

4. Eruptions in the solar atmosphere

Are IRIS bombs connected to Ellerman Bombs?

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Recent observations by the Interface Region Imaging Spectrograph (IRIS) have revealed pockets of hot gas ($\approx 2\text{--}8 \times 10^4$ K) potentially resulting from magnetic reconnection in the partially ionized lower solar atmosphere (IRIS bombs; IBs). Using joint observations between IRIS and the Chinese New Vacuum Solar Telescope, we have identified 10 IBs. We find that 3 are unambiguously and 3 others are possibly connected to Ellerman bombs (EBs), which show intense brightening of the extended Ha wings without leaving an obvious signature in the Ha core. These bombs generally reveal the following distinct properties: (1) the O IV 1401.156 Å and 1399.774 Å lines are absent or very weak; (2) the Mn I 2795.640 Å line manifests as an absorption feature superimposed on the greatly enhanced Mg II k line wing; (3) the Mg II k and h lines show intense brightening in the wings and no dramatic enhancement in the cores; (4) chromospheric absorption lines such as Ni II 1393.330 Å and 1335.203 Å are very strong; and (5) the 1700 Å images obtained with the Atmospheric Imaging Assembly on board the Solar Dynamics Observatory reveal intense and compact brightenings. These properties support the formation of these bombs in the photosphere, demonstrating that EBs can be heated much more efficiently than previously thought. We also demonstrate that the Mg II k and h lines can be used to investigate EBs similarly to Ha, which opens a promising new window for EB studies. The remaining four IBs obviously have no connection to EBs and they do not have the properties mentioned above, suggesting a higher formation layer, possibly in the chromosphere.