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Validation of the BPV$_{(n,\alpha)}$ method for the retrieval of Atmosphere Refractivity and Water Vapour Content by Radio Occultation Data

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The Boundary Profiles eValuation approach (BPV), applied both to the refractivity (n) and bending angles (α) revealed to be a very promising algorithm for the retrieval of Earth atmosphere profiles by GPS radio occultation data (GPS RO).

The BPV performs a fit of the bending angles of the outer troposphere layers -i.e. where the water vapour content is negligible and the GPS RO data are more reliable- by using an a-priori dry atmosphere model (Hopfield dry model). In the second step the dry a-priori model is extrapolated down to the ground after its key parameters have been estimated (surface pressure and temperature). Then the water vapour content is determined removing the dry contribution given by the model from the overall refractivity retrieved by GPS RO data and applying the well-known Smith & Weintraub relationship. The BPV can be applied directly to the bending angles as well. In this last case it is able to perform the inversion from the bending angles to refractivities in an alternative way to the Abel transform. The main advantage of the proposed approach is the possibility to derive the water vapor directly from the bending angles (or refractivity), without external information. Furthermore the BPV applied directly to the bending angles, avoids that Abel inversion be applied. So it is an intriguing matter to investigated if such alternative approach is able to get out, together with the Abel inversion, its main drawbacks like, for example, the negative bias through super-refractivity layers of the atmosphere.

So for all these reasons we plan to perform and show the results of a wide and exhaustive validation activity of the BPV approach. For such validation we will make use of the CHAMP bending angle and refractivity data (Version 005 from GFZ). These data are obtained by applying the FSI (Full Spectrum Inversion) in order to minimize the effects of atmospheric multipath in the lower tropopshere. Water vapor profiles are derived using the BPV method and a direct technique (one standard GFZ retrieval method). Both sets of occultation water vapor profiles then will be compared with radiosonde measurements and NCEP analysis data.