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Validation of the inferred ionospheric currents during a Sudden Impulse with GNSS TEC data over Italy.

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The definite identification of the characteristics of the geomagnetic response to Solar Wind (SW) pressure changes represents an interesting element of the magnetospheric dynamics that is also important in the Space Weather context. In the present analysis, we discriminate between magnetospheric (DL) and ionospheric (DP) contributions in the ground response comparing SEGMA array (South European Geomagnetic Array) and geostationary observations with the predictions of the Tsyganenko model for the different magnetospheric current systems (from the magnetopause, ring current, tail current, etc.) for different case events. To obtain the Ionospheric contribution we subtracted the field aligned currents (FAC) MFACE model (Model of FACs through Empirical Orthogonal Function analysis, He et al., [2012]) from the residual DP field at each ground station. Meaningful changes in the ionospheric currents reflect into meaningful variation of the total electron content in the ionosphere. Thus, to validate our approach in determining the ionospheric currents, we analyse calibrated TEC and TEC spatial gradients data over the Italian sites of the SEGMA array derived with a network of GNSS receivers, termed RING (Rete Integrata Nazionale GPS). RING is a dense network of about 180 stations covering the Italian territory, by means of which it is possible to obtain maps of TEC derived products with very fine spatial resolution (0.1˚x0.1˚, lat x long). The aim of this validation is to catch the correspondences between ionospheric current variations and the morphology and dynamics of the TEC in the mid latitude ionosphere on selected case events.