



## **LMODEL: A Multi-Sensor Satellite Precipitation Algorithm Using Cloud Development Modeling and Model Updating**

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This paper describes the development of a physically-based multi-sensor satellite rainfall monitoring methodology employing a conceptual cloud-development model. The LMODEL (Lagrangian Model) algorithm uses geostationary infra-red imagery to characterise processes influencing cloud growth and dispersal, with separate representations for convective and stratiform elements. These data drive a high-resolution semi-Lagrangian cellular model of raincloud development that is further updated against rainfall estimates from available microwave (MW) sensor overpasses using a combination of dynamic calibration and Kalman Filter approaches. A multi-resolution cloud tracking algorithm enables cloud advection to be traced to near geostationary pixel resolution while a specially developed empirical methodology is used to co-locate the MW satellite data to the high resolution model cells.

The LMODEL algorithm has been implemented for the continental United States. Validations against both ground radar and independent satellite MW rainfall observations indicate that the algorithm shows considerable potential to generate very high resolution (0.25-degree hourly) rainfall estimates. LMODEL shows considerable robustness with respect to available MW coverage, being able to produce effective estimates in MW-data-poor areas and times while being capable of fully utilising high density observations, such as will be provided by GPM.