



On planetary period oscillations of Saturn's auroral oval and planetary magnetic field

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Previous analyzes of Hubble Space Telescope (HST) images of Saturn's southern auroras obtained during two campaigns, in January 2007 and February 2008, have revealed that the auroral oval oscillates at a period close to the planetary rotation period, with its center describing an elongated ellipse of semi-major axis ~ 2 deg co-latitude aligned along the pre-noon to pre-midnight direction. Previous analyzes of Cassini magnetic field data have established that planetary-period magnetic field oscillations are observed both on closed field lines in the near-equatorial region and on open field lines in the polar regions. In this paper we present a synthesis of previous results, and compare the phases of the auroral oval and the equatorial magnetic field oscillations. We show that the southern oval displacement is directed approximately opposite to the oscillatory equatorial field direction during both HST campaign intervals. We also examine the relation of the southern oval oscillations to the periodic modulations in Saturn kilometric radiation (SKR) power, and show that the oval is displaced sunward at SKR maxima. It is suggested that the oval displacements are related to magnetospheric field line distortions associated with the rotating magnetic field perturbations, though noting that this picture provides no immediate explanation for the significantly elliptical nature of the observed oval motion.