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GLOBAL VTEC MAPS BASED ON COMBINED GPS AND TOPEX/JASON MEASUREMENTS

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Abstract.

A variety of dual-frequency beacons orbiting the Erath are today used to characterize the spatial and temporal variability of important ionospheric parameters, such as the electron density (ED) and the total electron content (TEC). The conspicuous exponent of these family, the GPS and TOPEX/Poseidon (and its follow-on missions, Jason), are today fully integrated to the battery of observational tools used by the aeronomy community.

From the point of view of the global vertical TEC (vTEC) estimation, GPS and TOPEX or Jason offer complementary advantages that may help to overcome their individual weaknesses. Briefly speaking, the powerfulness of GPS relies upon its capability for providing a good temporal resolution (one hour or less) for describing the variability of the vTEC distribution worldwide; its major weakness are the need of involving some crude approximations for calibrating the satellite and receiver biases and to interpolate the vTEC in open ocean regions rather far from the observing sites. In spite of being not totally free of instrumental biases, TOPEX and Jason provide an almost direct and accurate measurement of the vTEC without involving model approximations, and their observations are just located over ocean regions where GPS observations are rather scarce; the major limitation is the quite long interval of approximately three months, needed for covering all geographic longitudes and local times with TOPEX or Jason observations.

In this contribution we present a method for combining GPS and TOPEX/Jason observation in a consistent model approximation, which exploits the complementary benefits of both techniques. Basically, TOPEX/Jason observations are used to improve the calibration of the GPS satellite and receiver instrumental biases, and to improve the vTEC interpolation in open ocean regions, while GPS observations are used to achieve high temporal resolution of the vTEC variability. The combination of both type of observations carefully account for their intrinsic precision and accuracy. Besides, we present some preliminary results and discus the improvement achieved with the GPS+TOPEX/Jason combination with respect to the classical GPS base approximation.