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Multi-spacecraft observations of magnetotail dynamics driven by magnetic reconnection.

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Magnetic reconnection plays a key role controlling the dynamics of the Earth's magnetosphere and is particularly important in the magnetotail, where it enables the rapid release of energy stored in the lobe magnetic field. As such, the magnetotail is an excellent natural laboratory for the study of reconnection and experimental observations from multi-spacecraft missions such as Cluster, THEMIS and ARTEMIS are invaluable when attempting to understand how magnetic reconnection works in the magnetosphere.

On small scales, multi-point data from Cluster has been used to study the ion diffusion region. This has led to conclusive evidence that the Hall model of magnetic reconnection correctly describes how fast magnetic reconnection occurs in the magnetotail. On larger scales, multi-point data from THEMIS has been used to examine the extent of the near-Earth reconnection X-line, the large scale morphology of reconnection jets in the magnetotail, and the influence reconnection has on the magnetosphere as a whole. Finally, new data from ARTEMIS (the two THEMIS spacecraft now placed near the Moon to study both space plasma physics and planetary science) is now being used to examine the properties of the distant magnetotail, using two spacecraft for the first time.

In this talk, we compare and contrast the use of multi-point data in these different contexts and show how it has led to new developments in our understanding of magnetic reconnection in the Earth's magnetotail.