

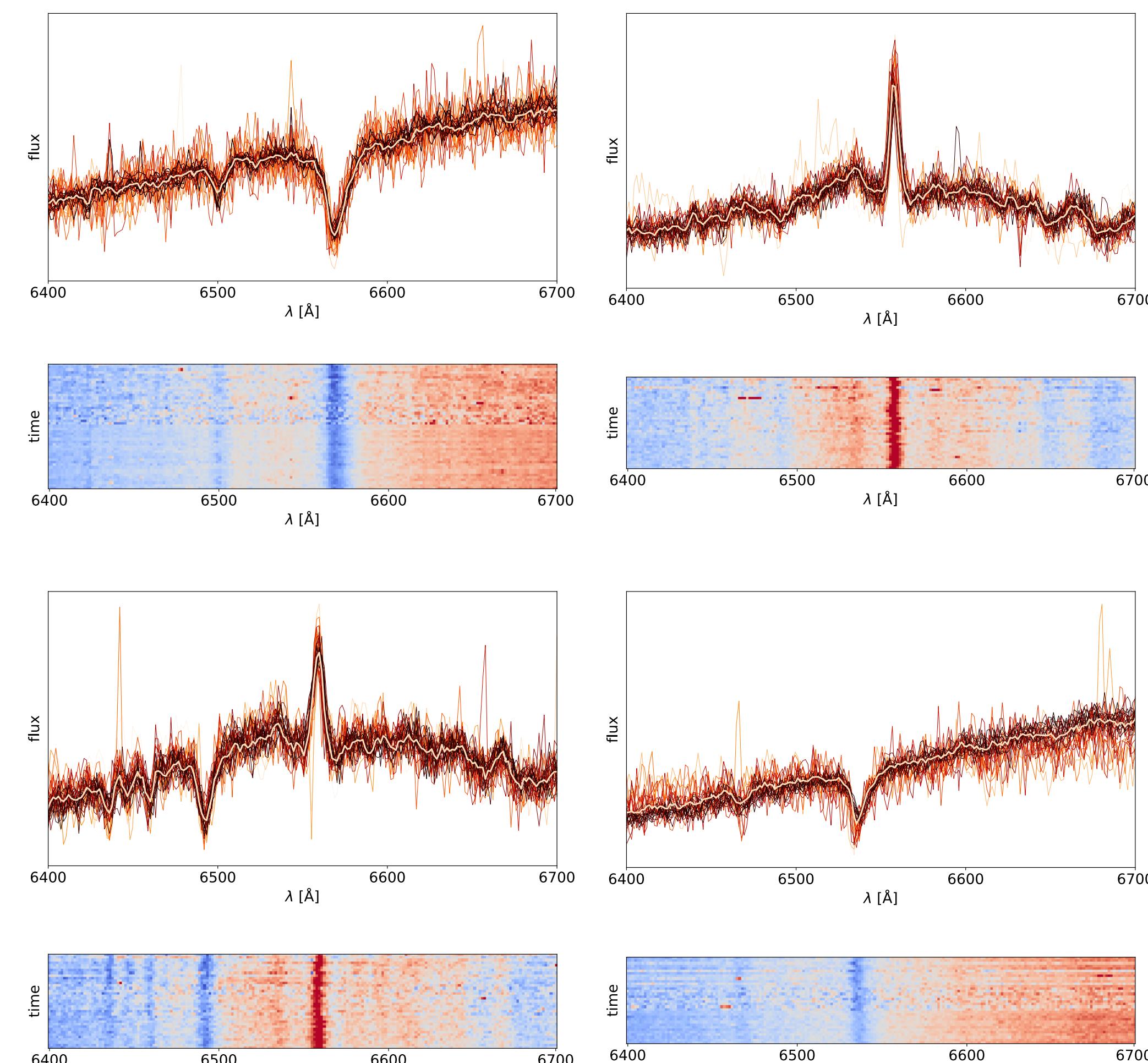
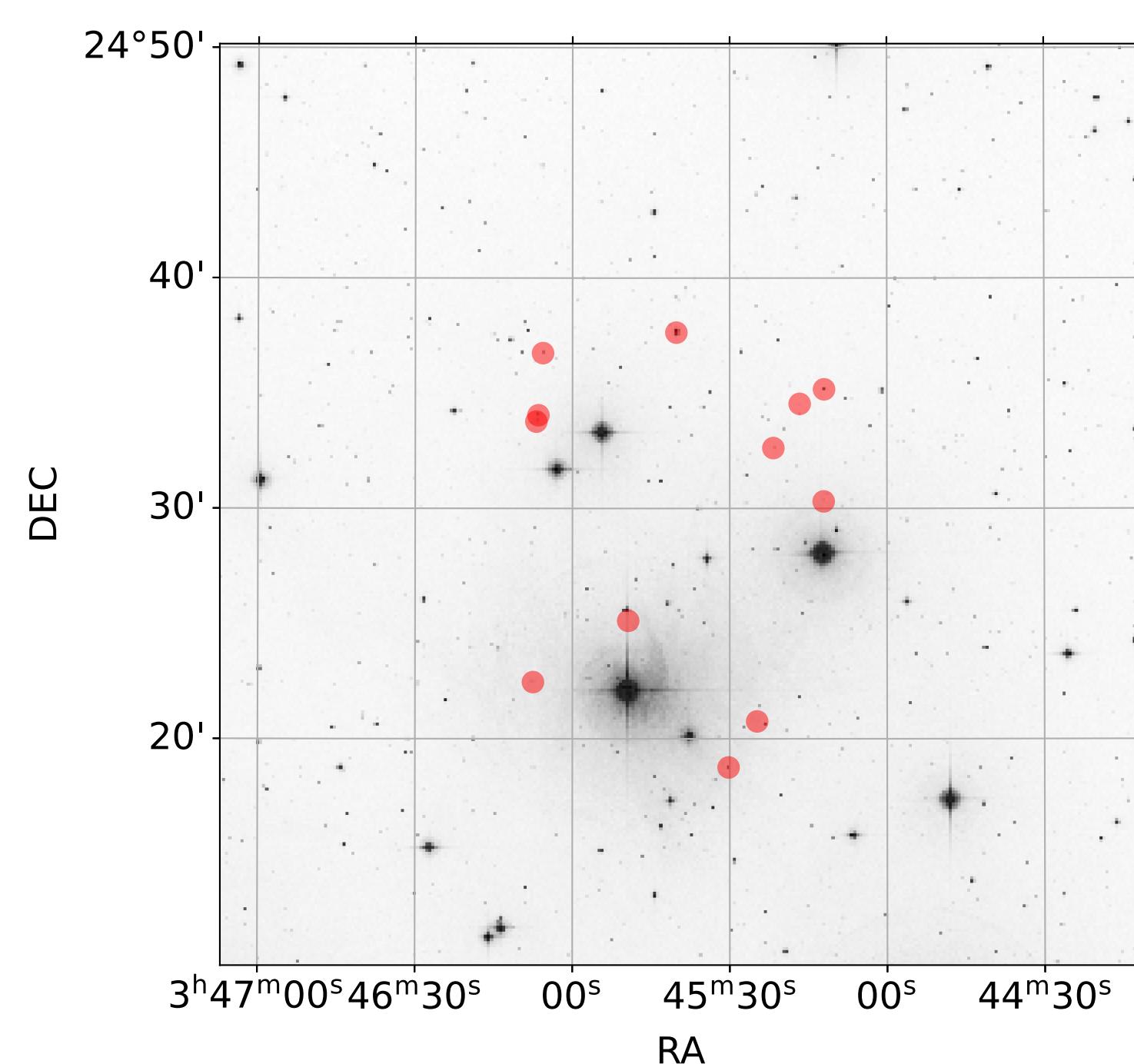
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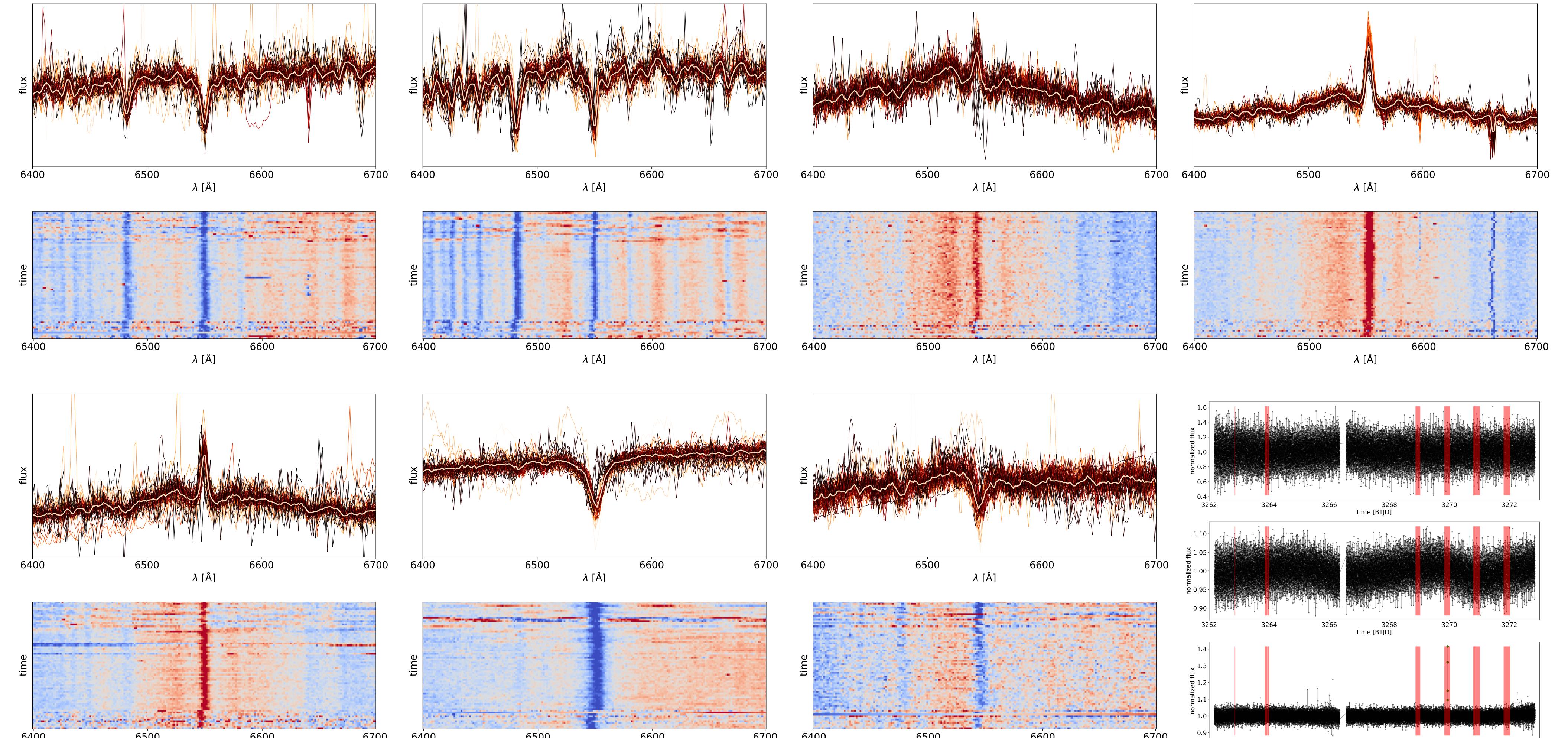
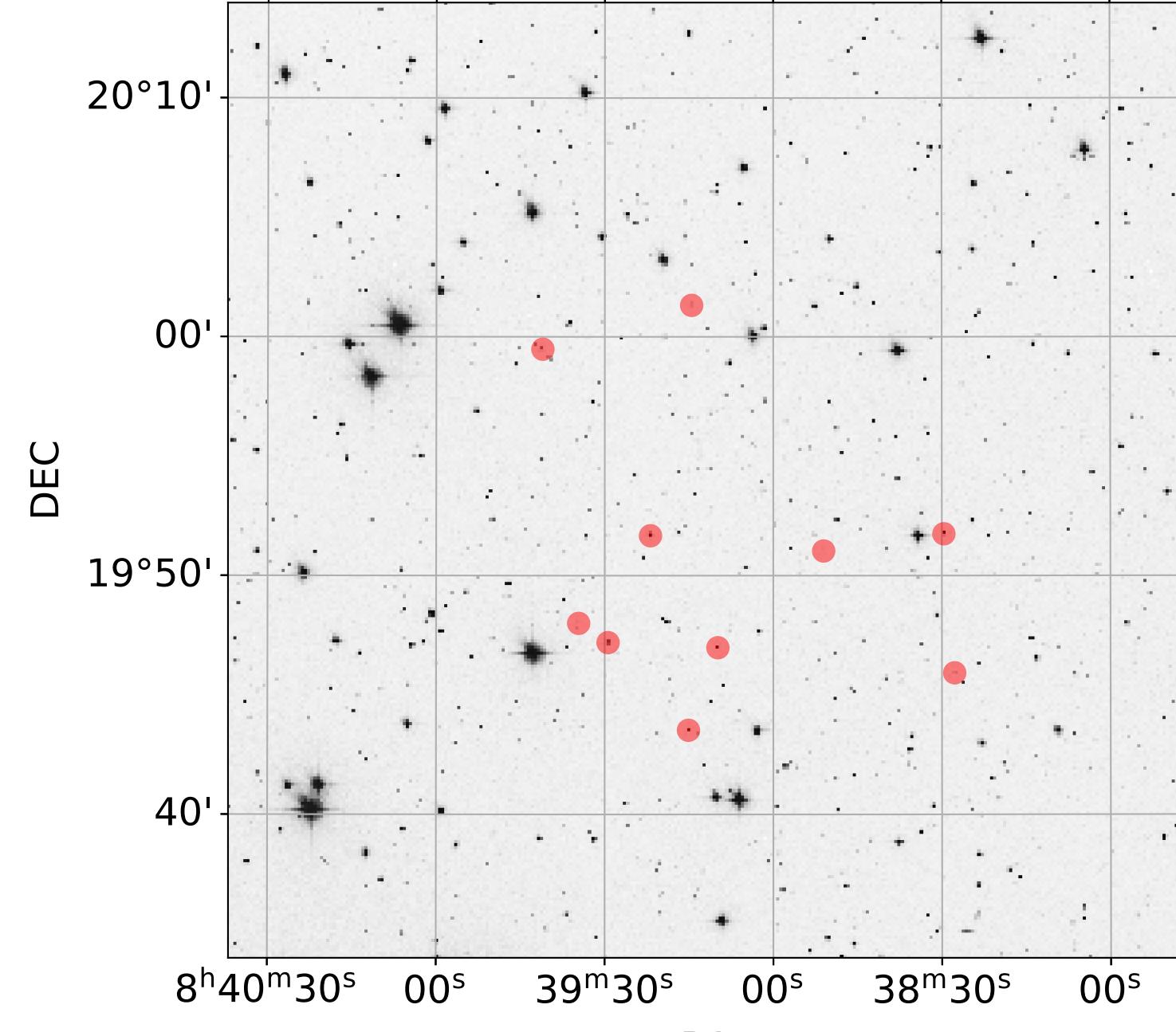
On the Sun, the energetic, erupting phenomena of flares and coronal mass ejections (CMEs) often occur together. While space-based photometry has revealed frequent white-light flares for vast numbers of stars, only a handful of coronal mass ejections have been detected. Space-based photometry reveals the timing and detailed structure of flares. To detect CME signatures, however, optical spectroscopy is essential, as the ejected plasma can be detected by Doppler-shifted emission bumps in the Balmer-regions. We present a dedicated ground-based multi-object spectroscopic observations of the young, nearby Praesepe (600 Gyr) and Pleiades (135 Gyr) clusters to detect CMEs and flares parallel with the observations of Praesepe by the TESS satellite. During the 10 days of overlapping observations, we did not find any obvious signs of CMEs or flares in the H α region.

Pleiades



During the 10 day-long observing run with the OSMOS multi-object spectrograph on the MDM telescope we had 12 hours of on-target time for 12 selected late-type stars in the 135 Gyr old Pleiades cluster. The instrument has a resolution of $R \sim 1600$, yielding a velocity resolution of $\sim 180 \text{ km/s}$, enough to resolve larger coronal mass ejections. The left plot shows the selected field and the stars in the mask. The right plots shows a few example spectra and dynamic spectra in the H α region with the average spectrum also shown.

Praesepe



In the 600 Gyr Praesepe cluster we had 15h on-target time for the 10 targets. During the MDM observing run the TESS also observed the cluster (a few sample 20s-cadence light curves are shown in the bottom right). We did not detect any obvious sign of CMEs or flares in the H α region. The total on-source time for the targets in the two clusters was close to 300 hours – even if we discard the spectra with low signal-to-noise levels, based on the empirical estimations of Odert et al. (2020 MNRAS, 494, 3766), we would expect at least one CME detection. It is possible that the relatively low spectral resolution, ionization of the ejecta (with the ionization of the plasma it cannot be detected in H α) and projection effects could have an influence on the results.