Strong Magnetic Control of the Thermospheric Density and Wind - an Updated View from CHAMP Satellite Observations

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The new measurements of the recent satellite CHAMP contribute considerably to the understanding of open issues about thermosphere-ionosphere coupling. With a high-resolution accelerometer, it effectively senses the in-situ air density and the neutral wind. Using these observations, we could study the upper atmosphere at a wide range of scales. Two major findings/updates over the classical views from e.g. MSIS are the density bulge near the cusp region, and the equatorial neutral density anomaly (an Equatorial Ionization Anomaly (EIA)-like latitudinal distribution in the neutral density). The most striking feature in the neutral wind is that the maximum velocity of the zonal wind tracks closely the dip equator instead of the geographic equator. Consequently, the zonal wind experiences strongest longitudinal variation in the equatorial region. All features demonstrate the strong magnetic control of the thermosphere even under quiet geomagnetic conditions.