MODIS AND GOES DATA TO DETECT WARM RAINING CLOUDS

Joan M. Castro[1] *and Nazario D. Ramirez*[2]

[1]Department of Civil Engineering, University of Puerto Rico, P.O. Box 9040, Mayaguez, PR 00681, U.S.A
[2]Department of Industrial Engineering, University of Puerto Rico, P.O. Box 9030, Mayaguez, PR 00681, U.S.A
joan.castro@upr.edu

Cloud microphysical parameters such as droplet effective radius (DER), cloud optical depth (COD), and cloud water path (CWP) show potential for detecting warm rain events and estimating the rain rates. The Cloud Water Path (CWP), which is a combination of effective radius and cloud optical depth, exhibit more correlation than the other parameters with the presence of warm raining clouds. A cloud with large COD is generally thick and contains more cloud droplets, and COD is correlated with warm rain because an optically thicker cloud generally has a longer path and more liquid water for sustaining the coalescence process. DER is correlated with warm rain because the presence of large droplets is critical for initiating the coalescence. Data files from different spatial and temporal resolutions have been extracted; geo-localization must be conducted to align in time and space the different satellite products. MODIS provides granule data at 1 km spatial resolution but only twice a day during the daytime (Terra from 14:30 to 15:00 UTC and Aqua 18:00 18:30 UTC). Thus, several rainfall events from different days were used to combine MODIS with GOES data, which are given at 4 km spatial resolution at every 15 minutes. The Lindsey-Grasso algorithm is adopted to estimate the visible reflectance 0.65 μm and near infrared 3.9 μm reflectances from GOES data. The droplet effective radius obtained from MODIS at 1 km resolution will be aggregated to correlate with near infrared reflectance (albedo 3.9 μm) from GOES data. Puerto Rico is the ideal testbed to study the warm raining clouds, since warm rain usually occurs in low-level liquid water clouds with no ice-phase process and also because Puerto Rico is heavily affected by rainfall due to warm-top convective processes that are induced by local sea breeze- and/or orographic features. The ceilometer shows that some of the local convective storms developed in the western part of Puerto Rico are below 3 km.