Project Title:
Constraining the Solar Wind temperature profile using the PSP data

Project Reference Code:
UAH-Tasnim2

Host Facility:
The University of Alabama in Huntsville

Host Facility Location:
301 Sparkman Dr.
Huntsville, AL 35899
https://www.uah.edu/

Project Description:
This research aims to include a better plasma temperature profile in the 1 AU data-driven magnetohydrodynamics model Tasnim *et al.* 2018 using Parker Solar Probe observations and to compare with the theoretical predictions by Adhikari *et al.*, 2020. The solar atmosphere's nominal temperature profile shows that the temperature increases with height but jumps sharply from 40000 K in the chromosphere to a few million degrees in the corona (Cravens, 1997; Golub & Pasachoff, 1997). Although different physical processes have been proposed to explain the coronal heating problem, it has remained one of the major open questions for solar physicists and space physicists. It is very important to develop a solar wind model to understand the coronal heating that considers more realistic temperature and velocity profiles. Recently, Adhikari *et al.*, 2020 developed a turbulence-driven solar model for the fast solar wind in an open coronal hole that assumes the magnetic field is aligned with the solar wind flow.

To constrain the temperature profile, the student will i) learn about the magnetohydrodynamics models, ii) extend the 2D data-driven analytic MHD solar wind model to include different power-law indices to predict temperature profiles of the corona and the velocity of the solar wind, iii) access and utilize PSP, Wind and STEREO data, and iv) compare the predictions using near-Earth observations from Wind and STEREO with the 2D data-driven model predictions that include a power-law temperature profile.

Disciplines:
Physics, Math, Computer Science, Space Science

Is U.S. citizenship required to participate in this project?
No

Internship Location and COVID-19 related Backup Plan
The internship location is the University of Alabama in Huntsville. Due to the COVID-19 pandemic, we are preparing multiple options to ensure that the internship will take place. We are looking at least at an in-person, hybrid, and fully virtual option. For any in-person component we will ensure that there is adequate physical spacing between workspaces, following all university cleaning protocols.

Name(s) of Mentor(s) and contact information:
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Internship Coordinator/ HR manager:
Dana Waller (dsw0012@uah.edu)

The name and contact information of personnel at the host facility is provided for further assistance with questions regarding the host facility or the project.

Interns will not enter into an employee/employer relationship with the host facility. No commitment with regard to later employment is implied or should be inferred.