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The longitudinal variation in daily mean thermospheric mass density
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In this work, we use thermosphere mass density data inferred from the accelerometer measurements made by the GRACE (˜480 km) and CHAMP (˜380 km) satellites to study the longitude structure of the daily mean thermospheric mass density under the quiet geomagnetic condition (Ap<10). Daily mean is performed on these data so that the effects of tides are removed. The results show that the thermospheric mass density is not uniform in the zonal direction, and there are strong longitude variations at all latitudes. The maximum of the daily mean mass density is always around the aurora zone which suggests that these longitudinal variations are most likely the result of auroral heating which includes Joule and particle heating. The largest relative longitudinal changes of the daily mean thermospheric mass density occur at high latitudes from October to February in the northern hemisphere and from March to September in the southern hemisphere. The high density regions extend toward lower latitudes and even into the opposite hemisphere. This extension is mainly confined to the longitudes where the magnetic poles are located. Thus the relative changes of the daily mean thermospheric mass density have strong seasonal variations and show an annual oscillation at high and middle latitudes but a semi-annual oscillation around the equator. There is asymmetry between two hemispheres in the longitude variations in the thermospheric mass density: they are stronger in southern hemisphere than in northern hemisphere. The mass density data observed by the GARCE and CHAMP satellites between 2003 and 2008 show similar characteristics at the two different altitudes.

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