Bursty Bulk Flows: Comparing THEMIS Observations with OpenGGCM Simulations.

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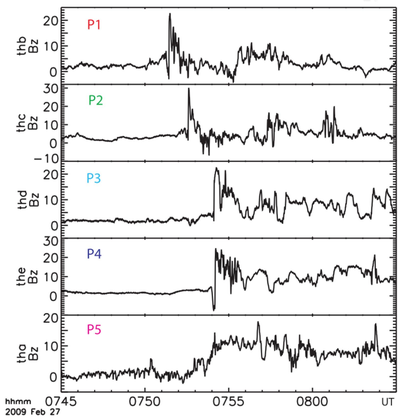
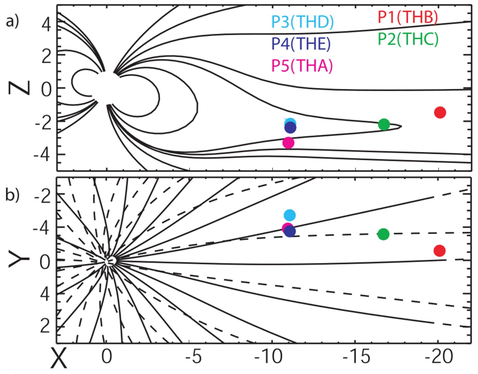
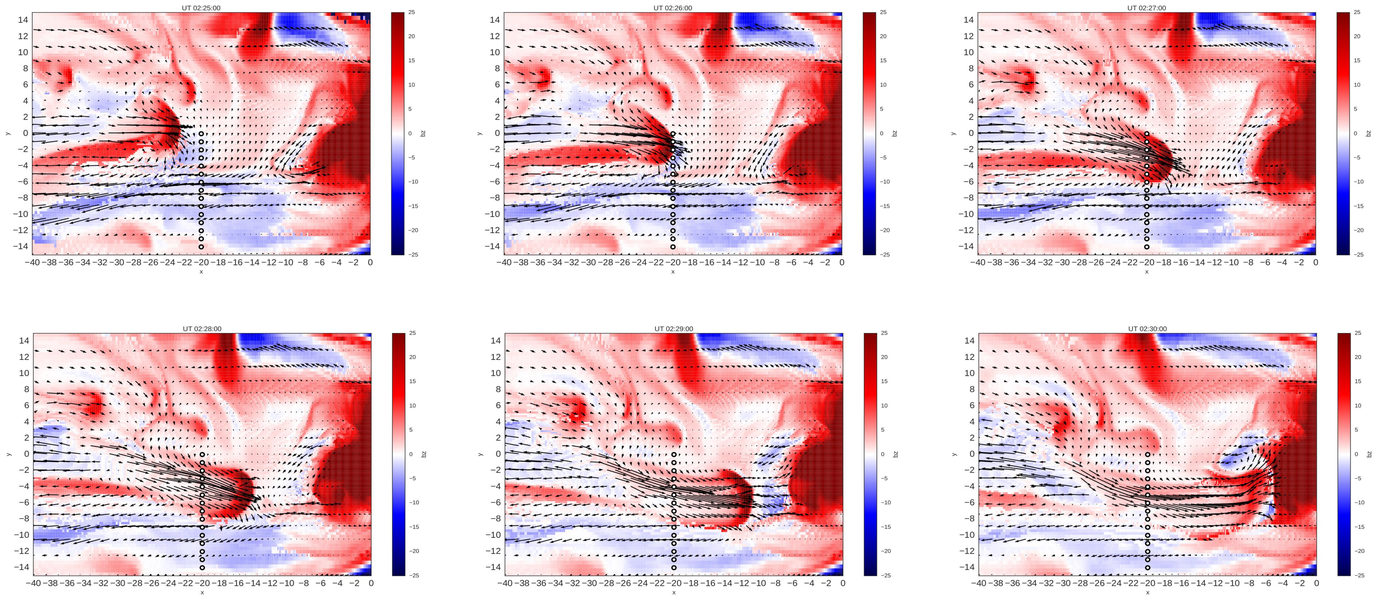
THEMIS observations of Bursty Bulk Flow (BBF) events in the Earth's magnetotail feature varying magnetic field (Bz) signatures for the same BBF, such as a dip in Bz which precedes the flow, as it propagates earthward through the central plasma sheet. It has not been clear whether these variations are due to some aspect of the BBF that is changing in time or due to the geometry of the BBF and the specific location of the spacecraft relative to it.





Figures from: Runov, A., V. Angelopoulos, M. I. Sitnov, V. A. Sergeev, J. Bonnell, J. P. McFadden, D. Larson, K.-H. Glassmeier, and U. Auster (2009), THEMIS observations of an earthward-propagating dipolarization front, Geophys. Res. Lett., 36, L14106, doi:10.1029/2009GL038980.

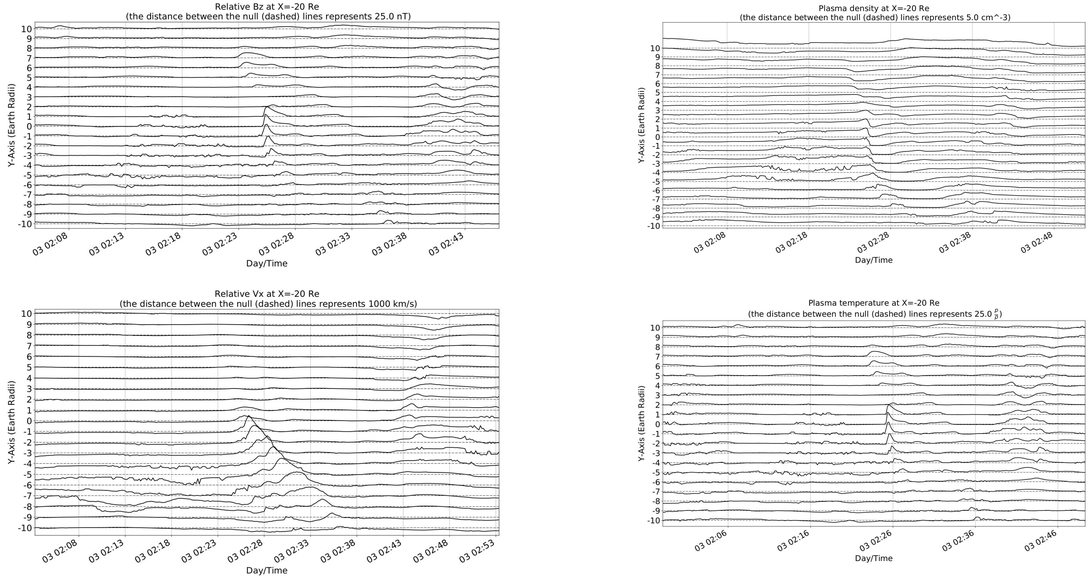
OpenGGCM Simulation with virtual satellites.

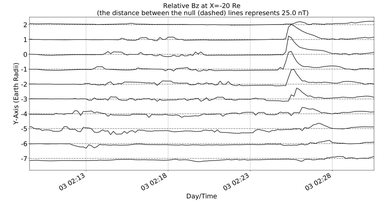


In order to investigate these varying BBF signatures, we use OpenGGCM simulations, which produce realistic looking BBFs. By inserting an array of virtual satellites, we generate virtual observations at different locations relative to the BBFs. We show that the same BBF produces highly varying signatures depending on the location of the observing satellite. Specifically we show that the dip in Bz seems to depend on where the satellite is relative to the BBF. This results mainly from the fact that BBFs are not simple one-dimensional structures as they are often depicted in the literature, but rather following more complicated paths in the plasma sheet.

Left: The small circles represent the locations of virtual satellites.

Virtual observations of the simulated BBF.





Left: Data collected by virtual satellites within the simulation.

Above: A zoomed-in image of the Bz data collected as the simulated BBF passed the virtual satellite array. The negative Bz dip is a feature found on the -Y side of the BBF, but it is not prominent, or is non-existent, on the +Y side of the BBF. This demonstrates a variation in Bx signatures similar to those observed by the THEMIS spacecraft.

Conclusion: The observed signature depends on a spacecraft's position relative to the BBF.