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Possible Signatures Of Kelvin-Helmholtz Waves On The Dusk Flank Of The Kronian Magnetopause

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A comprehensive survey of crossings of both Saturn's magnetopause and bow shock on the dusk side between January 2007 and December 2007 was compiled, using data from the Cassini fluxgate magnetometer and the Cassini electron spectrometer. Bow shock and magnetopause crossings were determined by the criteria discussed in Masters et al., 2008 and Masters et al., 2009 [1] respectively. 396 magnetopause crossings and 165 bow shock crossings were identified with large spatial variation; the high temporal frequency of crossings combined with the large radial variation was indicative of highly dynamic boundaries. A set of magnetopause crossings occurring near the nose of the magnetopause on the 30th June and 1st July 2007 were then analysed using minimum variance analysis (MVA) of the magnetic field vectors over the crossing interval to determine the direction of the boundary normal at each crossing. Using MVA analysis again to calculate the maximum variance direction of the magnetopause normals, I found a clear preferred direction of variance of the normals. The normals were found to deviate by an average of 30° about the average normal direction in the plane of maximum variance, but only by 12° in the perpendicular plane. The observed oscillation of dawn side crossing normals (Masters et al., 2009) was not present throughout the whole dusk set, but was present for subsets, which is suggestive of wave activity. Considering the orientation between the magnetospheric magnetic field and the direction of maximum variance of the normals, the Kelvin-Helmholtz (K-H) instability is the likely driving force of these boundary perturbations. Current work involves analyzing two further magnetopause crossing sets, one further dusk-ward and one closer to noon (SLT), to identify whether K-H waves are also present at these locations.

[1] Masters, A.; McAndrews, H. J.; Steinberg, J. T.; Thomsen, M. F.; Arridge, C. S.; Dougherty, M. K.; Billingham, L.; Schwartz, S. J.; Sergis, N.; Hospodarsky, G. B.; Coates, A. J. Hot flow anomalies at Saturn's bow shock, J. of Geophys. Res., Vol. 114, 2009