Satellite products in the Rapid Update Cycle and plans for the Rapid Refresh

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The Rapid Update Cycle (RUC) is an hourly data assimilation and short range numerical forecast system run operationally at the National Centers for Environmental Prediction (NCEP) since 1994. The concept of rapid updating means that every hour a new analysis and several short range forecasts are performed using observations collected during the previous hour. Because the process is repeated every hour with fresh data, there is a high demand to incorporate as many observations as possible into the analysis. Therefore the RUC uses a large variety of data in its three-dimensional variational analysis (3DVAR) scheme, including, among others, satellite products: GOES/NESDIS precipitable water, cloud-top pressure and temperature, cloud drift winds, and SSM/I precipitable water. It will be demonstrated how these measurements are used in wind, moisture, and cloud analyses within the RUC. Based on the success of the RUC over the contiguous United States has prompted us to extend its geographical coverage and at the same time to introduce a new generation of RUC called the Rapid Refresh (RR). The new domain will be about four times larger than the present one and will extend hourly assimilation and short-range forecasting to Alaska, Canada, and to the Western Atlantic. RR will also use one of the Weather Research and Forecasting (WRF) model cores for its numerical prediction, and Gridpoint Statistical Interpolation (GSI) as its variational analysis scheme.

GSI is already adopted at ESRL/GSD, and its development continues in close cooperation with the Environmental Modeling Center, one of the National Centers for Environmental Prediction. Because much of the enlarged domain for the Rapid Refresh is much less densely covered by observations than the contiguous United States, direct assimilation of satellite radiances, a capability of the GSI, will have a big impact on the analysis. Preliminary results from RR experiments will be presented at the conference.