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Overlapping cusp ion structures under Northward IMF

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On some occasions, Cluster data in the mid-altitude cusp reveal overlapping ion populations under Northward IMF. While the poleward part of the cusp exhibits the expected reverse dispersion due to lobe reconnection, its equatorward part shows a second high-energy ion population that coexists with the low energy tail of the dispersion. This second populations is either dispersionless or slightly dispersed with energies increasing with increasing at high latitudes, indicative of lobe reconnection as well. Our analysis reveals that the second population comes from the opposite hemisphere and is very likely on closed field lines. We interpret this overlap of cusp populations in terms of double magnetic reconnection leading to newly closed magnetic field line in the dayside.