

Survey of Saturn's magnetosheath and its boundaries throughout the Cassini mission

Jackman, Caitriona (1), Thomsen, Michelle (2) Sergis, Nick (3) and Dougherty, Michele (4)

(1) Department of Physics and Astronomy, University of Southampton, Southampton, SO17 1BJ, UK, (2) Planetary Science Institute, 1700 East Fort Lowell, Suite 106, Tucson, AZ, 85719, USA, (3) Office of Space Research and Technology, Academy of Athens, Athens, Greece (4) Blackett Laboratory, Imperial College London, London, UK.

(c.jackman@soton.ac.uk)

Abstract

The Cassini spacecraft orbited the planet Saturn from July 2004 – September 2017, and its varied orbital trajectory took it across the magnetopause and bow shock boundaries multiple times, at varying radial distances, local times, latitudes, and phases of the solar cycle. Here we present a complete list of these boundary crossings, derived primarily using data from the Cassini magnetometer instrument. In this work, we use the list to select intervals when Cassini spent time in Saturn's magnetosheath and in the upstream solar wind. We statistically examine these intervals over the full solar cycle of Cassini's exploration and examine local time asymmetries in the sheath, as well as the processing of the interplanetary magnetic field from the solar wind through the bow shock to the magnetopause, quantifying the impact of features such as Saturn's polar flattening on the magnetosheath properties. Furthermore, we combine this list with a recently published dataset of magnetosheath parameters to establish the link between the magnetosheath parameters and the upstream solar wind dynamic pressure, which allows us to explore the response of the

magnetosphere to solar wind dynamic pressure variations.

References

Thomsen, M. F., Coates, A. J., Jackman, C. M., Sergis, N., Jia, X., & Hansen, K. C. (2018). Survey of magnetosheath plasma properties at Saturn and inference of upstream flow conditions. *Journal of Geophysical Research: Space Physics*, 123. <https://doi.org/10.1002/2018JA025214>