The azimuthal extent of magnetopause reconnection

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Although the dayside magnetopause reconnection is shown to occur in localized regions or over an extended X-line, a systematic understanding of what is the prevailing scale size and how this depends on IMF conditions has not been achieved. Multi-point observations by spacecraft tend to be separated either too small to cover the reconnection site, or too large that the assumption of a continuous X-line between satellites becomes questionable. Radars and imagers can broadly monitor the ionospheric signatures of magnetopause reconnection around the cusp as fast anti-sunward flows and auroras, and can thus provide a large-scale context of the reconnection scale size given by the flow channel size. We combine multi-point THEMIS spacecraft observations with SuperDARN measurements to statistically determine the width of magnetopause reconnection and its IMF dependence. We require nearly simultaneous magnetopause crossing by at least two spacecraft and determine the occurrence of reconnection based on the Walen test and the D-shape distribution of ion phase space density. This is compared with the occurrence and the azimuthal width of ionospheric fast flows at the spacecraft footprint. Our preliminary results show that when the two spacecraft are separated by a few Re and both detect reconnection signatures, their footprints are located within or close to the same ionospheric flow channel. When one misses reconnection, its footprint is located away from the ionospheric flow channel. Such conjunctions ensure the physical connection between ionospheric flow channels and magnetopause reconnection extents, and thus enable a reliable interpretation of the reconnection width. We observe the reconnection width to be 200-600 km in ionosphere, which corresponds to 2 Re up to 8 Re in the equatorial plane, although more events are under survey.

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