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Validation of Satellite-based Rainfall Estimates for Severe Storms (Hurricanes)

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Severe storms such as hurricanes and tornadoes cause devastating damages, almost every year, over a large section of the United States. More accurate forecasting intensity and track of a heavy storm can help to reduce if not to prevent its damages to lives, infrastructure, and economy. Estimating accurate high resolution quantitative precipitation (QPE) from a hurricane, required to improve the forecasting and warning capabilities, is still a challenging problem because of physical characteristics of the hurricane even when it is still over the ocean. Satellite imagery seems to be a valuable source of information for estimating and forecasting heavy precipitation and also flash floods, particularly for over the oceans where the traditional ground-based gauge and radar sources cannot provide any information. To improve the capability of a rainfall retrieval algorithm for estimating QPE of severe storms, its product is evaluated in this study.

High (hourly 4km x 4km) resolutions satellite infrared-based rainfall products, from the NESDIS Hydro-Estimator (HE) and also PERSIANN (Precipitation Estimation from Remotely Sensed Information using an Artificial Neural Networks) algorithms, have been tested against NEXRAD stage-IV and rain gauge observations in this project. Three strong hurricanes: Charley, Jeanne, and Frances that caused devastating damages over Florida in the summer 2004 and also from summer 2005 hurricane Katrina, hurricane Wilma, and hurricane Ophelia have been considered to be investigated. Preliminary results demonstrate that for all hurricanes except for hurricane Charley, HE tends to underestimate rain rates especially when NEXRAD shows a heavy storm. In hurricanes Frances, Jeanne, and Wilma there are picks of heavy storm, which HE shows a big underestimation on those picks. In hurricane Charley HE tends to overestimate the amount of storm in general.