

A Combined IR and Lightning Rainfall Algorithm for Application to GOES-R

**Robert Adler
Weixin Xu
Nai-Yu Wang**

**ESSIC/CICS
University of Maryland**

A technique is developed and tested to estimate convective system rainfall from a combination of satellite infrared and lightning information that could be applied to GOES-R ABI and GLM data. The algorithm is developed and tested using seven years (2002-2008) of TRMM measurements over the southern United States during the warm season. Lightning information is coupled with a modified IR-based Convective/Stratiform Technique (CST) [Adler and Negri, 1988] and produces a lightning-enhanced CST (CSTL). Both CST and CSTL are then applied to the training (2002-2004) and independent (2005-2008) datasets. In general, this study shows significant improvement over the IR-only rainfall estimates (in terms of rain area, intensity, and volume) through the addition of lightning information. The CST can generally identify the heavy (convective) and light rain regions, while CSTL further identifies convective areas that are missed by CST, removes convective cores that are incorrectly defined by CST, and provides more dynamic range in detecting extremely heavy precipitation. Specifically, CSTL improves the convective detection by about 10% and reduces the convective false alarm rate by more than 30%. Similarly, CSTL improves the CST in the overall estimate of instantaneous rainfall rate by about 20%, especially for heavy precipitation. The CST and CSTL is also compared to examples of the operational GOES IR algorithm.

This study clearly establishes the potential value of GLM data to improve rain estimation from geosynchronous orbit using GOES-R.