



Report on recent and planned activities of the International Space Weather Activity Team on Ionospheric Indices and Scales

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Ionospheric indices have a high potential to support and contribute to user requirements in ground and space-based radio system applications such as HF communication, GNSS based safe navigation, and precise point positioning. Given that the current NOAA space weather scales currently target the ionospheric impact on radio systems mainly for HF propagation (e.g., the radio wave blackout scale), there is a need to extend the SW scales for trans-ionospheric radio systems such as GNSS, intersatellite telecommunication, and remote sensing radars. Following the discussions at previous COSPAR assemblies, the International Space Weather Activity Team (ISWAT) G2B-04 [1], established in 2021, encourage studies and test runs to specify the effectiveness of different types of ionospheric indices and scales to fill the gap in the SW scales in particular for trans-ionospheric radio system applications.

Regularly organized online meetings enable intensive discussion on selected topics concerning ionospheric indices and scales and their use. Considering the growing capabilities of ionospheric measurements onboard satellites, the development of new indices and scales covering the entire globe are now possible, without the regional restrictions imposed by using ground-based observations alone. One of the challenges is how to combine the observations of ionospheric irregularities from a stationary ground-based platform and from a space-based LEO platform moving at ~8 km/s.

To review the specification of current indices and scales to characterize the perturbation degree of the ionosphere for different applications, the team are drafting compact fact sheets for numerous indices currently used. The initiative intends to provide a quick orientation for young scientists and customers.

Recently, the team has initiated a Coordinated Ionospheric Study on Scales and Indices (CISSI) to enable a comparison of the outcome of different index approaches based on identical data sets. Participants may contribute with studies on index approaches and/or related applications of their own choice on a best efforts basis. Participants may also contribute ground and/or space based GNSS data sets for creating a common database useable in the collaborative work. Besides the discussion at ISWAT meetings, the team members are encouraged to collaborate and present their results at international meetings and in journal publications.

The present CISSI activity focuses on two periods from 16-19 March 2015 (St. Patrick storm) and from 22-25 May 2015 (quiet reference). Predefined regions cover Europe, North- and South-America and Asia. The current data sets stored and hosted by data centers and research institutions in different countries contain ground based GNSS and vertical sounding data. This and further campaigns shall help to consolidate ionospheric space weather scales used in space weather services.

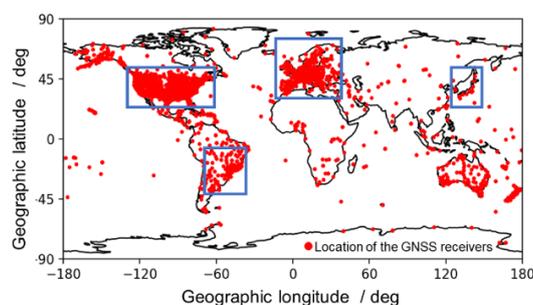


Figure 1. Schematic view of geographical regions selected for the CISSI campaign 2022