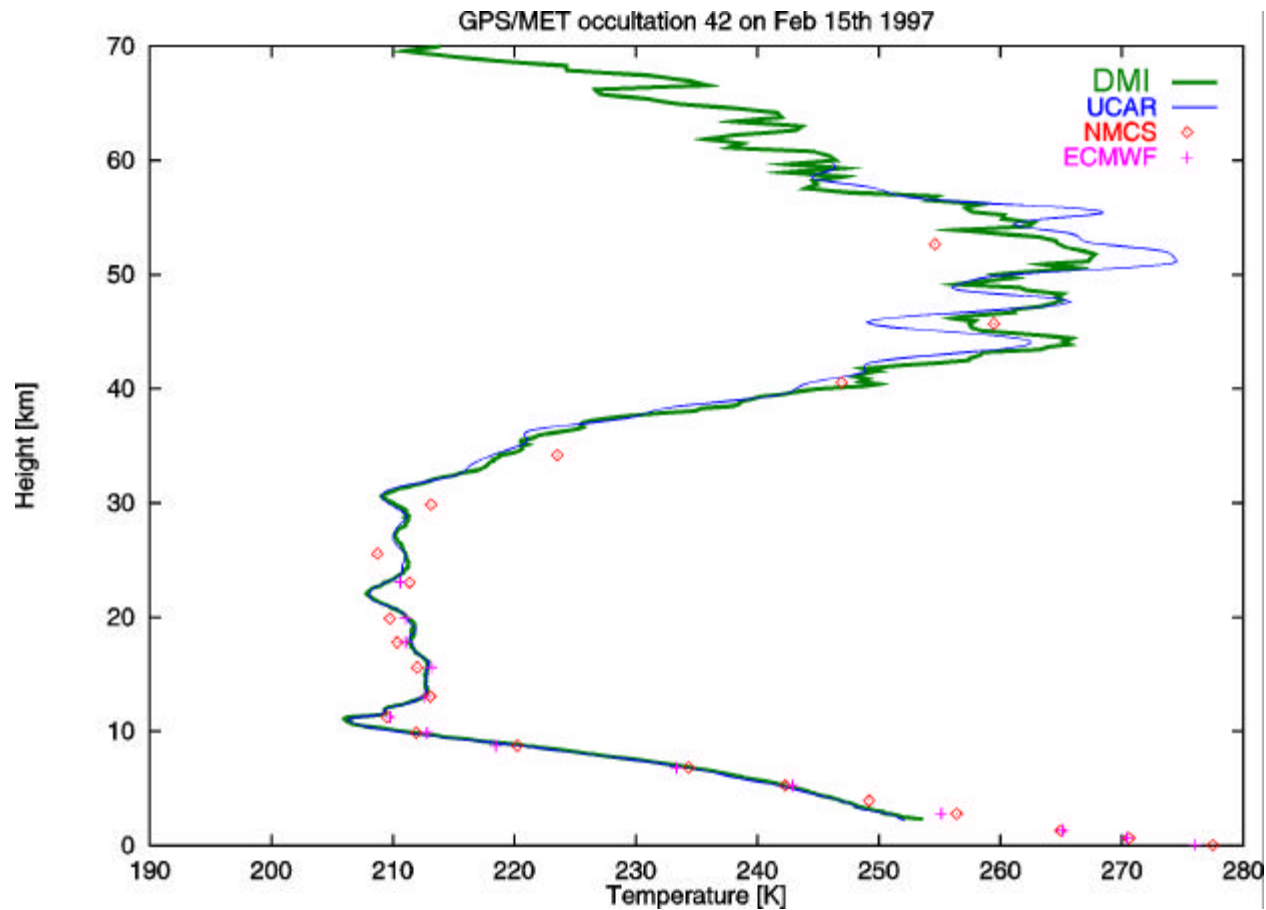
GRAS-SAG Report  
May 1998



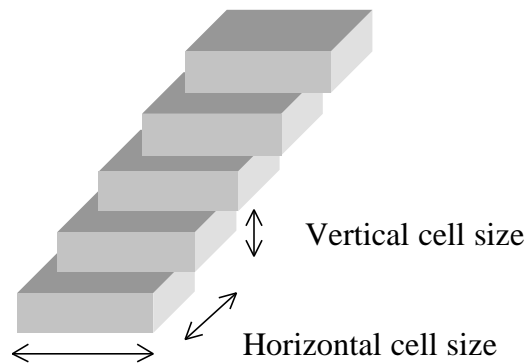
# Global distribution of measurements



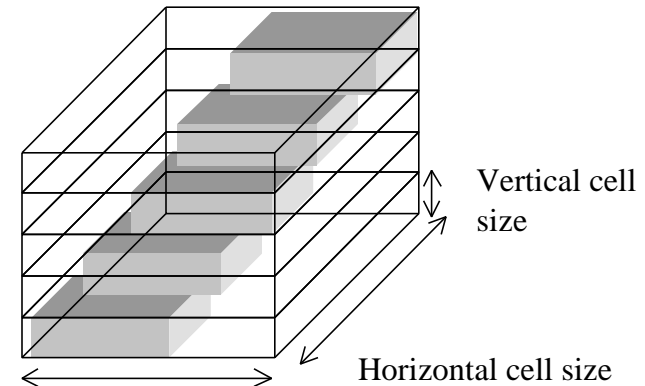
# Temperature profile from GPS/MET



# Skew occultation profiles



**Figure 1.** Illustration of a skew occultation profile.



**Figure 2.** Illustration of a true vertical occultation profile, containing the information from the skew profile.

# Software Deliverables for NRT Products



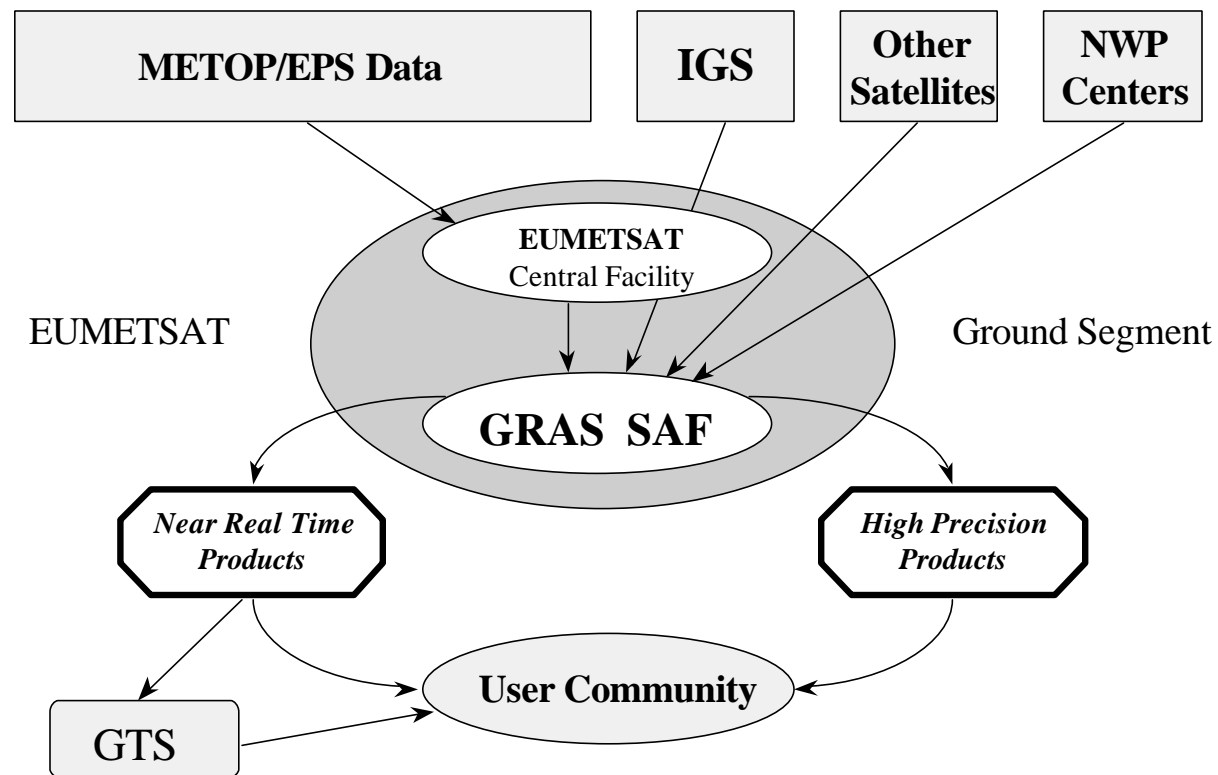
DMI, IEEC

- **Data products (B) and (C)**
  - ◆ Refractivity profiles
  - ◆ Temperature profiles
  - ◆ Pressure profiles
  - ◆ Water vapor profiles
  - ◆ Geographical location

UKMO

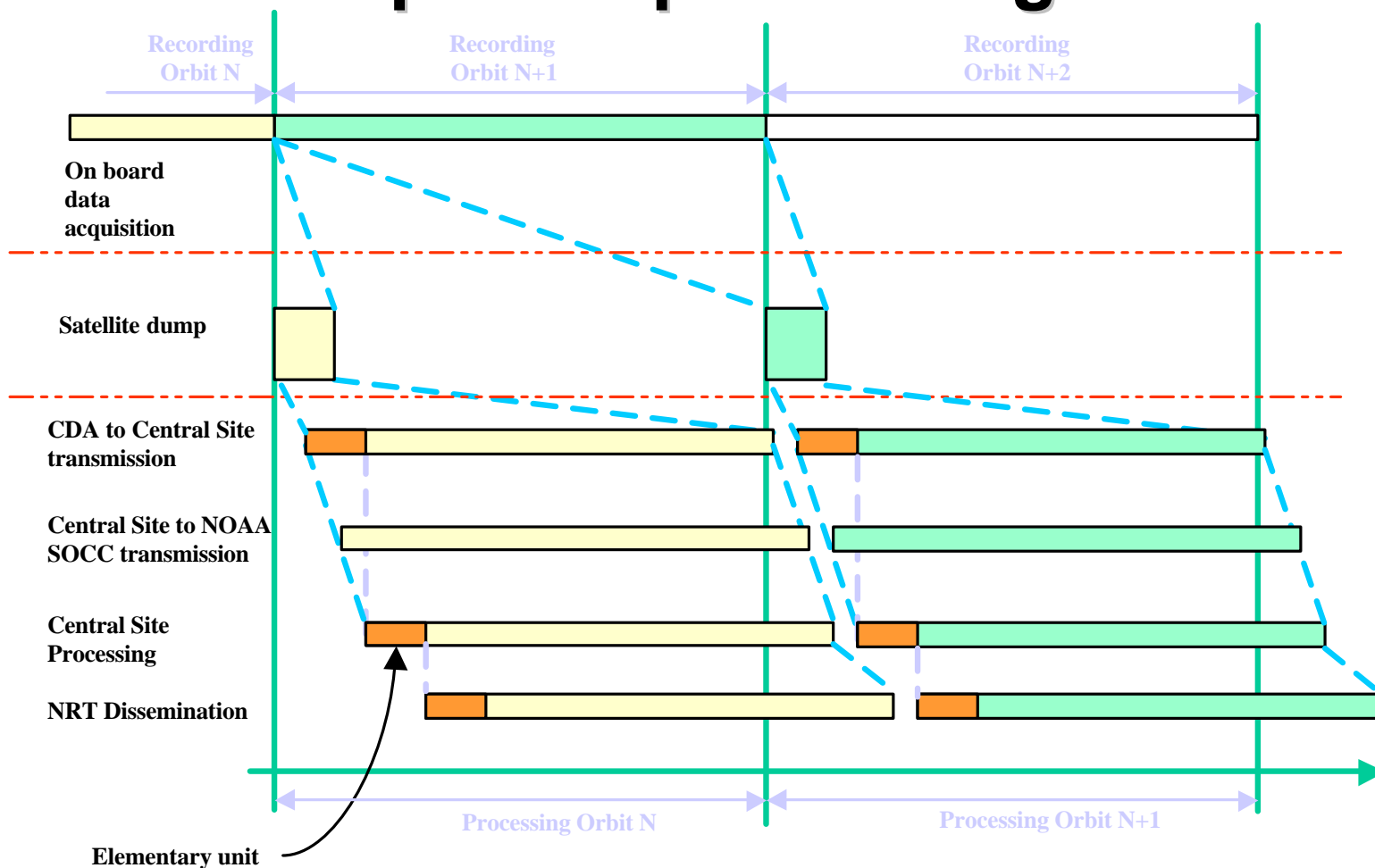
- **4DVAR Assimilation Software**
  - ◆ Forward operators
  - ◆ Error covariance matrix

# Data flow real time system





# Pipe line processing



EUMETSAT SAF Technical Coordination Meeting June 1999

EUMETSAT Meteorological Satellite Data Users' Conference, Copenhagen, September 1999