

Contrasting behavior of the thermosphere and ionosphere in response to the Oct. 28, 2003 solar flare in equatorial anomaly regions

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This study utilizes simultaneous observations of the electron and thermospheric density from the CHAMP satellite to study the thermospheric and ionospheric responses to the solar flare event on Oct. 28, 2003. Interesting features were observed in the ionosphere and thermosphere and their coupling during such a transient event. First, the thermospheric response time was found to be within a few minutes, much shorter than traditionally assumed. Second, the latitudinal distribution in the flare-induced neutral and plasma perturbations contrasts each other remarkably. The thermospheric density was enhanced by 20% almost homogeneously at all latitudes between about 50° S – 50° N within 20 minutes after the flare EUV burst. However, the electron density disturbance exhibited a distinctive latitudinal structure. It consisted of a largest enhancement of about 68% at the dip equator, small increase below 20% in mid-latitudes, and depression up to 35% between 10° – 20° N/S. Third, the EIA structure was significantly weakened during the flare. The CHAMP observations demonstrates that electrodynamics related to the equatorial fountain dominated the photo-chemistry in controlling the n_e disturbances in the equatorial anomaly regions during the flare event on Oct. 28, 2003.