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Progress Toward a Multiple Input Integrated Pole-to-Pole Global CMORPH

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A test system is being developed at NOAA Climate Prediction Center (CPC) to produce a CMORPH, IR-based, and model integrated high-resolution precipitation estimation on a 0.05olat/lon grid covering the entire globe from pole to pole. Experiments have been conducted for a summer Test Bed period using data for July and August of 2009.

The pole-to-pole global CMORPH system is built upon the Kalman Filter based CMORPH algorithm of Joyce and Xie (2011). First, retrievals of instantaneous precipitation rates from passive microwave (PMW) observations aboard nine low earth orbit (LEO) satellites are decoded and mapped onto a 0.05olat/lon grid over the globe. The mapped PMW retrievals are then calibrated utilizing a PDF matching technique against a reference field, the TRMM TMI-based PMW retrievals over tropics. The calibrated PMW precipitation estimates are then spatially propagated forward and backward in time, using precipitating cloud motion vectors, from their observation time to the next PMW observation. The PMW estimates propagated in both the forward and backward directions are then combined with IR-based precipitation estimates under the Kalman Filter framework, with weights defined based on previously determined error statistics dependent on latitude, season, surface type, and temporal distance from observation time.

The motion vectors for the precipitating cloud systems are defined using information from both satellite IR observations and precipitation fields generated by the NCEP Climate Forecast System Reanalysis (CFSR). To this end, motion vectors are first computed for the CFSR hourly precipitation fields through cross-correlation analysis of consecutive hourly precipitation fields on the global T382 (∼35km) grid. In a similar manner, separate processing is also performed on satellite IR-based precipitation estimates to derive motion vectors from observations. A blended analysis of precipitating cloud motion vectors is then constructed through the combination of CFSR and satellite-derived vectors utilizing a two-dimensional optimal interpolation (2D-OI) method, in which CFSR-derived motion vectors are used as the first guess and subsequently satellite derived vectors modify the first guess. Weights used to generate the combinations are defined under the OI framework as a function of error statistics for the CFSR and satellite IR based motion vectors.

Performance of the pole-to-pole global CMORPH and its key components, including combined PMW (MWCOMB), IR-based, and model precipitation, as well as model-derived, IR-based, and blended precipitation motion vectors, will be examined against NSSL Q2 radar observed precipitation estimates over CONUS, Finland FMI radar precipitation, and a daily gauge-based analysis including daily Canadian surface reports over global land. Detailed results will be reported at the EGU Meeting.