IMPLEMENTATION OF A METHODOLOGY TO CALIBRATE GROUND RADARS USING TRAM-PR OVER ARGENTINA



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Motivation

Analyze the behavior of the ground radar reflectivity data located in Ezeiza (Argentina) from the analysis of BIAS and Cumulative Distribution Functions (CDFs) to identify systematic errors and to obtain a calibration curve to adjust the same from TRMM-PR observations.

Results

✓ GR reflectivity histogram have a maximum frequency close to 14 dBZ.

- PR reflectivity histogram have a maximum frecuency close to 22 dBZ.
- Reflectivity difference histogram have shapes close to normal distribution.





- →Attenuation-corrected PR reflectivity (TRMM 2A-25). The precipitation radar onboard TRMM satellite has a 13.8 GHz frequency (2.2-cm wavelength) with an aproximatelly 4.5-km horizontal resolution at near nadir, and 0.25-km vertical resolution.
- →Ground-based radar (GR) operated by National Weather Service is deployed at Ezeiza - Argentina (34.49°S 58.32°W, 20m ASL). This radar is an Enterprise DWSR-2500C with 5.56-cm wavelength (C-band), 1° beam width, 0.5-km range resolution and volumen scan sampling frecuency every ~10min. Each volume scan consists of aproximately 16 sweeps, with elevation angles ranging from 0.5° (base scan) to 34°.

→ Period: January 2004 - December 2009



Methodology

- In order to compare both samples, a similar methodology proposed by Anagnostou et al. (2001) for the correct spatial arrangement of both sources of information has been followed.
- The method is based on a scheme that interpolates GR and PR volume scans into a fixed grid and on a data selection that minimizes uncertainties associated with weather conditions and differences in grid resolution, radar sensitivities, sampling volumes, viewing angles, and radar frequencies.

The systematic difference against the PR observations is -6 dB.

Histograms of GR and PR reflectivity values used for calculate the calibration curve. Also, it shows histogram of GR-PR reflectivity differences for selected matched cases.

<u>ੱਲ</u> 0.015 ≁PR 0.005 Radar reflectivity (dBZ)

Reflectivity differences between GR and PR considering 2-6 km (liquid phase) and 6-14 km (mixed phase) CAPPI volumes related to the PR reflectivity: mean (red circles) and mean \pm SD (black dots)



Reflectivity differences between GR and PR considering 2-14 km CAPPI volumes related to the (a) PR reflectivity and (b) distance from the ground radar site. Mean (red circles) and mean \pm SD (black dots)



- Instantaneous PR and GR reflectivity volume scans that are within a time lag at a maximum of 10 min are projected into a common earth parallel 3D cartesian grid with 5 X 5 km horizontal and 2 km vertical resolution.
- The 3D-box is centered at Ezeiza GR site ±200km and vertical levels ranging from 2 to 14 km.
- A total of 102 PR orbits coincident with Ezeiza GR was been include to obtain the calibration curve for the period 2004-2009.

Histogram Matching Technique

- between GR data and PR data.
- GR so it matches as close as possible the CDF of the PR, in order to remove the bias of GR information related to PR.
- matched with the value of the reference dataset corresponding to the same probability values.
- between two successive probability intervals (e.g. 5% and 10%).

Calibration examples

Some cases associated with different weather conditions have been selected to test the calibration during 2010. These cases are not part of the training set with which the calibration curve has been calculated.

CASE 1 and 2 have a convective behavior, while CASE 3 presents a stratiform precipitation, and CASE 4 shows squall line. Calibration in CASE 4 fits properly, during convective cases a underestimation is still present. Stratiform case denotes a reflectivity overestimation.



AKNOWLEDGMENTS: This work was partly funded by the projects: ANPCyT PICT 2008-215, UBACyT X633, CONICET PIP Nicolini. The first author would like to special thank CONICET for a PhD scholarship fund that allows this research, to the National Weather Service for the Ezeiza GR data and Erich Stocker for proving TRMM information over South America. Authors would like to thank to IPWG organizers for the travel support to assist to this Conference.