



Simulation and mitigation of higher-order ionospheric errors in PPP

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We developed a rapid and precise algorithm to compute ionospheric phase advances in a realistic electron density field. The electron density field is derived from a plasmaspheric extension of the International Reference Ionosphere (Gulyaeva and Bilitza, 2012) and the magnetic field stems from the International Geomagnetic Reference Field. For specific station locations, elevation and azimuth angles the ionospheric phase advances are stored in a look-up table. The higher-order ionospheric residuals are computed by forming the standard linear combination of the ionospheric phase advances.

In a simulation study we examine how the higher-order ionospheric residuals leak into estimated station coordinates, clocks, zenith delays and tropospheric gradients in precise point positioning. The simulation study includes a few hundred globally distributed stations and covers the time period 1990-2015. We take a close look on the estimated zenith delays and tropospheric gradients as they are considered a data source for meteorological and climate related research. We also show how the by product of this simulation study, the look-up tables, can be used to mitigate higher-order ionospheric errors in practise.

Gulyaeva, T.L., and Bilitza, D. Towards ISO Standard Earth Ionosphere and Plasmasphere Model. In: *New Developments in the Standard Model*, edited by R.J. Larsen, pp. 1-39, NOVA, Hauppauge, New York, 2012, available at https://www.novapublishers.com/catalog/product_info.php?products_id=35812