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Comparison of Altimetry-derived Ionosphere Electron Counts and CHAMP-measured External Field Variability over the Polar Regions

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The poorly understood complex dynamics of ionospheric irregularities and external field variablilty over the polar regions are poorly known due to limitations of empirical models. The limited accuracy in predicting ionospheric effects presents significant problems affecting communication, remote sensing, surveillance, navigation and climate change research. However, currently available space geodetic sensors facilitate substantially improved modeling of ionospheric Total Electron Content (TEC) from various ground- and space-based observations. These observations include the GPS derived Global Ionosphere Maps (GIMs) generated by the mapping of the slant radar signals (L-band) from satellite (20,000 km) to the global ground receiver station network at each receivers' zenith direction, LEO's (400 km -1300 km, in the F and H ionopshere regions) carrying GPS recievers, and EnviSat (750 km) dual-frequency altimeter observations. For external field variability, we remove from the CHAMP (450 km) measured magnetic field contributions from the core and crustal fields. We compare the altimeter-derived TEC at high latitudes with the GIM, solar-geomagnetic indices (e.g., Kp, Dst, AE), and to the spatial and temporal variations in the external field over the polar regions. We also compare the Polar Cap Index (PCI), an index generally accepted in recent years as an indicator of high latitude magnetic activity and related ionospheric dynamics, with TEC and CHAMP external field observations. We test the veracity of ground-based planetary magnetic indices by comparing external

field variability at sattelite altitudes over polar regions since the selection of satellite orbits for lithospheric magnetic anomaly analyses is commonly based on global ground planetary magnetic indices.