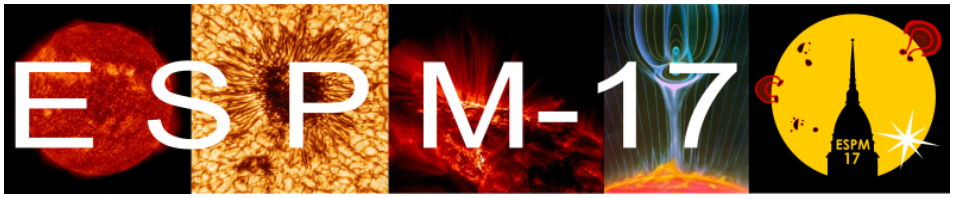

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On the detection of solar flares in a Sun-as-a-star setting

Sun-as-a-star (SAAS) observations provide a valuable link between resolved solar observations and disk-integrated stellar observations, as it gives a unique insight into how well-defined solar activity affects the average spectrum. This activity can affect the integrated spectrum in complex ways, and therefore the values of for example reference spectra and exoplanet characterizations. It is therefore important to understand the magnitude and timescale of these variations. We aim to contribute to this field by focusing on the most rapidly changing type of activity: solar flares. We present the first SAAS detection of solar flares with TNG/HARPS, and discuss its effects on the integrated spectrum. When combined with observations made with SST/CRISP&CHROMIS and SDO/AIA, we are able to point to several evolutionary features of the flares in the HARPS data, as well as discuss their imprints on activity indices and RV measurements. Additionally, we expand this work by converting several other SST flare observations into simulated SAAS observations using the Numerical-Sun-as-a-Star Integrator (NESSI). This allows us to show the wide range of spectral imprints that flares can leave on the integrated spectrum based on their morphology, location, and size.

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Track Classification: Multi-scale energy release, flares and coronal mass ejections