Geophysical Research Abstracts
Vol. 15, EGU2013-4060, 2013
EGU General Assembly 2013

On the shape of the Geomagnetic Tail at Lunar distances: Preliminary Resuts from Artemis Observations

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Geomagnetic tail is one of the least investigated regions of the magnetosphere behind the Earth owing to the limited number of spacecraft and observations. It is the region where the geomagnetic dipole field lines of the Earth are organized by the solar wind stretching. The characteristics of the geomagnetic tail and its response to IMF were studied by the missions, ISEE-3, IMP-8, Wind, Geotail, visited geomagnetic tail at different distances. The structure of the geomagnetic tail is controlled by the IMF orientation and its own internal dynamics. Geomagnetic tail has different regions where the plasma and magnetic field characteristics are largely depend on the IMF orientation. These characteristics show differences at different tail distances. For example it is determined that the tail twists as result of the reconnection with IMF By and this twist is higher as one move away from the Earth toward the distant tail. Like a windsock, it is expected that the IMF control will increase toward the distant tail. Twisting also displaces the north and south lobes on the dawn and dusk sides. Tail length and the shape are also different for different IMF orientations. Flattening of the geomagnetic tail cross-section occurs during the strong IMF Bys. It becomes an ellipse in the yz plane as the IMF By stress causes the tail to be flattened on the top and bottom. Models estimate that the geomagnetic tail length can be 165 Re while Pioneer spacecraft detected geomagnetic tail as long as 100 Re. These findings are based on the very limited data from brief geomagnetic tail encounters of the spacecraft. Since August 2011, with the repositioning of the two of THEMIS spacecraft pair, ARTEMIS is giving a new opportunity to study the geomagnetic tail at the lunar distances, 60 Re. Using these observations, we will investigate the geomagnetic field shape and its IMF dependence at 60 Re. Based on the magnetopause locations at 60 Re, we will study the shape of the tail on the xy-plane. Available analytical models and the numerical model results will be tested and used to find the best model at lunar distances. In this study, we will present our preliminary results and compare our findings with those from the earlier studies in the literature.