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Periodic modulation of ion velocities within the magnetodisk of Saturn

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The results of recent numerical simulations [Jia and Kivelson, 2012] show that in the magnetodisk of Saturn fluctuating magnetic field perturbations are accompanied by other oscillatory phenomena. They investigated the magnetotail response for a dual periodicity driver in the case when the solar wind flow was perpendicular to the rotation axis. As demonstrated in Fig. 7 of their paper the components of the flow velocity extracted at different radial distances plotted versus time exhibit periodic modulation.

Andrews et al. [2012] and Provan et al. [2012] investigated magnetic field modulations in Saturn's magnetosphere. They have shown that in the high latitude regions single period modulations can be observed, but near the current sheet dual periodicities are characteristic.

In this study we investigate periodicities in the azimuthal flow velocities using the numerical ion moments derived from the measurements of Cassini Plasma Spectrometer. Ramer et al. [2012] investigated these periodicities in the inner magnetosphere near the equatorial plane. We extend our study to include higher latitude passes in the outer magnetosphere to the orbit of Titan and beyond. To have a close match with the model assumptions of Jia and Kivelson, we investigated the behaviour of the ion velocities in the time range DOY 092–285, 2009, around Saturnian equinox, along different passes all containing a Titan flyby, and crossing the magnetodisk at different angles.

We have found that the azimuthal velocities show oscillatory behavior. The amplitude of the oscillation is comparable with the corrotation speed. We have also compared the structure of the velocity variations to the variations of ion densities along the different passes, and compared those to the model as well. The results of the current study is reported in this presentation.

References

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