Geophysical Research Abstracts
Vol. 16, EGU2014-6176, 2014
EGU General Assembly 2014

3D hybrid simulation of the interaction of a magnetic cloud with a bow shock

Lucile Turc (1), Dominique Fontaine (1), Philippe Savoini (1), and Ronan Modolo (2)

(1) Ecole Polytechnique, CNRS, Sorbonne Universités, UPMC Univ Paris 06, Univ Paris-Sud, UMR7648, Laboratoire de Physique des Plasmas, F-91128, Palaiseau, France (lucile.turc@lpp.polytechnique.fr), (2) LATMOS/IPSL/CNRS, Université de Versailles-Saint Quentin, Versailles, France

Magnetic clouds (MCs) are a subset of coronal mass ejections which are known for their importance in driving geomagnetic storms. Studies based on both observations and modelling have shown that the structure of an MC downstream of Earth's bow shock strongly depends on the encountered shock configuration. In order to complement these initial works, we use 3D hybrid simulations (i.e. ions dynamics are fully described and electrons are a massless fluid) to model the interaction of an MC with a planetary bow shock. These global simulations allow to generate a bow shock where full curvature effects are self-consistently included in a supercritical regime ($\mathrm{M_A} \geq 5$) as observed in front of a magnetic obstacle. Then, an MC modelled by a flux rope (Burlaga et al., 1988) is injected upstream and propagates towards this shock. We investigate the interaction of the MC with the bow shock, and in particular the impact on the MC's structure of the different domains of the shock wave from the quasi-perpendicular to the quasi-parallel (and its associated ion foreshock region). We use virtual spacecraft to probe the magnetosheath and compare their outputs to real spacecraft data.