Reconstruction of Plasmaspheric Density Distributions by Applying a Tomography Technique to Jason-1 plasmaspheric TEC Measurements

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GPS receiver onboard Jason-1 satellite provides the measurements of plasmaspheric total electron content (pTEC) between the altitudes of Jason-1 and GPS satellites (1,336 and 20,200 km, respectively). We developed a tomography algorithm and applied it to the Jason-1 pTEC data to reconstruct the plasmaspheric density distributions. To invert the observed pTECs into the vertical distribution of plasmaspheric electron density, we adopted a multiplicative algebraic reconstruction technique (MART) with an initial density from *Huang et al. (2004)*. The reconstruction of the plasmaspheric density distribution was performed on Indian ( ), Pacific ( ), and Atlantic ( ) longitudinal planes during the periods of high solar activity ( ) and low geomagnetic activity ( ) from 2002 to 2005. It is found that the reconstructed density distribution displays general climatological characteristics of the plasmasphere. For all three longitudinal sectors, the reconstructed distributions show weak diurnal variations being greater during daytime (09 –15 LT) than nighttime (21 –03 LT). In the Atlantic sector, the reconstructed plasmaspheric density exhibits an annual anomaly (higher density in December than in June), while it was not apparent in the other longitude sectors. By fitting the reconstructed density profiles, we derived the empirical profiles of equatorial plasmaspheric density for four seasons (March, June, September, and December) and for three longitude sectors. The empirical profiles display the diurnal variation and the annual anomaly, and significantly differ from those obtained from other kinds of plasmaspheric measurements.

Keywords: Plasmasphere, Tomography, Total Electron Content, GPS

