



## **Validation of GERB and CERES radiances and fluxes in the context of the Alacant and Valencia Anchor Stations Ground Field Campaigns**

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The purpose of this work is to compare top of the atmosphere (TOA) broadband radiances and fluxes measured by the Geostationary Earth Radiation Budget (GERB-1 and GERB-2) instruments on board Meteosat-8 and Meteosat-9 satellites, and those measured at both TOA and surface levels by the Clouds and the Earth's Radiant Energy System (CERES) instrument, on board Terra, with equivalent radiances and fluxes obtained from radiative transfer simulations. The simulations are performed using surface and atmospheric parameters measured during the GERB/CERES Ground Validation Campaigns at the Valencia Anchor Station (VAS) reference area in February 2004 and August 2006 and at the Alacant Anchor Station (AAS) area in November 2008.

The Valencia and Alacant Anchor Stations are automatic meteorological stations equipped with a large number of instruments, that measure, among others, air temperature and humidity at different levels, pressure, wind speed and direction, downwelling and upwelling shortwave and longwave fluxes, soil moisture, soil heat flux and soil temperature at different depths.

For the campaigns, additional ground instrumentation is used, such as in-situ radiosoundings for February 2004 campaign, derived precipitable water vapour content from CIMEL sunphotometer and GPS (Global Positioning System) instruments, diffuse shortwave radiation from Eppley automatic solar tracker, radiosoundings from the Spanish stations of Madrid and Murcia, aerosol optical thickness retrieval from CIMEL, and broadband albedo and temperature over shrubs, bare soil and vineyards in the study areas. Other datasets used in the validation procedure come from satellite products such as TOMS (Total Ozone Mapping Spectrometer) ozone, CERES/SARB (Surface and Atmospheric Radiation Budget) emissivity and bidirectional reflectances derived from MODIS (Moderate Resolution Imaging Spectroradiometer) MOD43 BRDF product.

As regards GERB data, GERB enhanced spatial resolution data (GERB High Resolution) is used, where the resolution of the computed fluxes is improved through the combination of well-calibrated GERB broadband data with SEVIRI narrow-band high-sampling-rate data. In the case of CERES, for the campaign dates, CERES Terra FM2 dedicated PAPS (Programmable Azimuth Plane Scanning) observations were targeting the VAS and AAS study areas as the satellite overpassed the sites. These special scans are designed not only to increase the sampling over a determined target by rotating the scanning plane of the instrument, but also to increase angular information from the observed target.

The study here developed includes the selection of atmospheric profiles from on-purpose radiosonde and GPS data, a BRDF calculation for every single CERES footprint and GERB pixels, and Streamer RT simulations and comparisons of TOA and Surface shortwave and longwave radiances and fluxes. The results obtained confirm

that the methodology proposed is able to reproduce CERES and GERB data, showing low root mean square errors in the comparisons.