



## **Field-aligned beams, intermediate distributions, and different diffuse ion distributions observed by Cluster upstream of Earth's bow shock**

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We report on the spatial and temporal evolution of energetic ion distributions upstream of Earth's bow shock. The data are obtained with the CIS instrument on Cluster. On 18 February 2003 the Cluster spacecraft were widely separated ( $\sim 1R_E$ ) and upstream of Earth's bow shock on the inbound leg of the orbit. This time period was after the passage of a CME, and the interplanetary magnetic field (IMF) was unusually quiet. Due to small changes of the IMF direction the spacecraft entered several times during this time interval regions with either field-aligned beams, intermediate type distributions, or diffuse ion distributions.

The diffuse ion distributions are at times filled to the lowest energies; at other times the distribution exhibits a hole in the center, i.e. the diffuse distribution is of a ring-type. From the location of the observations it is concluded that at the quasi-parallel bow shock the ion distribution is, at times, a superposition of a diffuse ion distribution and an ion population which is the remnant of the field-aligned beam from the more oblique portion of the bow shock after scattering by self-excited waves.