EVALUATION OF 3D CLOUDS WITH COSP RADAR-LIDAR SATELLITE SIMULATOR UNDER GCM ARPEGE

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Objectives:

Use radar and lidar measures to evaluate three-dimensional representation of clouds in climate and weather prediction models.

Method:

On a global scale, the Observational Simulator uses model fields to calculate synthetic observations that are directly comparable with satellite measurements.

Description:

ARPEGE

Grid

Horizontal resolution: 1-195 km

31 vertical levels


Three-hourly analysis interpolated

Three-hourly

Radar and Lidar simulators

Cloudy model parameters (Cloud cover, Cloud droplets, Precipitation fluxes)

Microphysical parameters

Hypersensitivity of spherical particles

Radar Simulator

Lidar Simulator

Comparing observations/simulations

- Time (1 month) and spatial average (2.5° x 2.5° horizontal and 1 km vertical)
- Method for determining presence of clouds: Radar Reflectivity > 27 dBZ SR Lidar > 5

Comparing "global" versus "path"

- Global: Average over all points in the grid
- Path: Average only the orbital path of the satellite.

Conclusion:

To obtain a stable result, a greater number of sub-columns is needed for radar and low-level clouds; we have a decreasing number of sub-columns with increasing period average. After that 150 sub-columns was chosen to use both simulators with simultaneity in daily and monthly scales.

The comparison of outputs of COSP simulator with radar and lidar observations shows the importance of doing these monthly diagnostics over orbital path of the satellite CALIPSO and CloudSat: the underestimation of deep convective cloud top and of marine stratocumulus in the east part of subtropical anticyclonic areas; instead an overestimation of cloudy fraction in the ITCZ.

CONCLUSIONS:

- Within the framework of EUCLIPSE project, improving representation of clouds is a key objective of climate models. Cloud feedback remains one of the largest sources of uncertainty for precipitation and climate variability.

- Active instruments (lidar and radar) aboard the CALIPSO and Cloudsat satellite provide high-resolution vertical profiles of clouds from the surface to the lower stratosphere.

REFERENCES:
