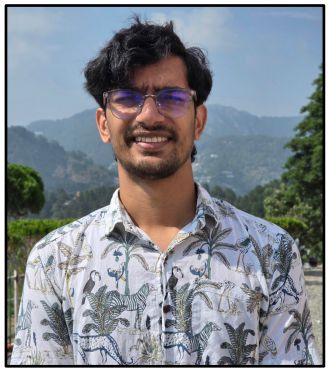
SPD Thomas Metcalf Travel Award Report
Coronal Loop Workshop XII (8 -11 June, 2026)
Northumbria University, Newcastle, UK



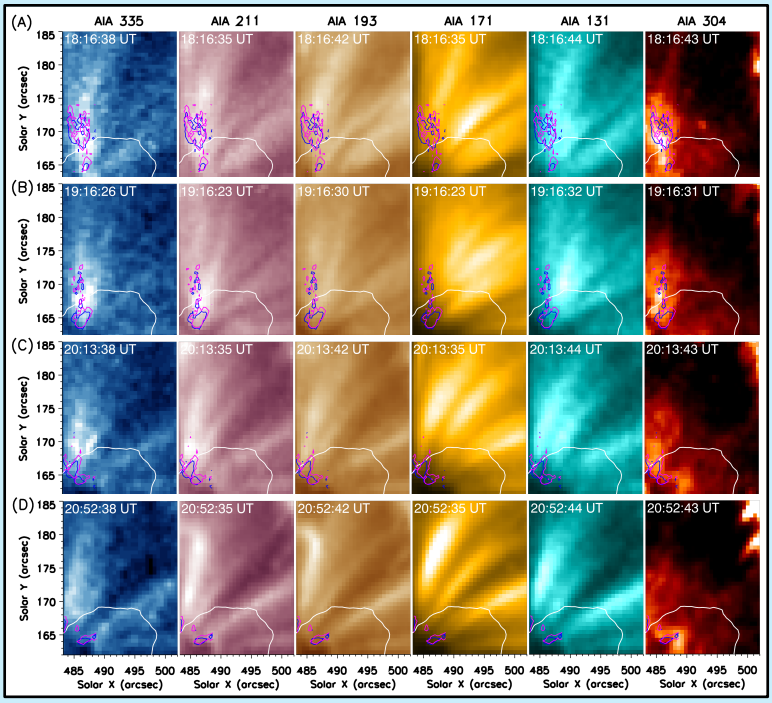
I am Bablu Mandal, a PhD Student at Aryabhatta Research Institute of Observational Sciences (ARIES), Nainital, India. I am working under the supervision of Dr. S. Krishna Prasad. One of the goals of my PhD thesis is to improve our understanding of the spatio-temporal evolution of Long-lived Transition Region downflows above sunspots and find their origin.

Email: mandalbablu1997@gmail.com

Invited Talk on "Spatio-Temporal Evolution of a Long-lived Super-sonic Downflow above a Sunspot"

Bablu Mandal, S. Krishna Prasad, Avijeet Prasad and Ambrish Pandey

Sunspot-specific, high speed downflows are observed as redshifted components in the Transition Region spectral lines and can have a lifetime from a few minutes (short-lived) to several hours (long-lived). In this work, we investigate evolution of a long-lived SSD in AR 12135 using IRIS observations. Triple Gaussian fitting with specific constraints at each pixel of the TR spectral lines, along with Non-Force Free Field (NFFF) extrapolation, is performed to study this event. Downflow is initially observed in both the umbral and penumbral regions. Over time, the penumbral downflow fades while the umbral downflow strengthens and appears as a single structure that eventually splits into two spatial parts. In this figure, intensity contours of these highspeed flows for Si IV 1394 (blue) & O IV 1401 (magenta) along with the white umbral boundary contour are overplotted on hotter to cooler AIA channels respectively (from left to right).



Our analysis revealed that changes in the downflow's morphology are linked to corresponding evolution of the coronal loops.

Derived average properties (electron density, downflow speed, and mass flux) of this event are consistent with existing studies.

I am grateful to the AAS/SPD Thomas Metcalf Travel Award committee and the organizers of Coronal Loop Workshop XII for selecting me for this prestigious award. The valuable feedbacks I received from the attending experts during the conference will help me refine and improve my research findings.