



Impact of SMOS soil moisture data assimilation on NCEP-GFS forecasts

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Soil moisture is one of the few critical land surface state variables that have long memory to impact the exchanges of water, energy and carbon between the land surface and atmosphere. Accurate information about soil moisture status is thus required for numerical weather, seasonal climate and hydrological forecast as well as for agricultural production forecasts, water management and many other water related economic or social activities. Since the successful launch of ESA's soil moisture ocean salinity (SMOS) mission in November 2009, about 2 years of soil moisture retrievals has been collected. SMOS is believed to be the currently best satellite sensors for soil moisture remote sensing. Therefore, it becomes interesting to examine how the collected SMOS soil moisture data are compared with other satellite-sensed soil moisture retrievals (such as NASA's Advanced Microwave Scanning Radiometer –AMSR-E and EUMETSAT's Advanced Scatterometer – ASCAT)), in situ soil moisture measurements, and how these data sets impact numerical weather prediction models such as the Global Forecast System of NOAA-NCEP. This study implements the Ensemble Kalman filter in GFS to assimilate the AMSR-E, ASCAT and SMOS soil moisture observations after a quantitative assessment of their error rate based on in situ measurements from ground networks around contiguous United States. in situ soil moisture measurements from ground networks (such as USDA Soil Climate Analysis network – SCAN and NOAA's U.S. Climate Reference Network –USCRN) are used to evaluate the GFS soil moisture simulations (analysis). The benefits and uncertainties of assimilating the satellite data products in GFS are examined by comparing the GFS forecasts of surface temperature and rainfall with and without the assimilations. From these examinations, the advantages of SMOS soil moisture data products over other satellite soil moisture data sets will be evaluated. The next step toward operationally assimilating soil moisture and other land observations into GFS will also be discussed.