Estimation of TOA Radiative Fluxes from the Geostationary Earth Radiation Budget (GERB) Instrument Data

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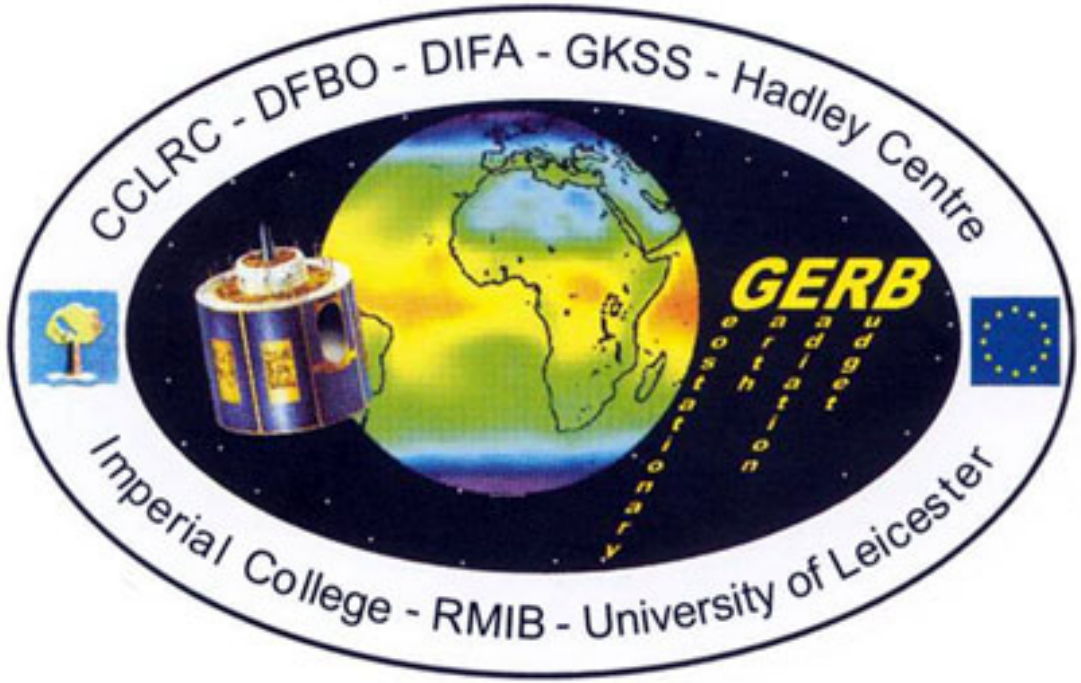
The GERB Project



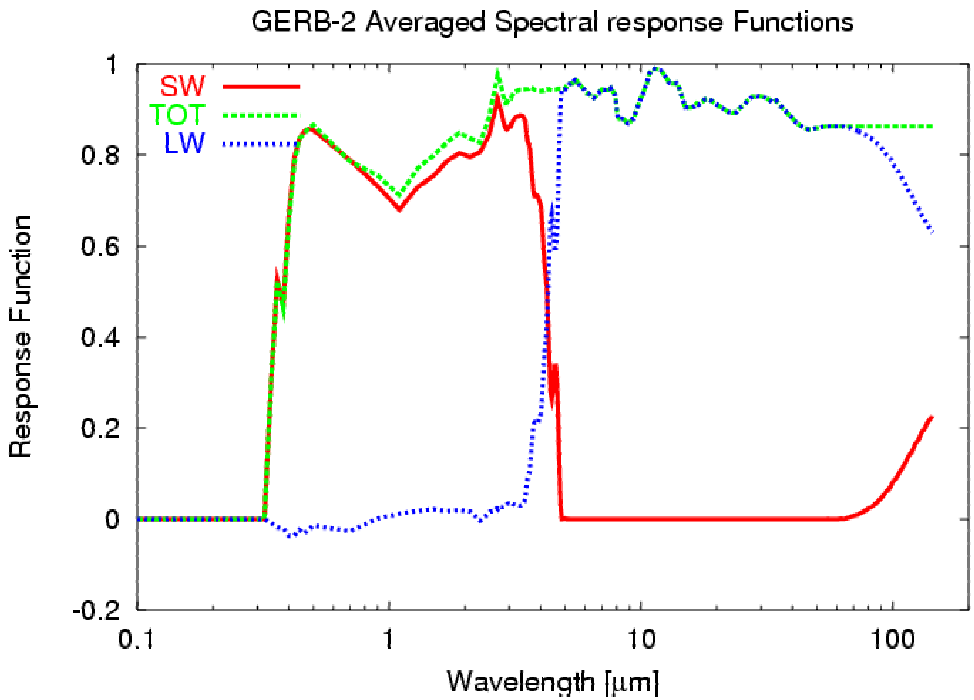
- Additional payload for EUMETSAT's Meteosat Second Generation geostationary satellites.
- Broadband radiometer on the geostationary orbit -> high temporal sampling.
- Synergy with CERES-EOS program.

Scientific goals

- Diurnal cycle and synoptic variability (tropical convection, marine strato-cumulus),
- Clouds and water vapour in the ERB,
- Constraints for NWP model,
- Improvement of LEO diurnal model and broadband BRDF,
- Synergy with SEVIRI visible calibration.

The GERB Instrument

- 2 channels BB radiometer: shortwave and total
- Black-bodies, solar integrating sphere
- Array of 256 thermopiles detectors
- Footprint size of ~ 50 km



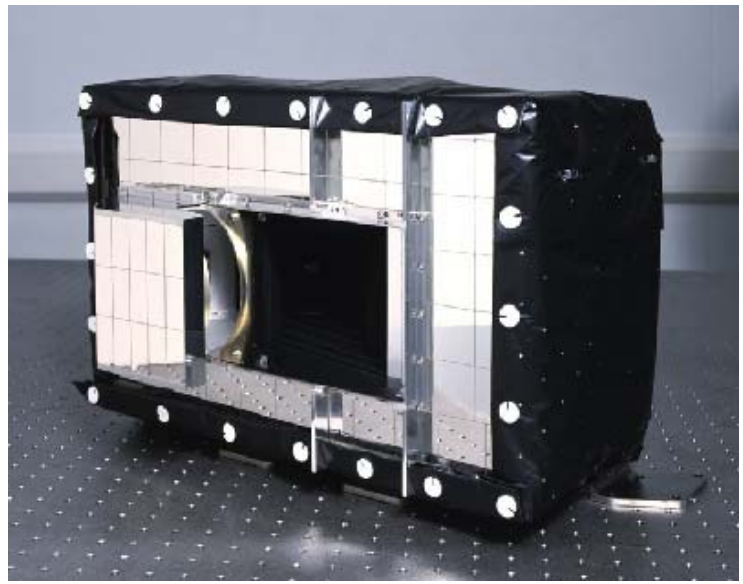
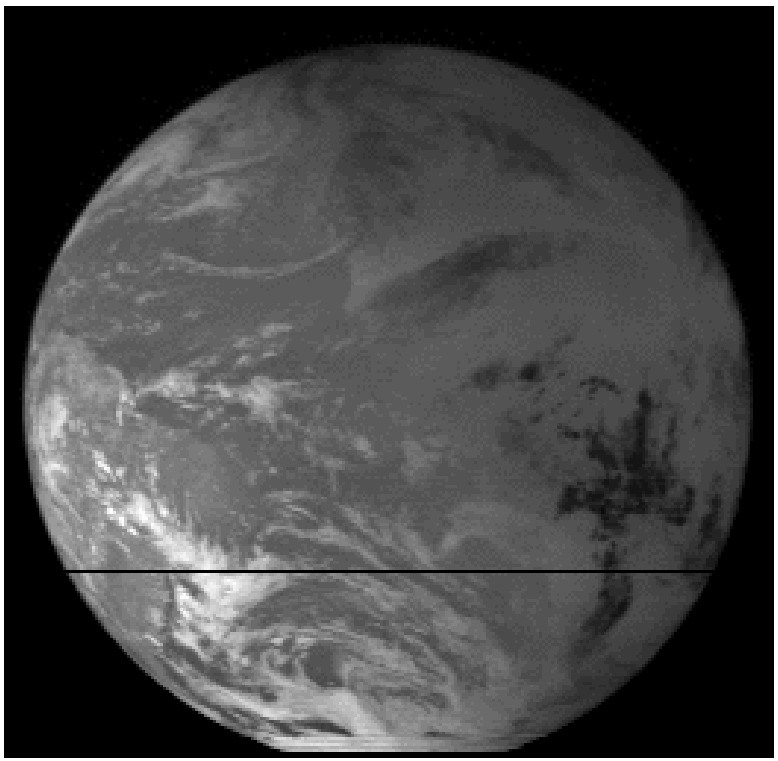
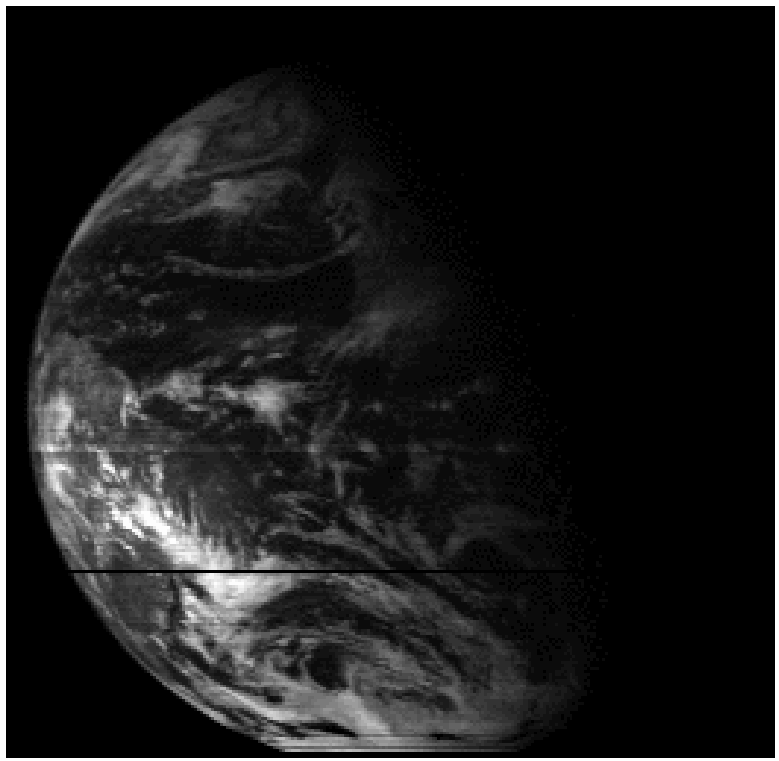


Image Acquisition

1 column (SW or TOT) for each satellite rotation (0.6s) Need a de-spinning mirror, Image = 282 columns (2'50") Cycle of 3 TOT and 3 SW images in 15'

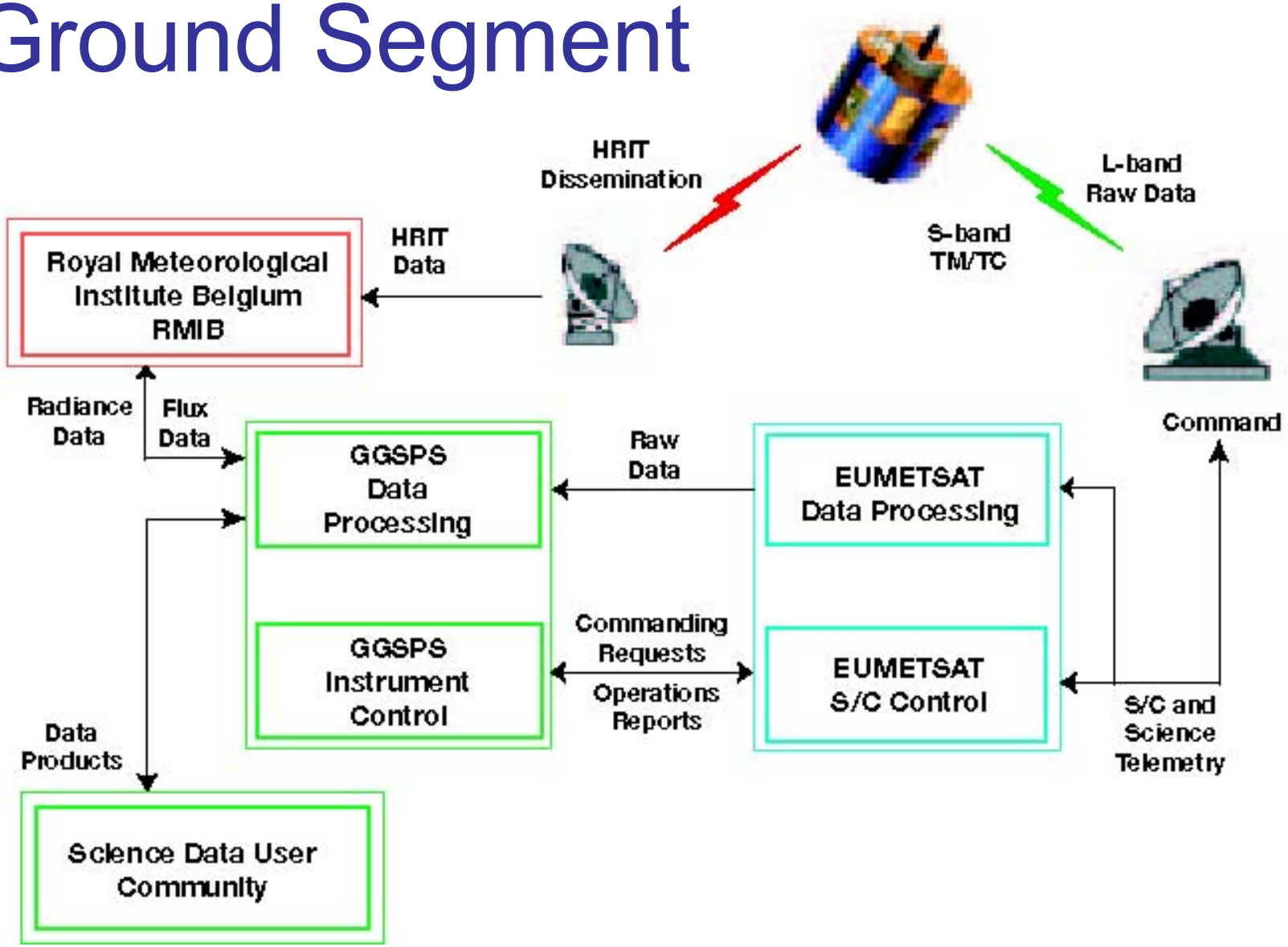


total



shortwave

Ground Segment

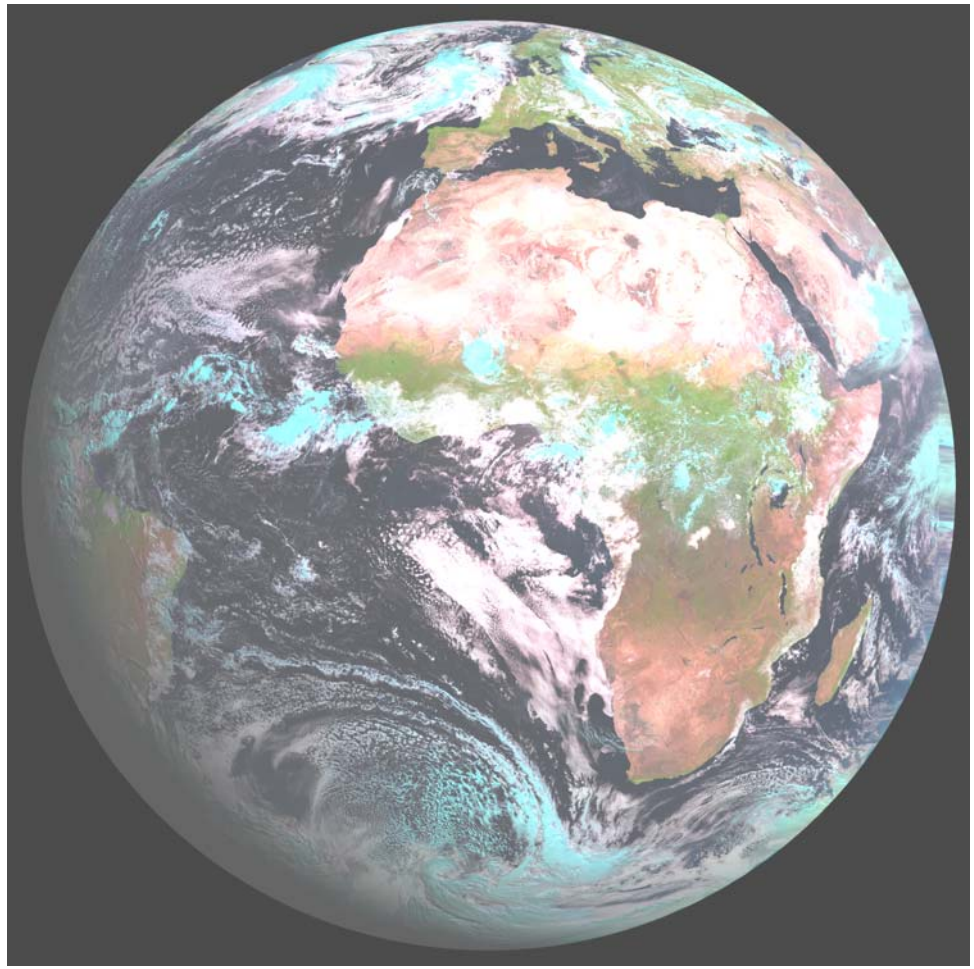


Distributed Ground Segment

- Rutherford Appleton Laboratory, RAL:
  - data calibration
  - data geolocation
- Royal Meteorological Inst. of Belgium, RMIB:
  - longwave estimation,
  - data unfiltering
  - radiance-to-flux convertion
  - enhancement of the spatial resolution
  - near-real time dissemination

The SEVIRI

Spinning Enhanced Visible and InfraRed Imager



The new generation of EUMETSAT imager

3 kilometers and 15’

12 Channels :

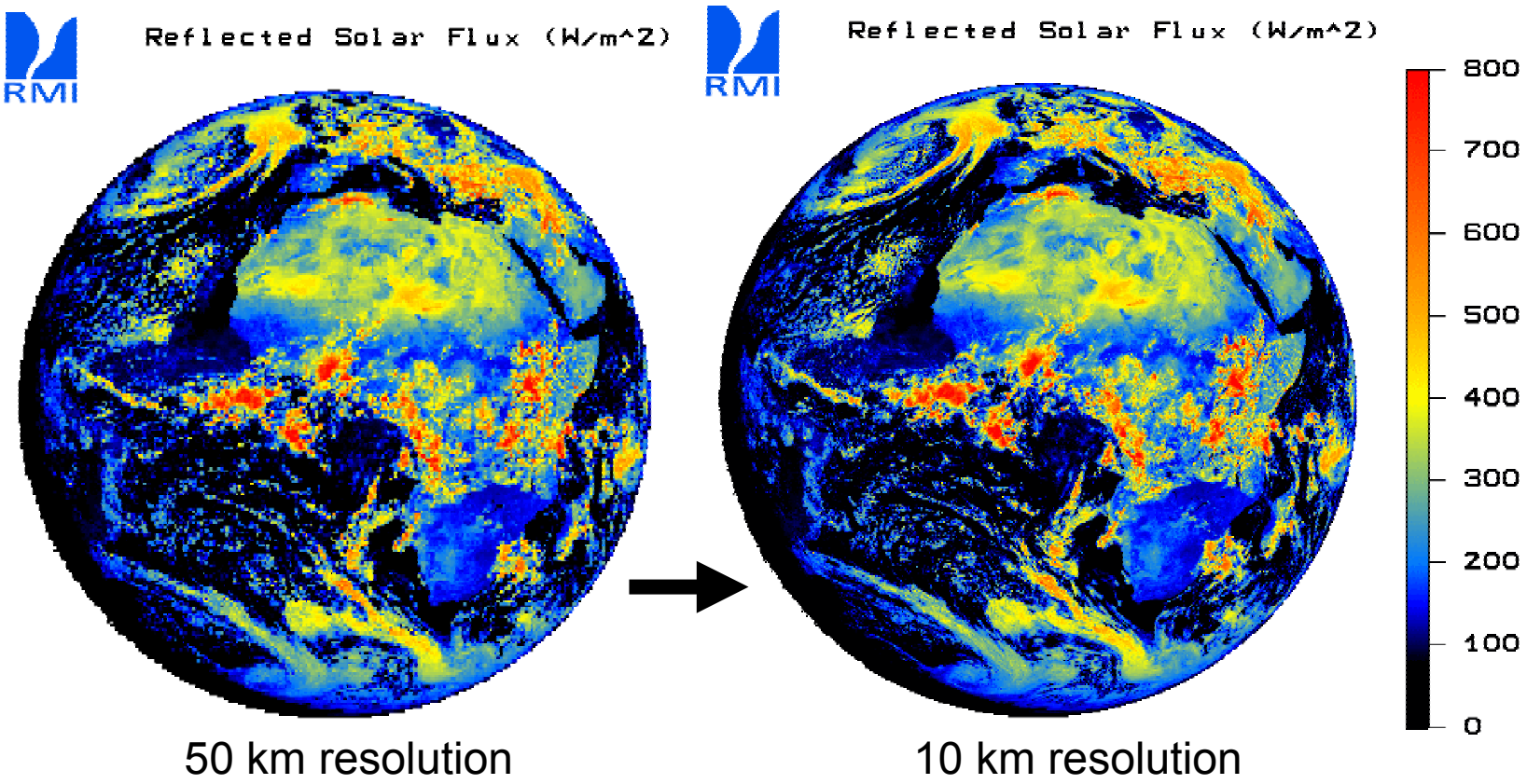
- 0.6, 0.8, 1.6, 3.9, 6.2, 7.3, 8.7, 9.7,10.8,12, 13.4µm
- High resolution Visible (HRV) at 1 km.

Synergetic use of SEVIRI

- provides spectral information useful for the GERB data unfiltering,
- allows an accurate scene identification needed to select the ADM in the CERES-TRMM ADMs set:
  - Surface type,
  - Cloud fraction in the GERB footprint (0…100%),
  - cloud optical depth τ,
  - cloud thermodynamic phase (water/ice),

- expand the spatial resolution 50 ->10 km

Method: Estimate BB radiances at high spatial resolution (NB-to-BB conversion) and “renormalize” those estimates using GERB measurement



50 km resolution

10 km resolution

Level 2 GERB Data (fluxes)

- Separate files for reflected solar flux and for emitted thermal flux.
- Also in the files: radiances, surface and cloud cover characteristics, viewing angles.
- Rectified products on geostationary equal-angle grids (50km and 10km).
- 15 minutes rate.

Accessing the Level 2 data

- Near-real time data and/or 10km data from the RMIB FTP site:

  http://gerb.oma.be ftp://gerb.oma.be

- Archive of 50 km data from the RAL site

  http://ggspspro.ag.rl.ac.uk

- Free of charge but user must register.

Conclusions

- First broadband radiometer on the geostationary orbit,
- Data acquisition started Dec. 2002
- On-going commissioning and validation,
- Instrument works fine,
- Estimation of the fluxes from the instrument radiance based on SEVIRI data and CERES ADM's