Cluster Observations of Field-Aligned Current Morphology and Evolution During Substorms

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Datasets from the European Union Seventh Framework Programme for Research (FP7) project European Cluster Assimilation Technology (ECLAT), and a list of substorm onsets identified from global auroral imagery taken by the far ultraviolet (FUV) imaging camera onboard the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) spacecraft, are used to present initial studies of Cluster Field-Aligned Current (FAC) morphology and evolution around the time and location of substorm onset in relation to the auroral substorm development and substorm current wedge scheme. The unique constellation configuration of the four Cluster spacecraft allows the so called curlometer technique to determine FACs flowing in and out of the terrestrial ionosphere, which are mapped from the magnetotail to ionospheric altitudes using the ECLAT Cluster footprints dataset. Case studies and statistics will be selected from an initial database of nearly 500 intervals in Cluster tail seasons (July-October 2001-2005) for which the Cluster magnetic field line footprints map to within 4 magnetic local time (MLT) sectors of the auroral substorm onset location.