

MULTIPOINT OBSERVATION OF SMALL SCALE IRREGULARITIES AT THE PLASMAPAUSE, USING THE WHISPER MEASUREMENTS

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The Cluster tetrahedron has penetrated several times in the plasmasphere with different mean separation distances (600 km, 2000 km and 100 km). The WHISPER experiment has observed small scale irregularities in the electron density profiles at inbound and outbound plasmopause crossings. Similar small scale structures have been observed with the EFW experiment measuring the spacecraft potential of all four Cluster spacecraft. Indeed, the spacecraft potential is roughly proportional to the local electron density. The high resolution electron density profiles (1.7 seconds sampling rate; $L = 0.001 R_E$) are shown versus McIlwain's L -parameter and versus the radial distance R_{equat} , where the magnetic field intensity has a minimum along the magnetic field lines passing through the position of the four spacecraft (Fig. 1).

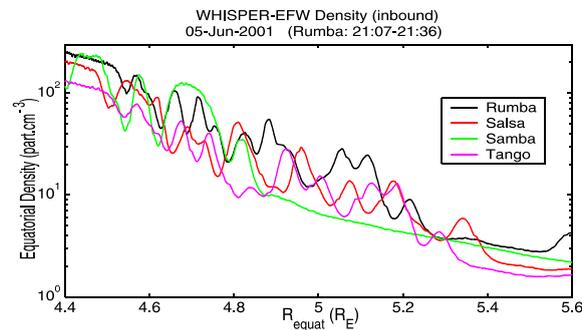


Fig. 1. Equatorial density derived from WHISPER and EFW versus the radial distance

These irregularities have cross- L width ranging from less than 1.7 seconds (8 km) up to several minutes (thousands of kilometers). Similar irregularities had already been observed by D.J. Southwood [1] with a high-resolution fluxgate magnetometer during the Earth swing-by of Cassini on 18th August 1999. These irregularities are interpreted as signatures of diamagnetic plasma elements produced by interchange instabilities [2].

A histogram of the cross- L widths of these irregularities has been compiled. The peak to trough ratio of the minimum electron density enhancement has also been determined for all spacecraft and is shown in a histogram. Multipoint techniques are used to compare all four electron density profiles. The spatial gradient of electron density has been determined from the four positions and the four measured density values. The velocities of the 3-dimensional structures have also been calculated. The occurrence of these irregularities as a function of MLT sector and geophysical conditions will also be presented.

REFERENCES

- [1] D.J. Southwood, et al., "Magnetometer measurements from the Cassini Earth swing-by," *J. Geophys. Res.*, vol. 106, pp. 30109-30128, 2001.
 [2] J.F. Lemaire, "The mechanisms of formation of the plasmopause", *Ann. Geophys.*, vol. 31, pp. 175-190, 1975.