



Case study of an atypical magnetopause crossing

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Using a new single spacecraft method (see the companion poster), we study an event of magnetopause crossing by the Cluster C1 spacecraft on April 15th, 2008. In this case, the normal is consistent with MVABC, the magnetic field is well fitted and the assumption that the CIS normal velocity is approximately equal to the velocity of the boundary seems to be consistent. A detailed and trustworthy analysis of the crossing can therefore be performed, leading to atypical but interesting results. The whole magnetopause, as often, does not seem to verify all the Rankine-Hugoniot jump conditions. We can establish the existence of three different sub-layers: the first one seems to be a slow shock, where the major part of the density gradient that characterizes the magnetopause takes place; the second one seems to be a rotational discontinuity, with a positive Walen test, and it is on a larger scale; the third one implies another –smaller- density jump, but its nature appears difficult to characterize precisely. These three boundaries a priori propagate at different speeds, and the ensemble should therefore correspond to a non stationary global layer. This could be an explanation of the breaking of the standard jump conditions for the global set. Investigating more precisely the first sub-layer, all the characteristics of a slow shock seem to be satisfied, except the magnetic field hodogram, which is not exactly conform to theory. We conjecture that the cause could be the interaction with the close rotational layer. A 1-D MHD simulation has been run in order to better understand the non linear interaction between a rotational and a compressional layer when the two meet.