

Analysis of RO data retrieved from the Wigner distribution function

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We discuss the retrieval of bending angles and refractivities from the Wigner distribution function (WDF). The WDF maps a 1D wave function to a 2D time-frequency representation in phase space similar to a radio holographic analysis. Using this representation it is possible to identify atmospheric multipath. This is similar to the standard radio holographic technique based on the spectrum analysis in small sliding apertures. However, the WDF is given by a global integral transform which results in a higher resolution. We present some examples and simulations for COSMIC and GRAS RO data which show that WDF allows for a sharp localization of the details of bending angle profiles.

We perform a statistical analysis of bending angles and refractivities and compare results obtained from WDF and canonical transform (wave optics) retrievals. The behavior in the lower troposphere is characterized by comparing to ECMWF global fields. The investigations show that the results obtained from the two different retrieval methods are in agreement. Small differences are noticeable in the lower troposphere and we discuss to what extent they are linked to the structural uncertainty in the retrievals.