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# Simulations of the Jovian magnetosphere

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The rapidly rotating magnetosphere of Jupiter is the largest single structure of the Solar system. Unlike the magnetosphere of the Earth, which is mostly filled with plasma originating from the Solar wind, the plasma of the Jovian magnetosphere emanates from an internal source: the Galilean moon Io. Due to its volcanism, Io continually supply the Jovian magnetosphere with heavy plasma: approximately 1000 kilograms of plasma is provided by Io every second. As a result of the coupling of the Jovian magnetosphere to its ionosphere, this plasma is accelerated up to approximately the corotation speed. In addition, due to the centrifugal force, the plasma is slowly driven away from Jupiter. When the plasma is too far from the planet to be accelerated efficiently by the Lorentz force, it tends to sub-corotate and it deforms the magnetic field lines of Jupiter, producing a electric current system which couples Jupiter's magnetosphere with its ionosphere and produces aurorae. Consequently, internal transport due to Io's plasma production seems to be one of the main processes causing the main auroral oval of Jupiter. On the other hand, the importance of the solar wind (which controls the aurorae on Earth) remains unclear for Jupiter.

In this study, the interactions between the solar wind and the Jovian magnetosphere are studied by means of global three dimensional magnetohydrodynamic (MHD) simulations. The ionization of the neutrals in the Io torus are reproduced by a mass loading source term in the MHD equations confined in a toroidal region located at 5.9 Rj from the centre of the planet. The influence of the incoming solar wind on the current systems of the Jovian magnetosphere is studied in an parameter study.