Comparison of GERB/SEVIRI and CERES scene identification

October 2, 2000

Steven Dewitte (GERB, CM-SAF),

Alessandro Ipe, Nicolas Clerbaux,Gilles Sadowski, Luis Gonzalez, Aline Hermans (GERB)

Bogdan Nicula , Alin Alecu (CM-SAF)

Royal Meteorological Institute of Belgium (RMIB).

Remote sensing from space section

Email : gerb@oma.be

CERES science team meeting, Huntsville, September 2000

Scene identification comparison : why?

- GERB angular conversion based on the **ERBE/CERES ADMs** (for solar reflected radiation),
- ADM's selection based on scene identification: surface + cloud cover.

=> to do accurate selection of the ADMs, the GERB scene identification must be as close as possible to the one that serves/will serve to derive the ADMs (CERES).

From CERES ADM team, the minimal cloud cover characterization must include:

- **the cloud optical depth τ,**
- **the cloud fraction f**
- **the cloud phase p,**

GERB cloud analysis overview

Based on the SEVIRI imaging device

channel	type	use
HRV	VIS	-
0.6μ	VIS	τ (land), f
0.8μ	VIS	τ (ocean), f
1.6μ	NIR	p via ratio $1.6\mu/0.6\mu$
3.9μ	WIN	-
6.2μ	WV	-
7.3μ	WV	-
8.7μ	WIN	-
9.7μ	O_3	-
10.8μ	WIN	p via BT
12μ	WIN	-
13.4μ	CO_2	-

Retrieved characteristics :

- τ and p at imager resolution,
- τ, p and f at GERB resolution.

Note : only during **day time**,

Cloud optical depth estimation τ_{vis} Method

1. selection of 0.6μ (land) or 0.8μ (ocean): reflectance ρ
2. accurate clear sky reflectance values from temporal analysis (60 days): ρ_{cs}
3. tables for overcast reflectance (built with SBDART):

$$\rho_{overcast} = \rho_{overcast}(\theta_v, \theta_s, \phi, p)$$

3. estimation of C (*"pixel mean cloud cover"*):

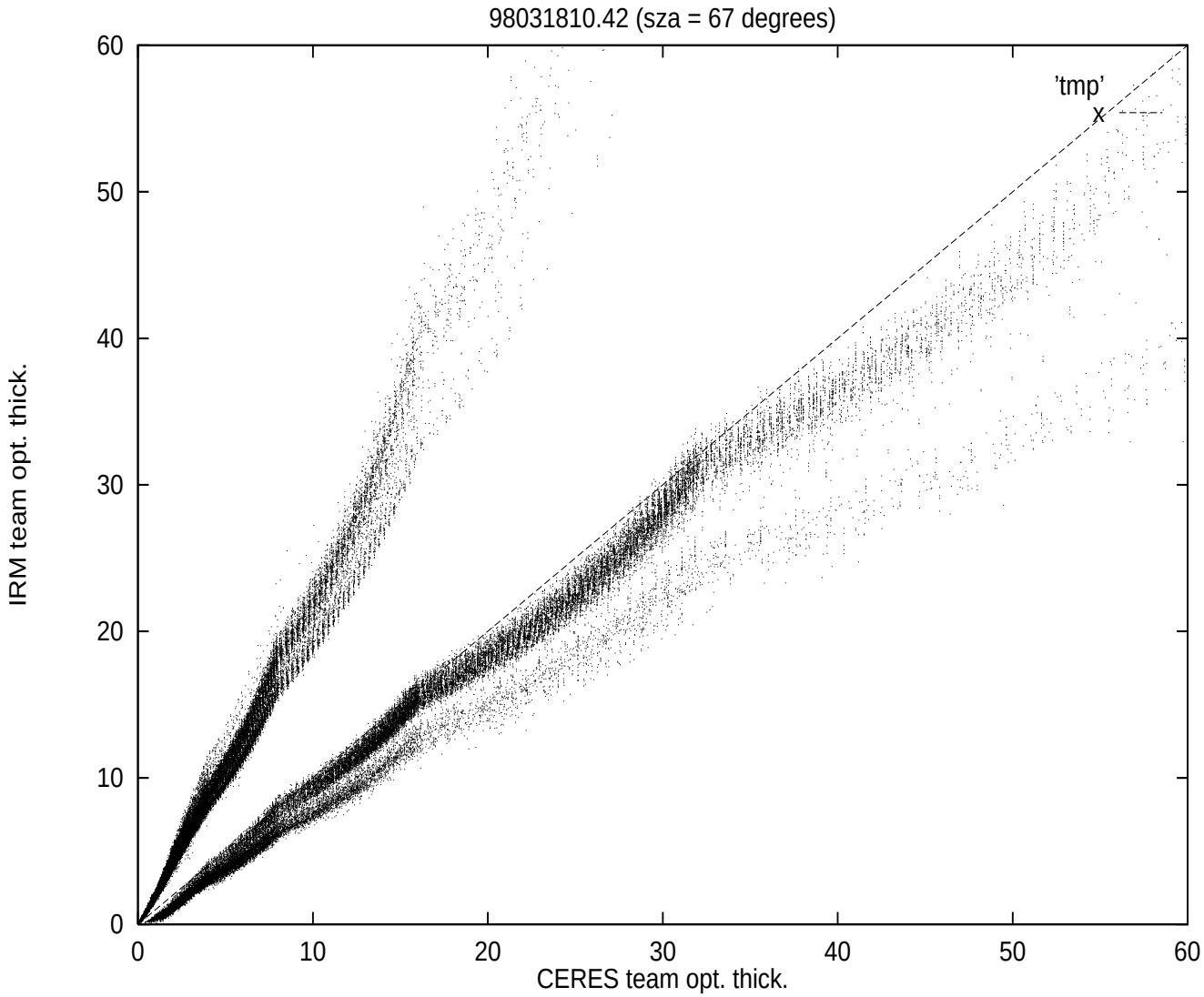
$$C = \frac{\rho - \rho_{cs}}{\rho_{overcast} - \rho_{cs}}$$

4. tables to convert C into τ (built with SBDART):

$$\tau = \tau(C, \theta_v, \theta_s, \phi, p, s)$$

Cloud optical depth τ_{vis} - Comparison with VINT retrieval

- Use of **VIRS data files** that contain τ_{VINT},
- GERB cloud analysis on the VIRS data $\rho_{0.63}$ and $\rho_{cs,0.63}$,
- comparison of the 2 optical depths.



Cloud optical depth τ comparison : discussion

- The GERB and VINT retrievals seem differ from multiplicating factors,
- This factor varies from place to place in the VIRS images,
- We are currently trying to understand the reason of this (kind of clouds, geometry, ...) in collaboration with the CERES cloud analysis team.

GERB Cloud fraction estimation f Method

1. Estimation of τ_{vis} for each imager pixel,
2. pixels classification using **simple thresholding** on τ

$$\tau_{thresh} = 1.0$$

3. => cloud mask (clear/cloudy) at the imager resolution,
4. cloud fraction f estimated as percent of cloudy pixels in the GERB PSF.

Cloud fraction estimation f - Comparison with CERES

- Use of CERES SSF files that contain cloud fraction f_{ceres},
- GERB cloud analysis applied on Meteosat -7 data (SEVIRI not available!) => cloud mask,
- estimation of f_{gerb} by convolution with CERES PSF,
- graphical representation of (f_{ceres}, f_{gerb}) for footprint at the same time and the same location.

Cloud fraction f comparison : discussion

- clear sky ($f = 0\%$) and overcast ($f = 100\%$) scenes : good results,
- partly and mostly cloudy scenes ($0\% < f < 100\%$): great dispersion but no systematic bias => validates the threshold value $\tau = 1$.

GERB Cloud phase estimation p - Method

1. Cloud phase estimation for each SEVIRI pixel using

$$(\frac{\rho_{1.6\mu}}{\rho_{0.6\mu}}, BT_{10.8\mu})$$

2. tables (built using SBDART):

$$p = p(\frac{\rho_{1.6\mu}}{\rho_{0.6\mu}}, BT_{10.8\mu}, \theta_v, \theta_s, \phi)$$

3. estimation of the ice/water ratio in the GERB footprint by convolution with GERB PSF=> p

Validation/comparison with CERES : TBD

- We plan to use VIRS data files (that contain $\rho_{0.63\mu}$, $\rho_{1.6\mu}$ and $BT_{10.8\mu}$) and compare the GERB and VINT cloud phase retrieval.

Current status of this comparison - Conclusions

- not compatible cloud optical depth τ retrieval,
- cloud fraction f retrieval : seems be OK,
- cloud phase p retrieval : to be compared,
- surface identification : to be compared.

=> This work is not finalized. We will continue in collaboration with the CERES cloud analysis and ADM teams.