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Additional curvature effect of the ionosphere and the electrically neutral atmosphere

Dudy D. Wijaya
Institute of Geodesy and Geophysics, Vienna University of Technology (dudy.wijaya@tuwien.ac.at)

In the present development of tropospheric propagation modeling for microwave observations, the propagation effects of microwave signals of different wavelengths through the ionosphere are not considered. Different microwave signals propagating through the electrically neutral atmosphere are treated to propagate along an identical path. Thus, following the non-dispersive properties of the electrically neutral atmosphere for microwave signals, this leads to the development of the same tropospheric model for different microwave observations. In an opposite manner, the development of ionospheric propagation modeling does not consider the propagation effects through the electrically neutral atmosphere.

Microwave signals, which are transmitted from a satellite or a quasar, propagate through the ionosphere and the electrically neutral atmosphere. Hence, it is important to evaluate the atmospheric propagation effects along the complete propagation path combining the ionosphere and the electrically neutral atmosphere. I found that by properly considering the complete atmospheric propagation effects, a new additional correction term, namely, the additional curvature effect, needs to be considered in calculation of the propagation effects of the ionosphere and the electrically neutral atmosphere. Furthermore, I have developed a new atmospheric correction formula that contains a term for calculating the additional curvature effect.

In this presentation, investigation on the additional curvature effect and its implications to the ionospheric and tropospheric propagation modeling for microwave observations are discussed.