CANONICAL TRANSFORM METHODS FOR RADIO OCCULTATION DATA

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The idea of transforming radio occultation measurements from the space representation to the impact parameter representation was recently shown to be a powerful retrieval method. This tranformation is given by a specific canonical transform whose generating function dictates the form of the Fourier integral operator performing the mapping of the field to the ray coordinate representation. It turns out that back-propagation is an immanent part of the canonical transform. Simulations performed with global atmospheric fields for cases with strong water vapor gradients that give rise to multipath propagation show that the canonical transform method can unfold the multipath behavior, thereby leading to more accurate retrieved quantities.
In the present work, we study a canonical transform that directly maps the measured field to the impact parameter representation without first carrying out a back-propagation. This canonical transform is determined to first order in a small parameter that measures the deviation of the satellite orbit from a circle. When the parameter is equal to zero, i.e., for circular orbits, then our canonical transform simply reduces to a Fourier transform. In the general case, the form of the generating function is such that it does not directly allow an implementation as an FFT-like algorithm. We are currently investigating the possibility of decomposing the mapping in order to obtain a fast, efficient numerical implementation.