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Assessing properties for near real-time estimations of the vertical total electron content of the ionosphere from GNSS data

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Erdogan et al. (2017) have recently developed a near real-time processing framework to estimate the global vertical total electron content (VTEC) of the ionosphere from GNSS data. In this approach VTEC is represented as a series expansion in terms of tensor products of compactly supported B-spline functions. It is well known that B-spline functions can be applied to heterogeneous distributed input data, because they can handle large data gaps, especially over the oceans, appropriately. The Kalman filter (KF) technique is applied to the pre-processed GNSS data immediately after acquisition; the estimation of the unknown parameters including the B-spline series coefficients of the VTEC representation as well as the differential code biases of the GNSS satellites and receivers is performed in near real time.

In this study, we compare the approach explained before with an inversion technique recently published by Farzaneh and Forootan (2017). This second approach is based on a series expansion in terms of spherical Slepian base functions in order to describe the horizontal ionospheric changes.

The main focus of our assessment is to show to what extent the selection of the base functions affects the result, namely the estimation of VTEC.