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## Improving Precipitation Retrieval by Brightness Temperature Temporal Variation ( $\Delta$ TB): Definition, Computation, and Application

Yalei You<sup>1</sup>, Christa Peters-Lidard<sup>2</sup>, Stephen Munchak<sup>2</sup>, and Sarah Ringerud<sup>1</sup>

<sup>1</sup>University of Maryland, ESSIC, United States of America (yyou@umd.edu)

<sup>2</sup>Goddard Space Flight Center, NASA, United States of America

Current microwave precipitation retrieval algorithms utilize the instantaneous brightness temperature (TB) from a single satellite to estimate the precipitation rate. This study proposed to add the time-dimension into the precipitation estimation process by using the TB (or emissivity) temporal variation ( $\Delta$ TB or  $\Delta$ e) derived from the Global Precipitation Measurement (GPM) microwave radiometer constellation. Results showed that (1)  $\Delta$ TB can improve the precipitation estimation over the cold surfaces (i.e., snow-covered region) through minimizing the microwave land surface emissivity's influence; (2)  $\Delta$ e under the clear-sky conditions can accurately estimate the daily rainfall accumulation; and (3)  $\Delta$ TB can be used to identify the liquid raindrop signature over the low surface emissivity areas. This study highlights the importance of maintaining the current passive microwave satellite constellation.