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On the impact of different mapping functions on geodetic and tropospheric products from VLBI data analysis

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Due to the highly volatile character of the neutral atmosphere, the modeling of the related propagation delay is challenging. This poses the most prominent limitation in the precision and accuracy of the parameters estimated in very long baseline interferometry (VLBI) data analysis. Hence, it is of paramount importance that all parameters involved in the process to describe the atmosphere induced delay effects such as mapping functions or gradients are rigorously accounted for.
In this work, we assess the impact of different mapping functions (MFs) in the analysis of the 24-hour VLBI sessions from 2002 onwards. Besides the original Vienna mapping functions (VMF1), which are based on data from ECMWF operational analysis, we apply MFs based on this concept but utilizing data from ray tracing in CMC's GDPS (UNB-VMF1). In addition to these we test the concept of advanced mapping using ECMWF's ERA-Interim reanalysis based on rigorous ray-tracing approach. For the parameter estimation we use the VieVS@GFZ software applying the classical Gauß-Markov model.
The purpose of this study is twofold. We investigate the effect of these analysis options on the baseline length repeatability as well as on the time series of station, source coordinates and Earth orientation parameters. As far as the tropospheric products are concerned, estimated zenith wet delays and linear horizontal gradients are compared with the ray traced ones from the aforementioned models.

Primary author: Mr BALIDAKIS, Kyriakos (Technische Universität Berlin, Institute of Geodesy and Geoinformation Science, Berlin, Germany)

Co-authors: Dr ZUS, Florian (Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum GFZ, Department of Geodesy and Remote Sensing, Potsdam, Germany); Prof. SCHUH, Harald (Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum GFZ, Department of Geodesy and Remote Sensing, Potsdam, Germany); Dr DOUŠA, Jan (Geodetic Observatory Pecný of the Research Institute of Geodesy, Topography and Cartography, Czech Republic); Dr KARBON, Maria (Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum GFZ, Department of Geodesy and Remote Sensing, Potsdam, Germany); Dr HEINKELMANN, Robert (Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum GFZ, Department of Geodesy and Remote Sensing, Potsdam, Germany); Mr BENEDIKT, Soja (Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum GFZ, Department of Geodesy and Remote Sensing, Potsdam, Germany); Dr GLASER, Susanne (Technische Universität Berlin, Institute of Geodesy and Geoinformation Science, Berlin, Germany); Dr NILSSON, Tobias (Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum GFZ, Department of Geodesy and Remote Sensing, Potsdam, Germany)

Presenter: Mr BALIDAKIS, Kyriakos (Technische Universität Berlin, Institute of Geodesy and Geoinformation Science, Berlin, Germany)

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