



## **Longitudinal variation in zonal winds at subauroral regions: Possible mechanisms**

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Longitudinal differences in thermospheric zonal winds ( $U_y$ ) were investigated in the subauroral region for different seasons and under solar maximum and medium conditions by using CHAMP observations. Prominent wave-1 longitudinal and diurnal variations of  $U_y$  were observed, along with an anti-phase relationship between the Northern and Southern Hemispheres. These structures persisted over the whole year and were independent of solar activity.  $U_y$  values were greater at nighttime than at daytime, and values in the south were greater than those in the north in local summer and winter. Model simulations confirmed the observed results in large-scale structures, and the nonzero dipole tilt was vital for the longitudinal variation of the zonal winds. The neutral air pressure gradient caused by the day-night difference in solar heating was a major contributor to the observed  $U_y$ . The pressure effects were larger at nighttime than at daytime and were larger in the Southern Hemisphere than in the Northern Hemisphere. Ion drag reduced the compatibility between the modeled and observed  $U_y$  as expected, with larger effects at nighttime than at daytime. Viscous force reduced the compatibility between the modeled and observed  $U_y$  with greater effects at daytime, except at nighttime in the Southern Hemisphere. Coriolis force reduced the compatibility between the modeled and observed  $U_y$ . The sum of these factors can explain the observed local time and the hemispheric asymmetries in the longitudinal variations of the zonal wind.