Comparison of SuperDARN observations with the ionospheric projection of the reconnection line as calculated through the Cooling model.

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Abstract - We compare the ionospheric projection of the X-line at the magnetopause with SuperDARN observations for three time periods.
1st period: a three hour interval on January 2, 2003, when the Interplanetary Magnetic Field (IMF) observed by ACE and the magnetosheath magnetic field observed by Cluster flipped twice between a B_y dominated state and a $B_z > 0$ state, both with positive B_y and negative B_x.
2nd period: an event of dual lobe reconnection observed by Cluster and SuperDARN on December 03, 2001.
3rd period: a reconfiguration of the ionospheric convection triggered by an SI on January 06, 1998.
We use the Cooling model to reconstruct the X line at the magnetopause. For this purpose, we evaluate the probability of component merging as a function of position on the magnetopause; we reconstruct several X–lines on the magnetopause starting from locations where reconnection is possible and we project them onto the polar ionosphere by using the Tsyganenko 96 model. Finally, all the X-lines are compared with the ionospheric convection patterns obtained from SuperDARN data.
We found that: the ionospheric projection of the most probable Cooling X-line in general does not match the position of the X-line in the ionosphere as inferred from the SuperDARN convection maps. For lobe reconnection the most probable Cooling X-line falls typically 5° MLAT equatorward than expected from the SuperDARN maps. In four cases of lobe reconnection, we obtain an X-line in agreement with the SuperDARN maps by choosing on the magnetopause an “ad hoc” starting point. On the contrary, for dominating B_y, a reasonable agreement between an “ad hoc” Cooling X-line and the SuperDARN maps can be found in one case out of three.