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Small Scale Magnetic Reconnection in the Solar Wind

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Previous studies of magnetic reconnection in the solar wind have suggested that a single reconnection X-line can extend and be active over millions of kilometres. We present a case study of an event observed in the solar wind on the 2nd March 2006 by the four Cluster spacecraft. We utilised the four point measurement capability to study the event at sub-second resolution over separation distances of $10,000\ km$ as well as over the larger scales separating Cluster from ACE and WIND. We thus test the consistency of the temporal and spatial structure of magnetic reconnection from large scales to small scales. This reconnection event showed significant differences between the Cluster spacecraft, particularly in the magnetic field data, suggesting reconnection in the solar wind can be variable over relatively small temporal and or spatial scales ($< 60\ s$ and/or $\sim 10,000\ km$). This leads to the conclusion that magnetic reconnection in the solar wind is not necessarily large scale and may be patchy in nature. This result raises questions about our current understanding of magnetic reconnection in the solar wind.