

## **Adaptation of GPS radio-occultation observation operators to the presence of atmospheric horizontal gradients**

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Certain refinements are needed to improve the interpretation of GPS radio occultation (RO) measurements, in order to better validate other instruments' data, or for data assimilation experiments. The impact of accounting for horizontal refractivity gradients in the atmosphere has been investigated to characterize the subsequent sensitivity on bending angle and impact parameter retrievals. Magnitude and variability of the sensitivity of these two quantities will be presented.

Presently, the spherical symmetry of the atmosphere is assumed in practical Numerical Weather Prediction (NWP) applications. Thereby the center of sphericity is chosen as an invariant, regardless of the atmospheric state, and does not account for the presence of horizontal gradients.

We have performed a preliminary exploration of using the center of sphericity of the refractivity field, instead of that of the reference ellipsoid. A description and quantification of the differences found in the location of the center of curvature, and consequently on retrieved impact parameters and bending angles is shown.

Finally, we compare the statistics of bending angle comparisons (Observation-Background) for Environment Canada's atmospheric fields, with or without accounting for the presence of horizontal gradients and therefore displacements of the center of curvature of the refractivity field. Results are shown for several days of the year 2010 (different seasons) and for the Kompasu Typhoon (Sep 2010) event.