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Ellerman Bomb detection in SST and SDO observations with Deep Learning.

Small-scale magnetic reconnection events have a fundamental role in the dynamics and evolution of active regions and flux emergence. To detect them, we can use Ellerman Bombs (EBs), events found across the photosphere of emerging active regions produced by the reconnection of strong field concentrations of opposite polarity. Their main characteristic is the enhancement of the wings of the $H\alpha$ line while the core remains in absorption. Ellerman Bombs detection has been performed in many studies using high-spatial resolution ground-based telescopes, but limited to short time series and small fields of view. To overcome this, we aim to detect EBs in data sets from the Solar Dynamics Observatory (SDO), allowing for a broader study in both the temporal and spatial domain. However, detecting EBs in SDO is challenging due to the lower spatial resolution compared to high-spatial resolution observatories and the absence of $H\alpha$ spectroscopy to identify them. To address this problem, we first apply deep learning techniques to observations from the Swedish 1-m Solar Telescope to automatically detect EBs using the $H\alpha$ line. These detections are then used to translate the observational signatures of EBs to the spectral passbands of the Atmospheric Imaging Assembly (AIA) on board SDO. We do this by means of a neural network-based segmentation process, which we use to find UV EBs signatures. This opens the way to study the relation between small-scale magnetic reconnection events with active regions throughout all their lifetime and across the solar disk.

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