Dependence of the Vorticity in Kronian Magnetosphere on the IMF

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In a series of simulation studies we have found turbulent convection and vortices formed at Saturn's dawn and dusk magnetopause in simulations when IMF was northward. We interpreted these vortices as resulting from the Kelvin Helmholtz (K-H) instability. The resolution of simulation is an important parameter for the formation of vortices and turbulent convection as it is necessary to capture the small changes in convection which can trigger of vortex formation. Recent developments in computer technology have enabled us to run simulations with much higher resolution (0.06RS) then was previously possible. In this study we perform simulations of the Kronian magnetosphere for various IMF orientations to determine the conditions under which vortices form.

In this study we determine the minimum component of BZ for vortex formation and present a physical model showing how the combination of the IMF, Saturn's rotating flows and reconnection determine when vortices form. From the detailed analysis of plasma convection in the magnetosheath and magnetosphere, there are important differences in the flow due to the tail reconnection and it affects the condition for K-H instability and vorticity in the overall magnetosphere.