

Comparison of substorm onsets between all-sky images and Pi2 magnetic pulsations.

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Substorms are explosive disturbance in the earth's magnetosphere and ionosphere. Substorm onset are traditionally identified using sudden auroral brightenings or magnetic Pi2 pulsations. These auroral brightenings and Pi2s are believed to occur typically within 1 minutes. On the other hand substorm onset has originally been defined to have two-stage development, i.e., two brightenings. Thus, it is unclear whether the Pi2s correspond to the first or the second brightening. To clarify this association, we compared all-sky images and Pi2 pulsations in Canada, using the data from THEMIS project. As a result, a Pi2 pulsation was observed at 04:36 UT on 29 February 2008. About the same time, an auroral initial brightening (04:33:30 UT) and the poleward expansion (i.e., the second brightening, 04:39:18 UT) were observed in Fort Smith. This result suggests that the Pi2 pulsation can be delayed by a few minutes from the substorm onset, which is originally defined by the auroral initial brightening.

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