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Space Studies of the Upper Atmospheres of the Earth and Planets including Reference Atmospheres (C)
Advances in Remote Sensing of the Middle and Upper Atmosphere and Ionosphere from the Ground and from Space, including Sounding Rockets and Multi-Instrument Studies (C0.2)
Either poster or oral presentation (no preference).

RECONSTRUCTION OF THE VERTICAL IONOSPHERIC ELECTRON DENSITY DISTRIBUTION FROM MULTI-INSTRUMENT OBSERVATION DATA

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A method is presented for reconstructing the vertical ionospheric profile utilizing multi-instrument observations. High-accuracy, ground-based digital ionosonde measurements are used for directly obtaining the bottom-side part (below the ionospheric peak height) of the electron density profile. Simultaneously-measured over-satellite electron content (OSEC) data from low Earth orbiting (LEO) satellites can be used for the determination of the top-side ionospheric scale height. The top-side ion density distribution is permitted to take one of several forms (profilers): Exponential, Chapman, or Epstein; the choice depending on the local time and the sub-ionospheric point's location. The ion scale heights are calculated by solving a system of equations that arise from the incorporation of the abovementioned ionospheric profilers into formulae describing ionospheric conditions/characteristics such as plasma quasi-neutrality and ion transition level. Once the topside scale heights are determined, the vertical ion and electron density distribution in the entire altitude range is calculated from the selected ionospheric profiler. The upper O+/H+ ion transition level (UTL) is a key reconstruction parameter, utilized when searching for a unique solution of the equation system. We use an empirical UTL model based on electron density profiles deduced from topside sounders; the model provides the transition height as a function of local time, season, geomagnetic latitude, longitude, and the solar flux F10.7 index. Representative results, using CHAMP satellite's OSEC measurements and European digisondes, are presented. The use of ionospheric radio occultation data and empirical models for the ionospheric peak density characteristics is also being investigated.