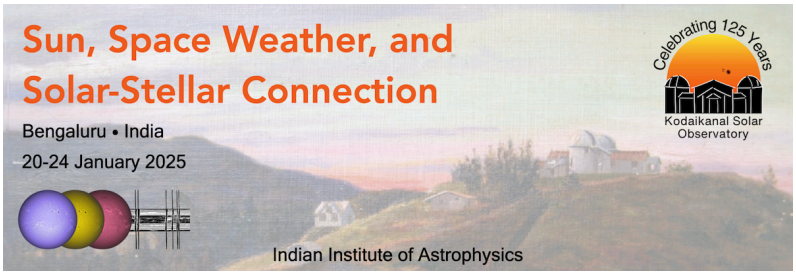

Contribution ID: **64** Type: **Invited talk**

Small-scale Magnetic Flux Emergence Preceding a Chain of Energetic Solar Atmospheric Events

Wednesday, January 22, 2025 9:25 AM (20 minutes)

Advancements in instrumentation have revealed a multitude of small-scale extreme-ultraviolet (EUV) events in the solar atmosphere and considerable effort is currently undergoing to unravel them. Our aim is to employ high-resolution and high-sensitivity magnetograms to gain a detailed understanding of the magnetic origin of such phenomena. We used coordinated observations from the Swedish 1-m Solar Telescope (SST), the Interface Region Imaging Spectrograph (IRIS), and the Solar Dynamics Observatory (SDO) to analyze an ephemeral magnetic flux emergence episode and the following chain of small-scale energetic events. These unique observations clearly link these phenomena together. The high-resolution (0.057”/pixel) magnetograms obtained with SST/CRISP allowed us to reliably measure the magnetic field at the photosphere and to detect the emerging dipole that caused the subsequent eruptive atmospheric events. Notably, this small-scale emergence episode remains indiscernible in the lower resolution SDO/HMI magnetograms (0.5”/pixel). We report the appearance of a dark bubble in Ca II K 3933 Å related to the emerging dipole, a sign of the canonical expanding magnetic dome predicted in flux emergence simulations. Evidence of reconnection is also found, first through an Ellerman bomb and later by the launch of a surge next to a UV burst. The UV burst exhibits a weak EUV counterpart in the coronal SDO/AIA channels. By calculating the differential emission measure (DEM), its plasma is shown to reach a temperature beyond 1 MK and to have densities between the upper chromosphere and transition region. Our study showcases the importance of high-resolution magnetograms in revealing the mechanisms that trigger phenomena such as EBs, UV bursts, and surges. This could hold implications for small-scale events similar to those recently reported in the EUV using Solar Orbiter. The finding of temperatures beyond 1 MK in the UV burst plasma strongly suggests that we are examining analogous features. Therefore, we recommend caution when drawing conclusions from full-disk magnetograms that lack the necessary resolution to reveal their true magnetic origin.

Contribution Type

Theme

Solar Magnetism in High-Resolution

Primary author: Dr NÓBREGA-SIVERIO, Daniel (Instituto de Astrofísica de Canarias (IAC))

Co-authors: Dr CABELLO, Iballa (Universidad de La Laguna, Dept. Didácticas Específicas); BOSE, Souvik (Lockheed Martin Solar & Astrophysics Lab/SETI Institute); ROUPPE VAN DER VOORT, Luc (RoCS, Uni. of Oslo); JOSHI, Reetika (Rosseland Centre for Solar Physics); FROMENT, Clara (CNRS, Orleans); Dr HENRIQUES, Vasco (Rosseland Centre for Solar Physics)

Presenter: Dr NÓBREGA-SIVERIO, Daniel (Instituto de Astrofísica de Canarias (IAC))

Session Classification: Jets and Magnetic Reconnection