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Estimating accuracy in optimal deconvolution of synthetic AMSR-E observations

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Abstract

Optimal deconvolution (ODC) utilizes the footprint overlap in microwave observations to estimate the earth's brightness temperatures (T_B). This paper examines the accuracy of ODC-estimated T_B compared with a standard averaging technique. Because brightness temperatures cannot be independently verified, we constructed synthetic True T_B for accuracy assessment. We assigned T_B at a high spatial resolution (1 km) grid and computed the True T_B by spatial averaging of the assigned T_B to a lower resolution earth grid (25 km), selected to match the resolution of products generated from the Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E). We used the sensor antenna response function along with the 1-km assigned T_B to generate synthetic observations at AMSR-E footprint locations. These synthetic observations were subsequently deconvolved in the ODC technique to estimate T_B at the lower resolution earth grid. The ODC-estimated T_B and the simple grid cell averages of the synthetic observations were compared with the True T_B allowing us to quantify the efficacy of each technique. In areas of high T_B contrast (such as boundaries of water bodies), ODC performed significantly better than averaging. In other areas, ODC and averaging techniques produced similar results. A technique similar to ODC can be effective in delineating water bodies with significant clarity. That will allow microwave observations to be utilized near the shorelines, a trouble spot for the currently used averaging techniques.

Keywords: Optimal; Deconvolution; Microwave; Radiometer; AMSR-E; Synthetic