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Estimation of GNSS instrumental biases and satellite altimetry time delays when determining global ionosphere maps

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For extracting information about the Total Electron Content (TEC) in the ionosphere from Global Navigation Satellite System (GNSS) measurements, usually the so-called geometry-free linear combination is used. It is formed by subtracting simultaneous observations at the two frequencies L1 and L2. The removal of all frequency-independent effects leads to an observable, which contains solely the ionospheric refraction and the inter-frequency hardware delays, associated with the satellites and the receivers. When modelling the ionosphere from GNSS data, the derived ionospheric parameters are affected by these instrumental biases. Therefore, it is necessary to estimate them as additional unknowns, also called Differential Code Biases (DCB). In this study Global Ionosphere Maps (GIM) from GNSS data are created. Additionally, satellite altimetry observations are introduced, which helps to compensate the insufficient GNSS coverage over the oceans. The combination of the data from about 200 GNSS stations and the TEC data derived by the satellite altimetry mission Jason-1 is performed on the normal equation level. This approach allows the independent computation of the receiver and satellite DCB, and moreover, a time delay of the satellite altimetry observations can be estimated. The poster presents the obtained combined global ionosphere maps in two hours intervals and the estimated daily values of GNSS and satellite altimetry time biases.