

Heavy precipitation retrieval from combined satellite observations and ground-based lightning measurements

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We have developed a series of algorithms for the retrieval of precipitation (especially, heavy precipitation) over the Mediterranean area using satellite observations from the available microwave (MW) radiometers onboard low Earth orbit (LEO) satellites and from the visible-infrared (VIS-IR) SEVIRI radiometer onboard the European geosynchronous (GEO) satellite Meteosat Second Generation (MSG), in conjunction with lightning data from ground-based networks – such as ZEUS and LINET. These are:

- A new approach for precipitation retrieval from space (which we call the Cloud Dynamics and Radiation Database approach, CDRD) that incorporates lightning and environmental/dynamical information in addition to the upwelling microwave brightness temperatures (TB's) so as to reduce the retrieval uncertainty and improve the retrieval performance;
- A new combined MW-IR technique for producing frequent precipitation retrievals from space (which we call PM-GCD technique), that uses passive-microwave (PM) retrievals in conjunction with lightning information and the Global Convection Detection (GCD) technique to discriminate deep convective clouds within the GEO observations;
- A new morphing approach (which we call the Lightning-based Precipitation Evolving Technique, L-PET) that uses the available lightning measurements for propagating the rainfall estimates from satellite-borne MW radiometers to a much higher time resolution than the MW observations.

We will present and discuss our combined MW/IR/lightning precipitation algorithms and analyses with special reference to some case studies over the western Mediterranean.