ASSIMILATION OF SYNTHETIC GOES-R AND REAL MSG RADIANCES IN CLOUDY CONDITIONS USING AN ENSEMBLE-BASED METHOD

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ABSTRACT

Observations from current and future satellite missions could significantly improve our knowledge about atmospheric processes. In particular, cloud-sensitive satellite observations from the future Geostationary Operational Environmental Satellite, generation R (GOES-R) could improve our knowledge about clouds. Our goal is to develop a data assimilation method that will be able to extract maximum information from the GOES-R observations in cloudy conditions and to improve analysis and forecast of clouds. To define "maximum information" we employ information measures based on the Shannon information theory. According to the information theory, observations are expected to bring most information in the areas of largest forecast uncertainty. The Weather Research and Forecasting (WRF) model and the Maximum Likelihood Ensemble Filter (MLEF) data assimilation approach are used in this study. We assimilate synthetic radiances from the 10.35 μm channel of the GOES-R Advanced Baseline Imager (ABI) and real METEOSAT Second Generation (MSG) radiances at 10.80 μm (as real data proxies for the GOES-R 10.35 μm radiances). The experimental results are examined for a case of an extratropical cyclone named Kyrill (January 2007), which is known for producing unusually strong winds with widespread damage and fatalities in Western Europe. The data assimilation problem for this case is especially challenging: there is a large error in the model-simulated radiances due to incorrect location of the clouds (shifted clouds), which is difficult to eliminate. Nevertheless, the data assimilation results indicate a potential of the future GOES-R data to significantly reduce these errors.