

GERB Inversion - Summary and Validation Plan

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Content

- SW and LW inversions for GERB
- Draft Validation Plan, for discussion

GERB Inversion - Summary

Shortwave

- Use of the CERES-TRMM models for 3*3 SEVIRI pixel boxes (about 10*10 km)
- ADM selection from: surface type, cloud optical depth τ , fraction (0,11%,22%,...,100% !) and phase
- Application without interpolation in cloud/surface properties (1 ADM is used), tri-linear interpolation on the angles (θ_v, θ_s, ϕ)

$$F = \frac{\pi L}{R(\theta_v, \phi)}$$

Expected problems: bad θ_v , bad θ_s , sun glint area

Longwave

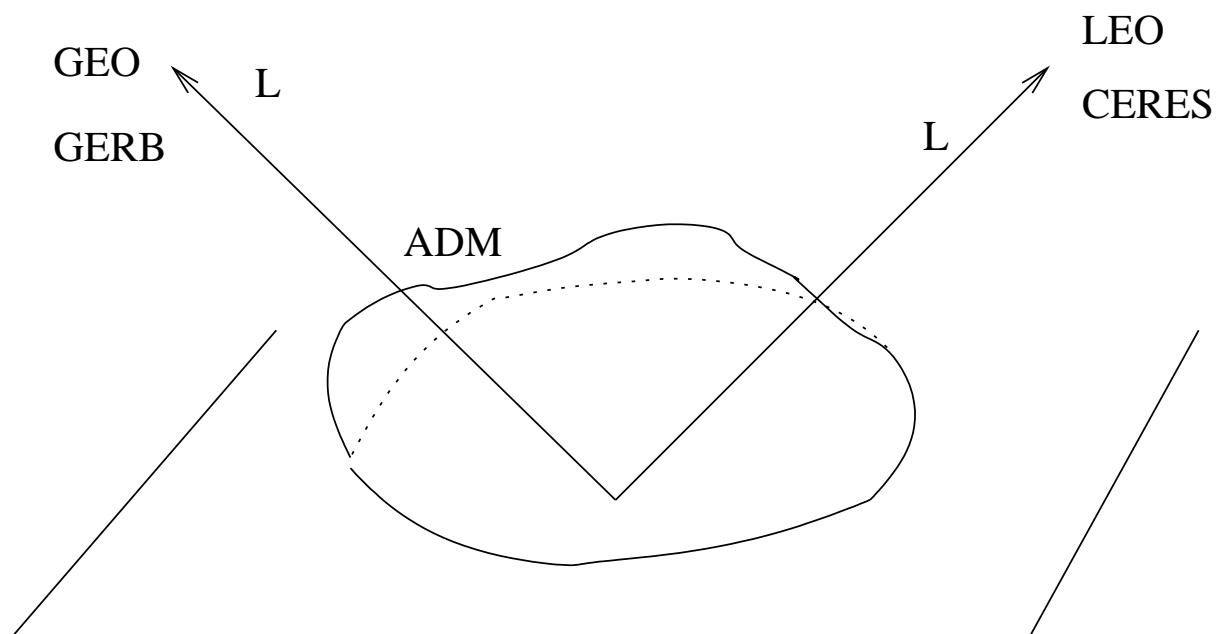
- Without explicit scene identification from SEVIRI and without information from NWP system (ECMWF, ...), using only the SEVIRI NB measurements:

$$R = R(\theta_v, L_{6.2\mu}, L_{7.3\mu}, \dots, L_{13.4\mu})$$

Expected problems: maximum error at nadir and grazing angles, underestimation of the anisotropy for cirrus clouds, overestimation over mountains,

Validations of the GERB Inversions

- Ideally after the validations of: calibration, unfiltering, scene identification.
- None of the CERES validation methods (θ_v dependence test, direct integration fluxes, along-track flux, ...) are possible for GERB alone.
- Use of colocated CERES (TRMM, EOS in RAPS mode) unfiltered radiances .



- About 10^6 useful couple of data (unfiltered radiances, fluxes, scene identification, ADM type, ...) per day! Note : GEO is supposed to be continuous in time and space.

Instantaneous inversion error is:

$$\epsilon = \frac{\pi L_{GEO}}{R(GEO)} - \frac{\pi L_{LEO}}{R(LEO)}$$

Using GERB and CERES-Terra/Aqua (ES8, 1.5 month delay), analyze bias and dispersion according to:

- viewing geometry (generalized “ θ_v dependence test”)
- scene type (e.g. surface, ADM type, cloud type),
- regional boxes

Try to correlate regional bias according to regional properties such as: cirrus cloud probability, topography, ...

Other possibility: compare mean GERB fluxes with fluxes obtained by Direct Integration of CERES (regional).

Note: Pre-Launch Validations

Using MS7/CERES-TRMM

Meteosat-7 (GERB-like) data and CERES-TRMM SSF Edition2 data for June/July/August 98

- Validation of the scene identification (co-angular!): comparison MS7 and VIRS τ , best suited threshold for RMIB “cloud mask” $\tau_{th} \sim 0.6$ (to have similar cloud fraction), cloud phase validation. [done]
- Generalized “ θ_v dependence test” (Steven method), now performed for SW and LW fluxes. [done]
- Validation of the ADM selection (confusion matrix, frequencies of the ADMs,...), [TBD]

Using MS7/CERES-Terra [TBD]

Meteosat-7 (GERB-like) data and CER_ES8_Terra-FM1_Edition1 for August 2001.

Note: GEO/LEO fluxes homogenization

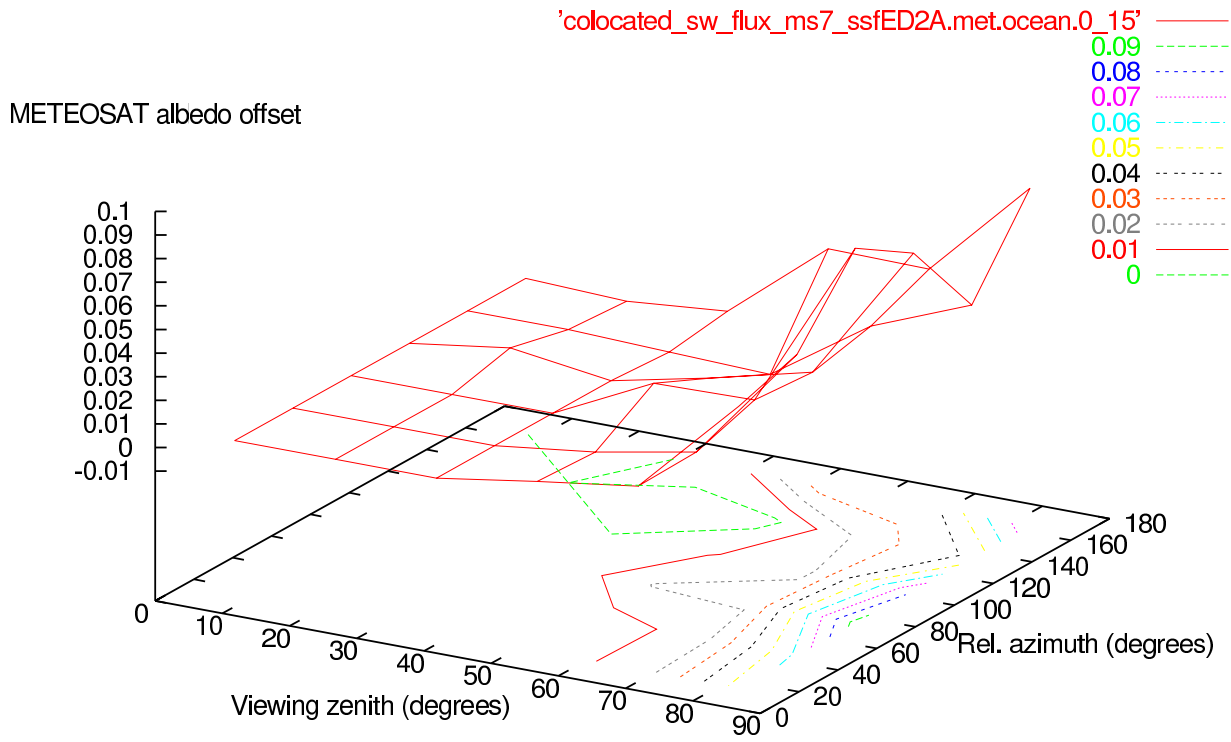
- Use pairs of GEO and CERES-RAPS fluxes
- Find bias $\Delta_{geo}(\theta_v, \phi)$ between GEO and CERES fluxes (or albedo) according to the surface (ocean, land, desert), cloud (clear/cloudy) and solar zenith angle bins (0-15,15-30,...,75-90). In average, the CERES-RAPS fluxes are supposed to be the “true flux”.
- correct the GEO fluxes

$$F'_{geo} = F_{geo} + \Delta_{geo}$$

- Find bias $\Delta_{ceres}(\theta_v, \phi)$ between CERES fluxes (or albedo) and **the corrected GEO** according to the surface (ocean, land, desert), cloud (clear/cloudy) and solar zenith angle bins (0-15,15-30,...,75-90). Here, the corrected GEO fluxes are supposed to be the “true flux”.
- correct the CERES fluxes

$$F'_{ceres} = F_{ceres} + \Delta_{ceres}$$

Ocean, albedo < 0.4, solar zenith angle < 15 degrees



Conclusions

- None direct validation of the inversion for the GERB instrument,
- Validation will be done using CERES unfiltered radiances in RAPS mode,
- When GERB radiances will be available and reliable they will probably be of interest to validate (e.g. instantaneous error) or built new CERES ADMs (Radiance Pairs Method),