

# Direct evidence for throat aurora being the ionospheric signature of magnetopause transient and reflecting localized magnetopause indentations

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Magnetopause transients, observing as brief entries into the magnetosheath by satellites, are commonly observed in the vicinity of the magnetopause and have been explained by several possible mechanisms. However, satellite observations alone are insufficient to determine the dynamics and context of transients. Throat auroras are characterized as north-south aligned discrete auroral forms extending from the equatorward edge of the discrete auroral oval that are only observed near dayside convection throat region and have been suggested as the ionospheric signature of localized magnetopause indentations. Using coordinated observations from the Magnetospheric Multiscale Mission (MMS) and ground-based all-sky imagers, we show one-to-one correspondences between transients observed by MMS near the subsolar magnetopause and throat auroras observed on the ground. The correspondence is valid not only for typical throat aurora with larger spatial scale but also for these with tiny scales. We even notice that the transient durations observed by satellite are approximately proportional to the width (east-west extension) of the throat aurora. These results provide direct evidence that throat auroras are ground signatures for the magnetopause transients. With the aid of auroral observations, we suggest that these transients reflect localized magnetopause indentations but are not produced by motion of the entire magnetopause. We also found that most transients are associated with earthward flow enhancements, which indicates that high-speed jets in the magnetosheath could be a driver for producing these transients.

Keywords: throat aurora, magnetosheath high speed jet, magnetopause transient, magnetopause indentation

