Combined global ionosphere maps from GPS and satellite altimetry

S. Todorova, T. Hobiger, H. Schuh

Institute of Geodesy and Geophysics, Vienna University of Technology, Vienna, Austria
(stodo@mars.hg.tuwien.ac.at)

The ionosphere is the upper part of the Earth´s atmosphere, where the free-electron and ion density is high enough to influence the propagation of electromagnetic waves. The ionisation is caused mainly by solar radiation and its intensity varies strongly with time, with geographical location, and with certain solar-related ionospheric disturbances. The ionosphere is a dispersive medium for the observables of all space geodetic techniques operating in the microwave band and disturbs both their group and phase velocity. The effect is in first approximation proportional to the so-called Slant Total Electron Content (STEC) along the ray path and can be corrected if the measurements are carried out at two distinct frequencies, which also provides information about the parameters of the ionosphere in terms of TEC values. In this study the following space geodetic techniques are used for estimation of the ionosphere – GPS and satellite altimetry missions. Each of these techniques has its specific characteristics influencing the derived ionosphere parameters. The study aims at the development of an improved combined model of the ionosphere, which should make best use of the advantages of each particular space geodetic technique. The combination is done by applying a least-squares adjustment (Gauss-Markov model) on each set of observations and combining the normal equations by adding the relevant matrices. The integrated ionosphere model is expected to be more accurate and reliable than the results derived by the two individual methods so far. As a basis for the combination global ionospheric maps from GPS data in two hours intervals have been created and some first tests of combining of those maps with altimetry data will be shown.