The Dispersal of Gas in Circumstellar Disks Based on Observations of H_2 in the FUV

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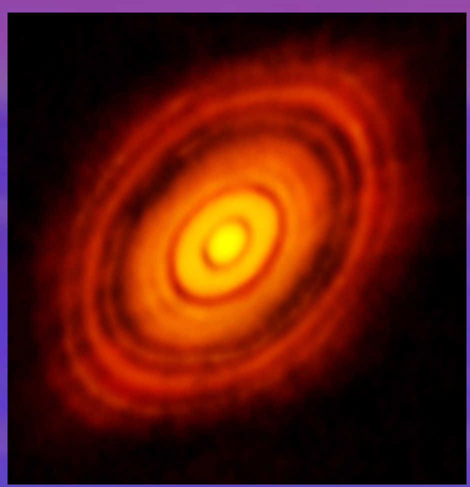

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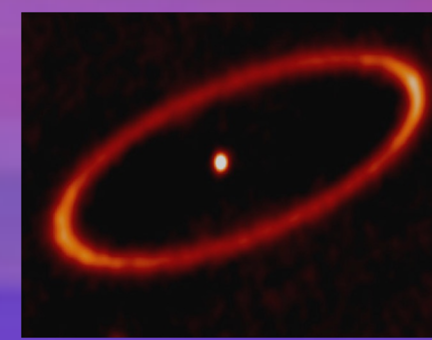
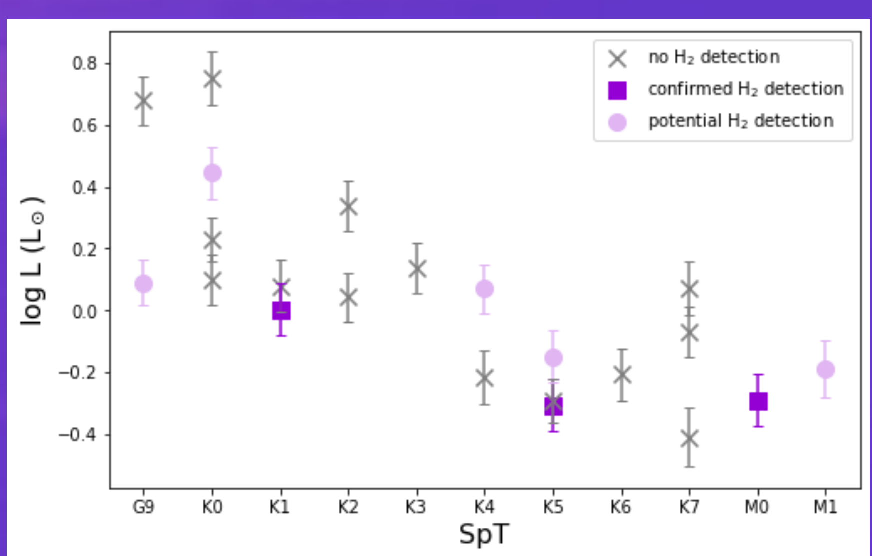


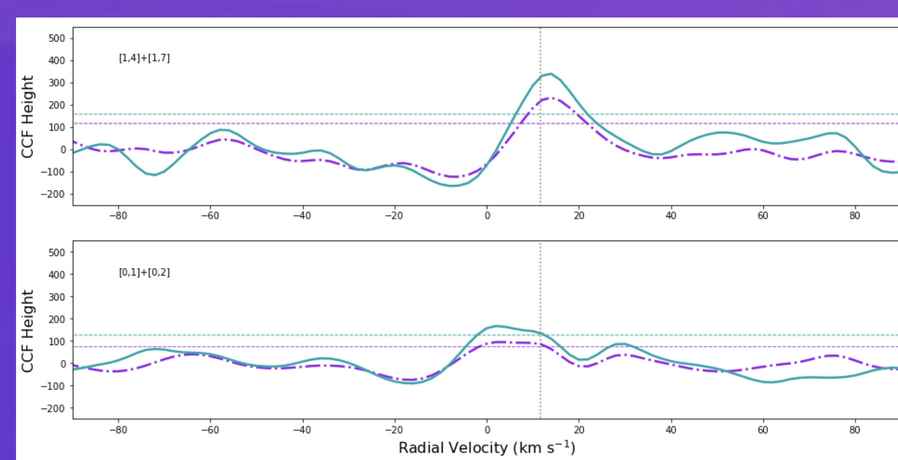
H_2 is the main component of primordial, circumstellar disks. However, because H_2 is hard to detect, our knowledge of how circumstellar disks disperse has been limited. We used cross-correlation functions (CCFs) and least-squares deconvolution (LSD) to increase our sensitivity by a factor of >10 to H_2 in FUV spectra from HST-COS and STIS. Our sample is of stars without near IR excess, indicating these systems have no remaining warm dust. **Goal: to determine whether warm gas can outlast warm dust in these systems**. But as cool stars have H_2 in their starspots (and likely in their photosphere for the coolest stars), how can we definitively determine the origin of the H_2?

At 6-8 Myr: 26 G, K, and M stars in Upper Sco

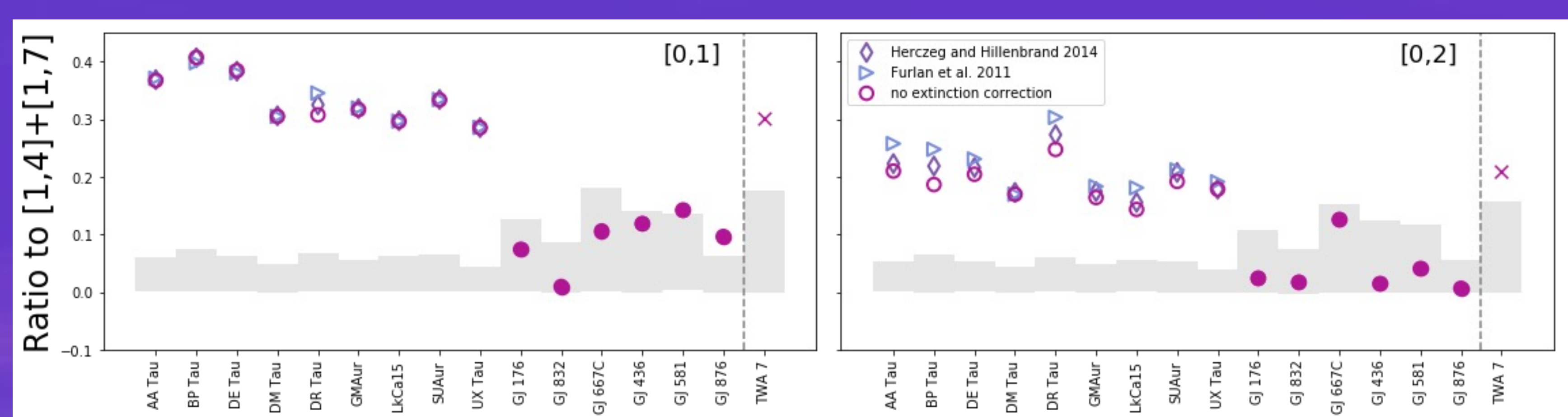


If the H_2 was in the stars, we would expect to see trends in spectral type. The lack of these trends is evidence that the H_2 is circumstellar.

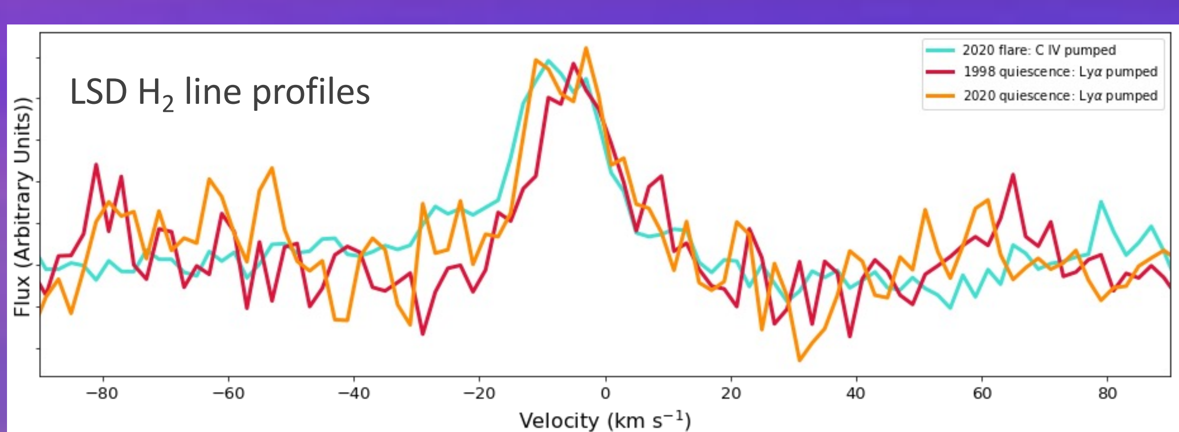
At ~9 Myr: TWA 7, a M2 star with a debris disk

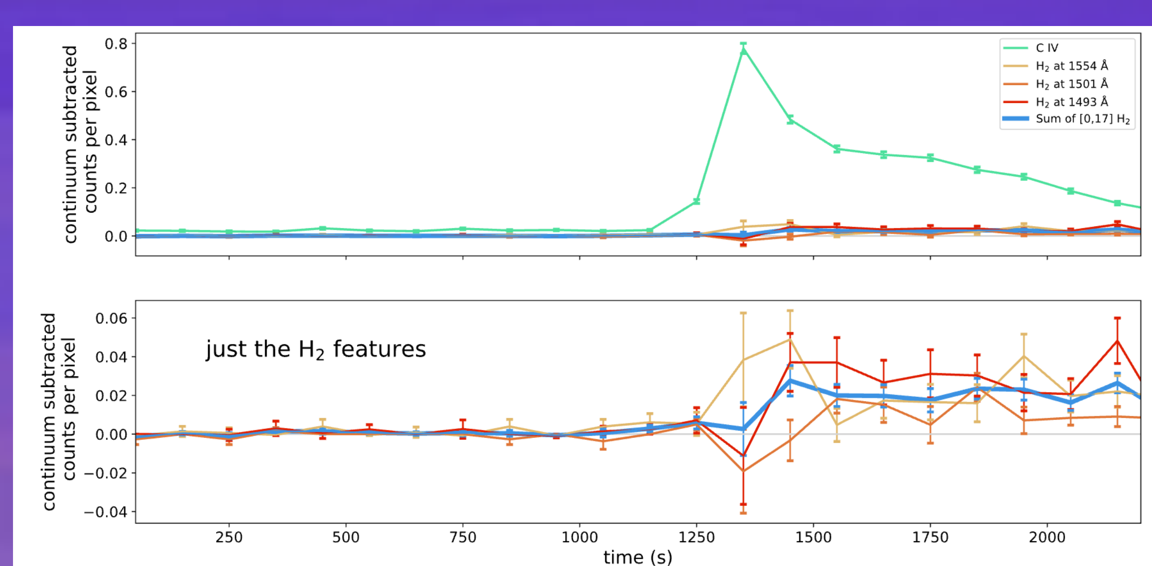


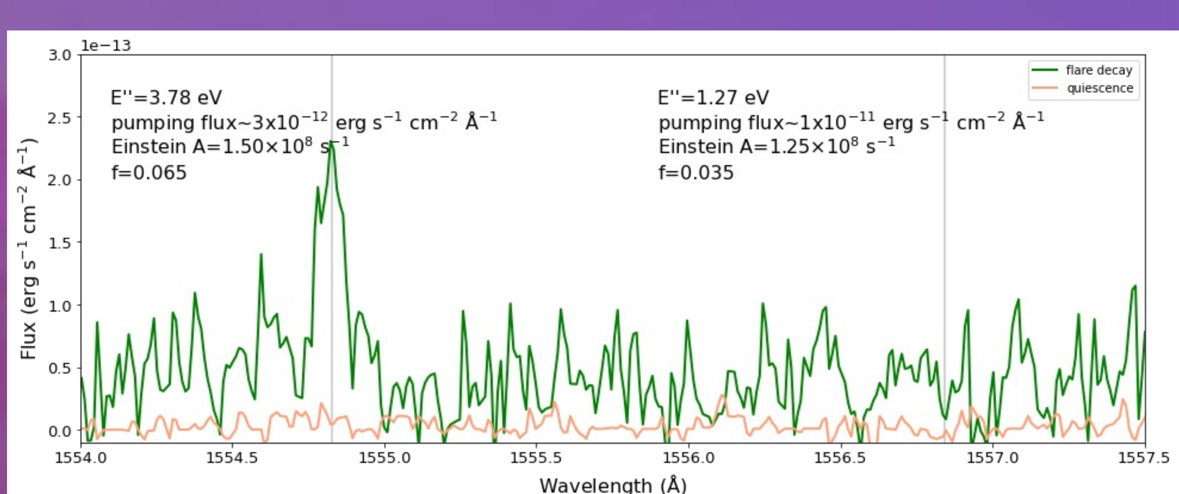
The ratio of H_2 CCF heights for TWA 7 is consistent with that of other stars with circumstellar gas, suggesting that TWA 7 is weakly accreting.



At ~23 Myr: AU Mic, a M0 star with a debris disk and 2 transiting exoplanets







We detect H_2 during both quiescence and a flare from AU Mic. Based on the lack of time delay from the H_2 emission in comparison to the flare, the H_2 is from the star not the disk. But the calculated temperature of the H_2 (1000-2000 K) is too cold for the star! We believe the H_2 is in a colder than normal starspot or a cold layer equivalent to a CO-mosphere. We also see significant non-thermal heating during the flare, as shown in the bottom right figure.