



Thermosphere observations during the prolonged solar minimum

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Accelerometers on the CHAMP and GRACE satellites have made it possible to accumulate near-continuous and simultaneous records of thermosphere density between about 320 and 490 km since mid-2002. CHAMP and GRACE are in near-polar and quasi-circular orbits, sampling 24 hrs local time approximately every 4 and 5 months, respectively. These capabilities offer unique opportunities to study temporal and latitudinal responses of the thermosphere to geomagnetic disturbances as well as tides. Due to the different precession rates of the orbits, the local times sampled by CHAMP and GRACE are in general not the same, i.e., four local times are sampled most of the time. However, there have been four instances when the orbital planes were co-planar (same local times).

The last of these occurred on 17 December 2008, and therefore under conditions representative of the recent deep solar minimum. This co-planar event will be discussed in this poster. During this time CHAMP and GRACE provide near pole-to-pole total mass density measurements at local times of 8.4 and 20.4 hr at altitudes of 332 and 476 km, respectively. The latitudinal structure of the observed densities is significantly different at the two altitudes, which is most probably due to a much higher than modeled partial contribution of Helium at the GRACE altitude. NRLMSIS00 predicts a similar latitude structure for an altitude about 50-100 km higher, and it overestimates the observed densities by 10-25% on average. In addition, both CHAMP and GRACE reveal longitudinal structures with 2 to 3 maxima that we interpret as non-migrating tides from the lower atmosphere. These density perturbations are unusually large due to the low solar activity, with amplitudes typically of order +/- 10 to +/- 25 % about mean density levels. Some wave activity appears to be dependent on geomagnetic activity.