IONOSPHERIC DISTURBANCES OBSERVED OVER SOUTH AMERICA BY A MULTI-GNSS INDEX BASED ON TEC DATA

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We present an analysis of ionospheric responses to space weather drivers observed using a new version of the Disturbance Ionosphere Index (DIX), adapted to South America by Denardini et al (2020). The DIX is an index primarily developed to express the response due to abnormal Total Electron Content (TEC) changes related to geomagnetic storms (Jakowski et al., 2006). The present version of the DIX includes terms focused on improving its sensibility to a larger range of disturbances (e.g. TEC depletions due to Equatorial Plasma Bubbles [EPBs]), as well as an attempt to mitigate some daytime limitations. In addition, this methodology also includes the employment of data from at least two GNSS systems (e.g. GPS, GLONASS, and Galileo) in the TEC calculation, providing a better data coverage in South America, and expanding it to cover the whole Latin America and the Atlantic Ocean as described in Mendoza et al. (2019). Results of the Disturbance Ionosphere Index for South America (DIXSA) are presented and discussed in terms of an analysis of its time variation during cases of EPBs and some storm-related disturbances. Finally, the DIXSA results are displayed with the support of data obtained from some other instruments (e.g. ionosondes, magnetometers, and all-sky imagers).

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References:

Denardini, C. M., Picanço, G. A. S., Barbosa Neto, P. F., Nogueira, P. A. B., Carmo, C. S., Resende, L. C. A., … Bilibio, A. Vestena. (2020a). Ionospheric Scale Index Map Based on TEC Data for Space Weather Studies and Applications. Space Weather, (in Press).

Jakowski, N., Stankov, S. M., Schlueter, S., & Klaehn, D. (2006). On developing a new ionospheric perturbation index for space weather operations. Advances in Space Research, 38(11), 2596–2600. https://doi.org/https://doi.org/10.

Mendoza, L. P. O., Meza, A. M., & Aragón Paz, J. M. (2019). A multi-GNSS, multifrequency, and near-real-time ionospheric TEC monitoring system for South America. Space Weather, 17, 654–661. https://doi.org/10.1029/2019SW002187