# Project Details

**ROSES ID:** NNH22ZDA001N-LWS
**Selection Year:** 2022
**Program Element:** Focused Science Topic

**Topic:** FST #2: Coupling of the Solar Wind Plasma and Energy to the Geospace System

**Project Title:**
Specifying Properties of Dayside Magnetopause Reconnection from a Machine-Learning Model for the Earth s Cusps

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**Summary:**
This proposal quantifies the properties of dayside magnetopause reconnection via a novel machine-learning-based analysis of in-situ measurements of ion fluxes within the terrestrial cusps. It addresses the following science questions:_x000D_
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How do solar wind plasma and magnetic field conditions control the spatiotemporal variability of the high/mid-altitude cusps?_x000D_
How do solar wind plasma and magnetic field conditions control the spatiotemporal variability of the low-altitude cusps?_x000D_
What can we infer about the location(s) of reconnection on the magnetopause from cusp properties?_x000D_
What can we infer about the time dependence of reconnection on the magnetopause from cusp properties?_x000D_
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Magnetic reconnection on the dayside magnetopause represents the primary mechanism for transporting mass, momentum, and energy from the solar wind into the terrestrial magnetosphere. Despite its crucial role, accurate information regarding the location, extent, and time dependence of reconnection remains difficult to obtain. Several studies have demonstrated that the spatiotemporal dynamics of the dayside magnetic reconnection can be inferred remotely from the time-energy dispersion of ions in the cusps; however, it is still difficult to infer the overall cusp behavior from intermittent snapshots of isolated in-situ measurements._x000D_
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This project aims to use novel machine learning techniques to leverage the immense amount of ion flux observations available from the cusps, provide reliable models for cusp dynamics, and, through these, improve our understanding of magnetic reconnection on the dayside magnetopause. First, we will implement regression models for the high/mid-altitude Northern cusp (beyond