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Analysis of sporadic E variability derived from GPS radio occultation measurements and possible links to dynamics

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Sporadic E are thin layers of enhanced electron density, which appear usually at an altitude range between 90 and 120 km. They cause strong amplitude scintillations in GPS occultation signals. This feature is used to derive information on sporadic E occurrence from satellite based GPS radio occultation (RO) data.

We intend to introduce the RO technique as a valuable method for sporadic E observation. The data base for our investigation includes RO measurements from CHAMP, GRACE-A and FORMOSAT-3/COSMIC during 2007 and 2008. This multi-satellite data set allows for global investigations with high spatial resolution. We derive global distributions of sporadic E occurrence rates as well as its daily, seasonal and spatial variations.

The ionospheric E region is coupled with mesospheric/lower thermospheric wind field through the winds-hear (VxB) mechanism. It is expected that sporadic E layers are formed in a region of negative zonal windshear (e.g., with westward winds over eastward winds). Strong shears are provided by solar tides, in particular the diurnal tide in lower latitudes and the semidiurnal tide (SDT) in midlatitudes. With focus on the northern midlatitudes we present sporadic E occurrence rates which exhibit a dominating semidiurnal structure. Comparisons with ground-based and space-based wind measurements show excellent agreement between the phases of the sporadic E semidiurnal signal and the SDT phase.