Ground validation of MeghaTropiques products
by rain gages and radar data

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Objectives and data

A key component of the Megha-Tropiques project is the Validation of the products and algorithms to ensure the highest quality. The validation plan has been designed in close link with the product developers in order to answer for their specific need. The feedback loop from validation results to developers will be maintained throughout MT validation phase. The basis of validation is to compare MT measurements with reference data acquired through dedicated campaigns or from operational networks, round the tropics thanks to international collaborations, especially with Brazil through INPE, ANA, CEMADEN, INMET, and with India through IRS and Indian scientific action thanks to the Indo-French Water Cell (IRD/BSc in Bangalore).

The aim of these study is to evaluate Megha-Tropiques products:

TAPER (Tropical Amount of Precipitation with an Estimate of Emitter) is the instant rainfall product under the satellite track. These algorithms work with any microwave platform.

Our ground reference dataset integrates data from the ANA, INMET, and INPE networks over the South America continent. A super site is set up in Guadalupanos, with a polarimetric radar and three validation sites of 1°x1° equipped with a densified network of rain gauges in Niger, Niós and Senegal, and operational data systems such as CLISS for Africa and CPC globally. Block kriging interpolation technique is used to get gridded rainfall.

TAPER is compared to currently used reference: satellite rainfall estimate such as TRMM, GCM, FPS, FUS and EPSAT.

For the validation of instant rainfall we use IRS-Meteo France 5-band radars located in Cercle (Guadeloupe, Martinique), India Ocean (Reunion) and Pacific Ocean (New-Caledonia).

The daily accumulation maps (left) and the season accumulation maps reflects that TAPER slightly overestimates the daily rain in the range 20-20mm. The studies over Africa and India corroborate the Brazilian results. TAPER have a large amount of rain detections. That makes a slightly global negative bias. But concerning the conditional bias (rain detected by both, TAPER and reference) TAPER seems to over estimate the daily rainfall. TAPER have in general a very low false alarm rate.

The figure below show three series for pixels with more than 5 stations. We can see that in the Northen we can not detect the low rainfall events, due probably to the warm rain (difficult to detect), but mainly due to the low temporal sampling and short rainfall events. We can expect that Megha-Tropiques will improve that aspect due to the high temporal sampling.

The figure in the left is the Taylor’s diagram of satellite products and CPC versus the ground sampled reference. TAPER summarizes the performances of the different products relative to a reference. For that analysis we consider only the pixels with more than 5 stations for the period CND 2011.

The figure represents in polar coordinates the cosine of correlation coefficient (theta, not a angular linear scale) and the standard deviation normalized by the standard deviation of the reference (distance of points to the origin). That geometric configuration makes that the distance between the points and the reference (the green square) is the centered RMS error. We see that TAPER (little green square) have similar performances than “real-time” products, with a lowest global bias (color scale shows the global bias).

The daily rainfall product BRAIN will be evaluated using radar rainfall maps (5 minutes time steps). Above there is an example of direct comparison of radar fields provided by Météo France (left columns), and the BRAIN estimate for different platforms (right columns) such as TMI, SSMI, SMHI. The radar data is first processed to match BRAIN pixels resolution (middle column)

Perspectives

This preliminary studies will be extended as we are gathering more data in the inter tropical band in particular in India and Africa

We are expecting the MT MADRAS sampling to improve substantially the performance of TAPER, this will be tested in the next months.

Other aspects of the validation not covered in this poster but which are investigated are:

- Accounting for the sampling errors in both the reference and the product in the evaluation
- Hydrological validations using instrumented and well modelled basins