



Cluster observations of ion energy steps in the polar cusp under southward and eastward IMF

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The reconnection between the interplanetary magnetic field (IMF) and the Earth's magnetic field is taking place at the magnetopause on magnetic field lines threading through the polar cusp. When the IMF is southward, reconnection occurs near the subsolar point, which is magnetically connected to the equatorward boundary of the polar cusp. Subsequently the ions injected through the reconnection point precipitate in the cusp and are dispersed poleward. If reconnection is continuous and operates at constant rate, the ion dispersion is smooth and continuous. On the other hand if the reconnection rate varies, we expect interruption in the dispersion forming energy steps or staircase. Similarly, multiple entries near the magnetopause could also produce steps at low or mid-altitude when a spacecraft is crossing subsequently the field lines originating from these multiple sources. In addition, motion of the magnetopause induced by solar wind pressure changes or erosion due to reconnection can also induce a motion of the polar cusp and a disruption of the ions dispersion observed by a spacecraft. Cluster with four spacecraft following each other in the mid-altitude cusp should be able to distinguish between these "temporal" and "spatial" effects. We will present two cases of Cluster cusp crossings, one occurring under constant southward IMF and the other one under eastward IMF. On the first one, two spacecraft, separated by 1 min 20s, observed the same step in the middle of the dispersion and two additional injections poleward. On the other hand, on the second cusp crossing, the first spacecraft observed a step in the ion dispersion, 30 s later the second spacecraft observed a smooth dispersion and the last spacecraft observed a gap in the dispersion, 7 min later. These results will be discussed in term of temporal or patchy reconnection.