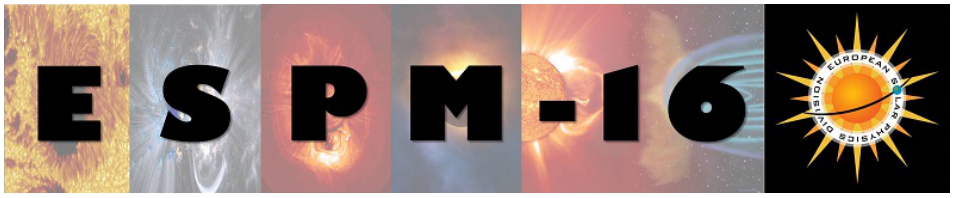

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How connected is the solar atmosphere

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The atmospheric conditions of the Sun are encoded within the line emission of different atomic transitions (spectra). To infer the physics of the solar atmosphere from spectra, we have to compare these observations with synthetic outputs from simulations. It is however often the case that the thermodynamic solutions satisfying an observation are degenerate, with different variations of vertically stratified temperatures, densities, and velocity fields leading to the same synthetic output. It is therefore desirable to restrain the solution space of our simulations by analyzing multiple spectral lines simultaneously. We use machine learning methods in combination with observations from the Interface Region Imaging Spectrograph (IRIS), to calculate the entire set of possible spectral responses over all spectral windows during a solar flare giving a single fixed Mg II spectrum. The results provide us with an automatic way of analyzing the Sun through a multithermal lens and provide us with a rich set of constraints for simulations and interpretations. This method helps shed light on the emission found at the edge of flare ribbons, showing central reversals in chromospheric and transition region lines, as well as deep atmospheric heating as indicated by enhanced Fe II emission.

Primary authors: Dr PANOS, Brandon (University of Geneva); KLEINT, Lucia (University of Geneva)

Presenter: Dr PANOS, Brandon (University of Geneva)

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