2010 Beacon Satellite Symposium
P. Doherty and M. Hernandez-Pajares (Eds.)
CIMNE, Barcelona, 2009

TEC RECONSTRUCTION USING DUAL FREQUENCY MODERNIZED GPS (L1/L5) AND GALILEO (E1/E5A) MEASUREMENTS

RENE WARNANT[*†], MATTHIEU LONCHAY[†], JUSTINE SPITS[*], BENOIT BIDAINE[†], STANIMIR STANKOV[*] AND GILLES WAUTELET[*]

[*] Royal Meteorological Institute of Belgium (RMI)
Avenue Circulaire, 3
B-1180 Brussels, Belgium
e-mail: Rene.Warnant@oma.be, web page: http://swans.meteo.be

[†] University of Liege (ULg)
Geodesy and Satellite Positioning
Allée du 6 Août, 17
B-4000 Liege, Belgium
Web page: http://www.geo.ulg.ac.be

Key words: TEC, Galileo, Modernized GPS.

Summary. GPS dual frequency L1/L2 measurements have been used for many years to reconstruct the ionosphere Total Electron Content and to detect small-scale irregular structures in the ionospheric plasma [1]. TEC is usually computed by forming the geometry-free combination of L1/L2 phase measurements. Most of the existing techniques use the geometry-free combination of code measurements to solve the non-integer geometry-free ambiguity. This methodology requires the computation of satellite and receiver hardware biases. In addition, the quality of the ambiguity resolution process strongly depends on code multipath. New signals from Galileo and from modernized GPS offer new opportunities for TEC reconstruction. First attempts to compute TEC using triple frequency measurements from modernized GPS (L1/L2/L5) and from Galileo (E1, E5a, E5b) give very promising results [2] but, at the present time, only a few triple frequency GPS/Galileo receivers are available. The University of Liege has purchased two Septentrio PolaRx3G receivers which allow tracking GPS L1/L5 and Galileo E1/E5a signals. These receivers have been installed at the Geophysical Observatory of Dourbes (50.1°N, 4.6° E) and are continuously tracking all GPS and Galileo satellites in view (including GPS SVN49/PRN01, Giove A and Giove B) since November 2009. The paper analyzes the added value of L1/L5 and E1/E5a geometry free combinations and of the new GPS and Galileo signals for TEC reconstruction. It discusses the influence of multipath and of SVN49/PRN1, Giove A and Giove B hardware biases.

REFERENCES

[1] R. Warnant R**.** and E. Pottiaux, "The increase of the ionospheric activity as measured by GPS", *Earth, Planets and Space*, **52**, 11, 1055-1060 (2000).

[2] J. Spits and R. Warnant, "Total Electron Content monitoring using triple frequency GNSS data: a three-step approach", *J. of Atmospheric and Solar-Terrestrial Physics*, **70**, 1885-1893, doi:10.1016/j.jastp.2008.03.007 (2008)