Convergence of two plasmasphere models for modeling of electron content above the Earth's ionosphere

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A combined 3-D ionosphere-plasmasphere model provides an opportunity to produce a simple analytical model for the plasmaspheric contribution to total electron content, PTEC/TEC, in terms of solar and geophysical conditions. In addition to ionospheric corrections, such a model may be used for the plasmaspheric corrections to signals of navigational satellites such as the Global Positional System GPS. Recent studies have brought evidence that the plasmaspheric electron content, PTEC, can comprise nearly 50% of GPS-derived TEC, particularly, at nighttime for solar minimum. In the present study a step towards convergence of two plasmasphere models has been made to reduce their differences at distances of 1 to 3 Earth's radii, Re. The Global Core Plasma Model, GCPM, provides a reliable plasma density along closed field lines. Two anchor points from GCPM for electron density at altitudes of 6370 km (1Re) and 20,000 km (near the GPS orbit altitude) are assimilated by the Russian plasmasphere model, SMI, analytically expressed via electron density at these two heights. Convergence of two plasmasphere extensions of the International Reference Ionosphere in a combined vertical analytical profile representation is used to produce the model of the ratio of the plasmaspheric part of total electron content, PTEC/TEC, in terms of geomagnetic latitude, local time, season, solar activity and geomagnetic activity. The inferred model represents average conditions in the Earth's environment according to its parent models GCPM, SMI, and IRI, which have been documented in the ISO Technical Specification TS16457.