Title: *PRObing wave energy Transport in the Solar Atmosphere (PROTSAhan)*

Introduction: The temperature in the solar atmosphere increases from a few thousand to millions of degrees while moving from the photosphere to the corona. This increase in the temperature is known as coronal heating. One of the mechanisms of coronal heating is the dissipation of MHD waves in the solar atmosphere that leads to the heating of the local plasma. Despite several decades of observations, our understanding of the mechanism of the excitation, propagation, and dissipation of MHD waves in the solar atmosphere is limited. Therefore, coronal heating due to MHD waves is still an outstanding problem in solar physics. This gap in our understanding is due to the lack of high-resolution imaging and spectroscopic observations and state-of-the-art MHD simulations employing a realistic background atmosphere. This begs for more detailed studies using observations from new and advanced existing and upcoming space-based observatories such as Solar Orbiter, IRIS and Indian ADITYA-L1 mission and at the same time constructing MHD models and validating these models with observations.

Aim: The main objective of this project is to answer some of the long-standing questions regarding the physics of wave energy transport. This will allow us to elucidate the role of MHD waves in heating the solar atmosphere. The main aim is to understand how are MHD waves excited in the solar atmosphere? How do these waves propagate from the photosphere to the corona? And how do these waves dissipate and heat the local plasma? To accomplish these objectives, we will construct MHD models by performing high-resolution state-of-art 3D numerical simulations implementing an inhomogeneous background solar atmosphere. Furthermore, we will generate synthetic observations by performing forward modelling of numerical simulations. The synthetic observations will be compared with real observations to validate and improve the MHD model. On the one hand, MHD models will allow us to investigate the quantities such as density, temperature, kinetic energy, magnetic energy, etc that cannot be directly observed using remote sensing instruments. On the other hand, synthetic and real observations from Aditya-L1 and Solar Orbiter will permit us to investigate the observational characteristics of MHD waves. This unique approach of combining MHD simulations and observations is a powerful tool to understand the physics of wave energy transport in the solar atmosphere.

Expected outcome: This work will enable a step forward in our understanding of the physics of wave excitation in the lower atmosphere, its propagation to the upper atmosphere, i.e, solar corona and the mechanism of damping leading to the heating of the solar corona.

Funding: Jointly funded by SERB/DST and ARIES

Number of JRF positions: 01

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