



## **The generation of downshifted oscillations in the electron foreshock due to loss-cone instability**

**V. Lobzin** (1), B. Lefebvre (2), S. Schwartz (2), V. Krasnoselskikh (1), P. Decreau (1)  
(1) LPCE/CNRS-Université d'Orleans (vlobzine@cnrs-orleans.fr), (2) Imperial College,  
London, UK

WHISPER measurements onboard four Cluster satellites during several Earth's bow shock crossings showed the presence of two types of high frequency electrostatic waves in the electron foreshock region: Langmuir and downshifted waves with the frequencies between electron and ion plasma frequencies. The downshifted waves were observed upstream of the shock front and they grow up just in the vicinity of the forward edge of the whistler precursor wave train. An analysis of electron distribution function did not reveal unambiguously any signature of a high energy beam, however, it showed the presence of the loss-cone type distribution function. We performed a theoretical study of instabilities related to such a kind of distributions and found that the two wave modes can be simultaneously generated. An estimate of the saturation level of the waves gives characteristic amplitudes which are similar to observed ones.