# Dynamics of the ionosphere over Brazilian sector as probed by CSES-01 and Swarm satellites and ground-based observations during the August 2018 storm

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The geomagnetic storm occurred on 25 August 2018, under solar minimum conditions, is currently the strongest ever probed by the first China Seismo-Electromagnetic Satellite (CSES-01), launched on 2 February 2018. By integrating the in-situ measurements provided by CSES-01 (orbiting at altitude of 507 km) and by Swarm A satellite (orbiting at ca. 470 km) with ground-based observations (ionosondes, magnetometers and Global Navigation Satellite System receivers), we investigate the ionospheric response at low- and mid- latitudes over Brazil. Specifically, we focus on the electrodynamic disturbances driven by solar wind changes, causing modifications of the Equatorial Electrojet (EEJ). Our proposed multi-sensor technique analysis mainly highlights the variations in the topside and bottomside ionosphere, and the interplay between Prompt Penetrating Electric Fields and Disturbance Dynamo Electric Fields resulting in EEJ variations. Thanks to this approach and leveraging on the newly available CSES-01 data, we complement and extend what was recently investigated in the Western South American sector, by highlighting the significant longitudinal differences, which mainly come from the occurrence of a daytime counter-EEJ during both 25 and 26 August at Brazilian longitudes and during part of 26 August only in the Peruvian sector. In addition, the increased thermospheric circulation driven by the storm had an impact on the EEJ during the recovery phase of the storm. The observations at the CSES-01/Swarm altitudes, integrated with the ground-based ones, recorded signatures of Equatorial Ionospheric Anomaly (EIA) crests formation and modification during daytime in association with the positive ionospheric storm effects at mid-latitude. As an example of the analyses, Figure 1 reports the signatures of EIA crests in the topside ionosphere as depicted by the in-situ electron density measured by both Swarm and CSES-01. The Local Time (LT) of Swarm track is between 14:00 and 15:00, while the LT of CSES-01 is fixed at about 14:00, being its orbit Sun-synchronous. A double crest signature is present for both satellites on 25 August (main phase/beginning recovery), while it is completely lost on 26 August (recovery phase) at both altitudes. Alternation of crest appearance and disappearance is found during the recovery phase of the storm.

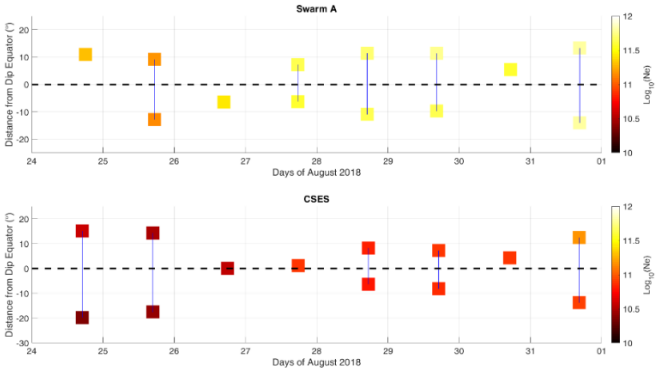


**Figure 1.** Distance from the dip-equator of the north and south maximum of the electron density as measured during the daytime passes of Swarm A (top) and CSES-01 (bottom) over Brazil. The colors indicate the corresponding plasma density.