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Non-maxwellian features of magnetosheath ion distribution associated with mirror waves

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The ion distribution function of magnetosheath plasma often exhibits a significant temperature anisotropy $T_\perp > T_\parallel$. This anisotropy can induce plasma instabilities and give rise to ultra low frequency (ULF) plasma waves, such as the mirror waves. The mirror waves quickly grow to very large amplitudes and evolve into non-periodic plasma structures called mirror modes. Theoretical and numerical studies suggest that trapped ion population is the key element in the saturation of the mirror instability and non-linear evolution of mirror modes. Previous experimental studies mostly used moments of the ion distribution function to analyze this phenomenon. In this work we used the full 3D ion distribution measurements from Cluster spacecraft to study the details of the ion distribution during intervals of ULF wave activity. We show that the plasma strongly deviates from a standard bi-maxwellian model and we demonstrate the presence of trapped particles correlated with mirror mode field fluctuations. The results are compared with existing models.