

On the simultaneity of substorm onset between two hemispheres

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Simultaneous observations of AKR from the northern (by IMAGE satellite) and southern (by Cluster satellite) hemispheres showed some cases in which the build-up of field-aligned acceleration occurs only in one hemisphere at the substorm onset. This indicates that a substorm does not always complete its current system by connecting the cross-tail current with both northern and southern ionospheric currents. Conjugate auroral observations showed a case in which the auroral breakup in the northern and southern hemispheres was not simultaneous by a few minutes. This time different breakup between two hemispheres suggests that local auroral ionosphere controls auroral breakup in each hemisphere. The evidence in this study may indicate that the build-up of the field-aligned acceleration region at the auroral breakup does not result from the magnetospheric process and that the auroral ionosphere finally controls and/or ignites the substorm onset.