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Deformation of the Magnetospheric Magnetic field by double-loop Substorm Current Wedge

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Recent studies of magnetic field dipolarization amplitudes simultaneously observed by four THEMIS and one NOAA-GOES spacecraft radially-distributed in the magneto tail have confirmed a double-loop (R1-like plus R2-like) geometry of the Substorm Current Wedge (SCW) and introduce and test the new magnetospheric quantitative model SCW2L. Using inversion algorithm we determined the locations of equatorial segments and total currents of both SCW2L loops to be I1 $\sim$0.1 to 0.2 MA, with a ratio I2 / I1 $\sim$ 0.3 to 0.5 for two events. Interpreting the ratio of dipolarization amplitudes simultaneously observed by NOAA-GOES at r = 6.6 Re and THEMIS spacecraft at r $\sim$ 11 Re we established that equatorial part of R2-like current loop stops tailward of geostationary orbit in case of dipole-like magnetic field configuration (BZ0 > 75 nT at GEO prior to onset) and earthward of GEO in the case of strongly stretched magnetic tail (BZ0 < 60 nT). To investigate the SCW2L influence on the mapping we map the neutral sheet points to the ionosphere using T89+DIP and SCW2L magnetic field models to demonstrate and quantify field line twisting effect which leads to significant footprints shifts caused by double-loop current system. Varying SCW2L model parameters such as I2 / I1 ratio, wedge longitudinal size, field line stretching amplitude, equatorial current radial distance and FACs spread we investigate the amplitudes of ionospheric footpoints shifts under wide range conditions in magnetosphere and discuss possible shapes of active ionospheric structures (such as auroral bulge) that appear when the substorm current system develops. This research is supported by the FP-7 EU grant (ECLAT).