Electron Heat Flux and Whistler Instability in the Earth's Magnetosheath

Ida Svenningsson*†[1,2], Emiliya Yordanova[1], Alexandros Chasapis[3], Yuri Khotyaintsev[2,4], Mats André[1], and Giulia Cozzani[5]

[1]Swedish Institute of Space Physics, Uppsala – Sweden
[2]Uppsala Universitet [Uppsala] – Sweden
[3]LASP, University of Colorado Boulder, Boulder, CO, USA – United States
[4]Swedish Institute of Space Physics, Uppsala – Sweden
[5]Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E), Orléans, France – Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E) Université d'Orléans – France

Abstract

The electron heat flux is an important quantity in understanding energy conversion in collisionless plasmas. While it has been studied in the solar wind, the heat flux properties and evolution across the Earth's magnetosheath region have not yet been explored. We use MMS burst-mode measurements from the 2023 unbiased magnetosheath campaign to quantify and investigate the electron heat flux. Our results show that the heat flux follows the magnetosheath magnetic field as it drapes around the magnetosphere. It is also aligned with the magnetic field, similarly to the solar wind, however it is not substantially changed by local magnetosheath processes. We find that the heat flux is limited by whistler instability thresholds and aligns with the propagation of low-frequency whistler waves but not correlated with increased whistler wave presence. We suggest that the whistler heat flux instability is one, but not the main, instability generating whistler waves in the magnetosheath.

*Speaker
†Corresponding author: ida.svenningsson@irfu.se