

UPSTREAM PROTON CYCLOTRON WAVES AT VENUS FROM VENUS EXPRESS MAGNETOMETER OBSERVATIONS

M. Delva¹, M. Volwerk¹, C. Mazelle², C. Bertucci³, T.L. Zhang¹,
Z. Voeroes¹, S. Pope⁴

¹*Space Research Institute, Austrian Academy of Sciences, Graz, Austria*

²*CESR/UPS-CNRS, Toulouse, France*

³*Imperial College London, UK*

⁴*University of Sheffield, UK*

The magnetometer data from the Venus Express mission are investigated for the occurrence of proton cyclotron waves. As a new feature at Venus, proton cyclotron waves (PCW) were detected in the upstream region, in and upstream of the foreshock region and over a large volume of space; they are a direct indication of pick up of planetary protons from the exosphere of Venus and loss of hydrogen to interplanetary space. A detailed study of representative cases as well as an overview of the specific wave properties over long time span observations from start of the nominal orbit (May 2006) is presented, i.e. specific aspects of the spectra, analysis in the magnetic field principal axes system, direction of propagation etc. The waves occur till large distances from the planet ($\approx 8 R_v$) and for a large range of angles (V_{sw}, B). Finally, the question of wave generation is discussed and different generation mechanisms are suggested, with emphasis on instabilities driven by field-aligned planetary ion beams.