Geophysical Research Abstracts
Vol. 14, EGU2012-10431-1, 2012
EGU General Assembly 2012

Geometry of the refractivity field for GNSS signals propagation

C. Desjardins (1), P. Gegout (2), L. Soudarin (3), and R. Biancale (4)

(1) CNES/CLS, Ramonville St. Agne, France, (2) CNRS/GET/GRGS, Toulouse, France, (3) CLS, Orbitography and Geodesy, Ramonville St. Agne, France, (4) CNES/GET/GRGS, Toulouse, France

In order to improve the modeling of the propagation of GNSS electromagnetic signals through the neutral atmosphere and achieve millimetre accuracy at low elevation, the GRGS (Groupe de Recherche de Géodésie Spatiale) in collaboration with CLS (Collecte Localisation Satellite) has developed a new set of mapping functions called AMF (Adaptive Mapping Functions) for applications in geodesy (GNSS and DORIS orbits determination and stations positioning), altimetry or InSAR. The idea is to use high resolution observational data assimilations produced by the ECMWF (European Center for Medium-range Weather Forecast) to model tropospheric delays from ray tracing for all elevations and azimuths. AMF are used to fit tropospheric ray-traced delays using a few numbers of coefficients for a given site at a given time.

This study presents the error's order of magnitude of several parts of this methodology.

First, we examine methods to properly describe in geodetic coordinates, the geometry of the refractivity field provided by numerical weather model. We especially focus on the required transformations between meteorological vertical and horizontal discretizations and geodetic heights based on the conventions of WGS84 and the GTOPO 30 digital Earth's model topography.

In a second part, we discuss the mathematical representation of the shape of the physical Earth. We compare latitude and azimuthal dependency of a standard atmosphere for several geometries such that sphere, reference ellipsoid or osculating sphere of the reference ellipsoid. We show how the chosen assumption of the Earth's geometry modifies the computed slant tropospheric delays.