The International Beacon Satellite Symposium *BSS2010*
P. Doherty, M. Hernández-Pajares, J.M. Juan, J. Sanz and A. Aragon-Angel (Eds)
Campus Nord UPC, Barcelona, 2010

APPLYING SPATIAL INTERPOLATION METHODS TO MONITOR THE IONOSPHERE ABOVE NORTHERN EUROPE

Sebastian Schäfer[*] and Mohammed Ouassou[*]

[*] Norwegian Mapping Authority Geodetic Institute
NO-3507 Hoenefoss, Norway
e-mail: Sebastian.Schaefer@statkart.no
Web page: http://www.statkart.no/

Key words: Ionosphere, VTEC, Kriging, GIVE.

Abstract: The interaction of the solar and the terrestrial magnetic field is reflected into the origin and movement of plasma irregularities within the polar ionosphere. The corresponding changes of plasma density and temperature in this region causes scintillations in the transmission of GNSS signals, which lead to significant disturbances for navigation and positioning systems. Using the information of GPS satellites in combination with a dense network of around 100 ground receivers distributed in northern Europe, the Norwegian Mapping Authority (NMA) is able to produce detailed overview maps of the Vertical Total Electron Content (VTEC). Taking advantage of additional ground receivers at remote island, such as Svalbard, Bjornya and Jan Mayen, an extension of the map region between 30ºW and 40ºE in longitude and 55ºN and 85ºN in latitude is possible. Above the norwegian mainland a spatial resolution of up to 2º in each direction can be supported. The number of considered ground stations leads to a large number of ionospheric pierce points (IPP) between GPS satellites and the receivers. That allows the application of spatial linear interpolation algorithms, such as IDW and Kriging, in order to calculate the vertical delay accurately at the Ionospheric Grid Points (IGP) defined above. In addition the Grid Ionospheric Verical Error (GIVE) is determined, which rep- resents an upper error bound for the estimated VTEC values at the given IGP positions. The NMA model is tested in several case studies during time periods of both quiet and strong solar activity. Thus, the NMA model is capable to deliver detailed information about the ionospheric conditions and the integrity of the interpolated VTEC results at high latitudes, which is of particular interest for users of GNSS applications.