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Response of Ionospheric Topside Electron Density during Solar Flares

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The topside ionosphere is highly sensitive to solar flare activity, which leads to sudden enhancements in solar X-ray and EUV flux. These enhancements can significantly alter electron density profiles, impacting satellite communication and navigation systems. This study examines the response of topside electron density (Ne) to solar flares using in-situ data from the Swarm satellites. Electron density measurements during selected solar flare events are compared against X-ray flux data obtained from the GOES satellite to quantify the degree of ionospheric response. Additionally, background Ne values from the International Reference Ionosphere (IRI) model are employed to distinguish flare-induced perturbations from normal diurnal and latitudinal variations. A global analysis is carried out to investigate the topside ionospheric electron density response across different latitude regions. Preliminary findings reveal a consistent decrease in Ne during flare events, with the magnitude of the response varying by local time, latitude, and flare intensity. The study also explores how the ionospheric response aligns or diverges from IRI predictions during solar flares.

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