

Improving Cross-Track Scanning Radiometers' Precipitation Retrieval over Ocean by Morphing

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ABSTRACT: Previous studies showed that conical scanning radiometers greatly outperform cross-track scanning radiometers for precipitation retrieval over ocean. This study demonstrates a novel approach to improve precipitation rates at the cross-track scanning radiometers' observation time by propagating the conical scanning radiometers' retrievals to the cross-track scanning radiometers' observation time. The improved precipitation rate is a weighted average of original crosstrack radiometers' retrievals and retrievals propagated from a conical scanning radiometer. The cross-track scanning radiometers include the Advanced Technology Microwave Sounder (ATMS) on board the SNPP satellite and four Microwave Humidity Sounders (MHSs). The conical scanning radiometers include the Advanced Microwave Scanning Radiometer 2 (AMSR2) and three Special Sensor Microwave Imager/Sounders (SSMISs), while the precipitation retrievals from the Global Precipitation Measurement (GPM) Microwave Imager (GMI) are taken as the reference. Results show that the morphed precipitation rates agree much better with the reference. The degree of improvement depends on several factors, including the propagated precipitation source, the time interval between the cross-track scanning radiometer and the conical scanning radiometer, the precipitation type (convective versus stratiform), the precipitation events' size, and the geolocation. The study has potential to greatly improve high-impact weather systems monitoring (e.g., hurricanes) and multisatellite precipitation products. It may also enhance the usefulness of future satellite missions with cross-track scanning radiometers on board.