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Open flux in Saturn's magnetosphere

S.V. Badman (1), C.M. Jackman (2), J.T. Clarke (3), and J.D. Nichols (4)

(1) JAXA ISAS, Sagamihara, Japan (s.badman@stp.isas.jaxa.jp), (2) Department of Physics and Astronomy, University College London, London, UK, (3) Center for Space Physics, Boston University, Boston, USA, (4) Department of Physics and Astronomy, University of Leicester, Leicester, UK

The interaction between a planetary magnetosphere and the surrounding solar wind can be diagnosed by measuring the amount of planetary magnetic flux 'open' to the interplanetary magnetic field. At Saturn, this is achieved using images of the UV aurora, taking the poleward boundary of the aurora as a proxy for the open-closed field line boundary. In this study we use HST observations acquired over several years to survey the amount of open flux present in Saturn's magnetosphere, and the change in flux content between consecutive observations. The amount of open flux per hemisphere varies between 10 and 50 GWb, with a mean of 35 GWb. Using these measurements, we estimate the characteristic size of Saturn's magnetotail. The change in open flux over time is related to the balance between creation of open flux at the dayside magnetopause and its closure via reconnection in the magnetotail. We compare our results with estimates of reconnection rates at the dayside magnetopause as well as the flux transported via the post-plasmoid plasma sheet in Saturn's magnetotail. Finally, the characteristics of Saturn's magnetotail lobes are compared with those of the Earth and Mercury.