



GNSS-based Regional Ionosphere Modeling over Bosnia and Herzegovina

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The ionospheric delay is one of the main error-sources in applications that rely on Global Navigation Satellite System (GNSS) observations. Dual-frequency receivers allow the elimination of the major part of the ionospheric range error by forming an ionosphere-free linear combination. Although global models, broadcasted by satellite systems, are available, single-frequency mass-market receivers are not able to correct the signal's delay with sufficient accuracy. Thus, precise regional models are necessary for achieving high accuracy in GNSS positioning and navigation.

This study deals with regional modeling of the ionospheric Total Electron Content (TEC) over Bosnia and Herzegovina. Ionosphere modeling is conducted using dual frequency measurements from GNSS (GPS+GLONASS) permanent stations in Bosnia and Herzegovina and nearby, which belong to the Bosnia and Herzegovina Positioning Service (BIHPOS) and the European Permanent Network (EPN). The chosen network comprises 9 BIHPOS stations circularly located about 80 km from the central permanent station in Sarajevo.

The regional model is based on phase-leveled geometry-free observables, which enable the estimation of corrections for single frequency GNSS ranges at the sub-dm level. Modeling of the GNSS-derived total electron content is performed with single-layer model, using Taylor series expansions of degree and order 2 in coordinate-differences to a chosen reference point as appropriate technique to describe local TEC variations.

The model's applicability is tested in respect to global ionospheric maps (GIM) issued by the Center for Orbit Determination in Europe (CODE), empirical model IRI2015 (International Reference Ionosphere) and the models developed under the project Regiomontan at Vienna University of Technology.

This study aims to establish the first GNSS-based regional ionospheric model utilizing data of the BIHPOS GNSS permanent stations and the European Permanent Network in Bosnia and Herzegovina and Western Balkan.