Geophysical Research Abstracts, Vol. 8, 04064, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04064

Use of GPS radio occultation observations in the NOAA/JCSDA data assimilation system.

L. Cucurull (1,2), R. J. Purser (1), and J.C. Derber (1)

(1) National Centers for Environmental Prediction, Environmental Modeling Center, Washington DC, USA, (2) University Corporation for Atmospheric Research, Boulder, CO, USA.

GPS radio occultation (RO) data are provided by receivers onboard low Earth orbiting (LEO) satellites. As the radio signals transmitted by the GPS satellites pass through the atmosphere, they are refracted due to the transverse density gradients along the path. As an LEO satellite sets or rises behind the Earth's limb relative to the GPS satellite, the onboard GPS receiver takes measurements of the phase and amplitude of the GPS signals. These measurements together with the precise knowledge of the positions and velocities of the GPS and LEO satellites can be used to derive quasi-vertical profiles of bending angle. Under the assumption of local spherical symmetry, refractivity profiles can be derived from bending angle profiles through Abel transform inversions.

The COSMIC (Constellation Observing System for Meteorology, Ionosphere and Climate) mission will launch six small satellites in March 2006, each carrying a GPS occultation receiver. COSMIC will provide 2,500 $\sim$ 3,000 RO soundings per day uniformly distributed around the globe in near real time. The US National Weather Service (NOAA/NWS) is planning to assimilate GPS RO observations from the COSMIC mission into its operational data assimilation system.

The assimilation of the GPS RO data require the development of an appropriate forward model and its corresponding adjoint. The procedures necessary to assimilate profiles of refractivity have been implemented and tested. In this case, the linearization of the forward operator is adequate.

A more careful treatment is needed when assimilating observations of bending angle, as some approximations usually applied make the forward model highly nonlinear. In this regard, we have developed a bending-angle forward operator by using the

smoothed Lagrange-polynomial interpolators to assure the continuity of the forward model with respect to perturbations in model variables.

In this presentation, the basis of the GPS RO technique, and the mathematical aspects of the assimilation of profiles of bending angle, will be described.