A Spectroscopic Analysis of the Ultra-violet Evolution of K Stars

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Why K stars?

K stars may offer the balance between the long-lived but energetic M stars, and the quiescent but short lived G stars as an optimal host for a habitable planet. Photochemical climate models have shown that planets orbiting K stars offer the strongest chances for observing biosignatures [e.g. 1, 2].

Why the UV?

Photochemistry: The UV ionizes and photo-dissociates some of the most important molecules in planetary atmospheres for the detection of life, such as H_2O, CH_4, and CO_2, with potential for complete erosion [e.g. 3, 4].

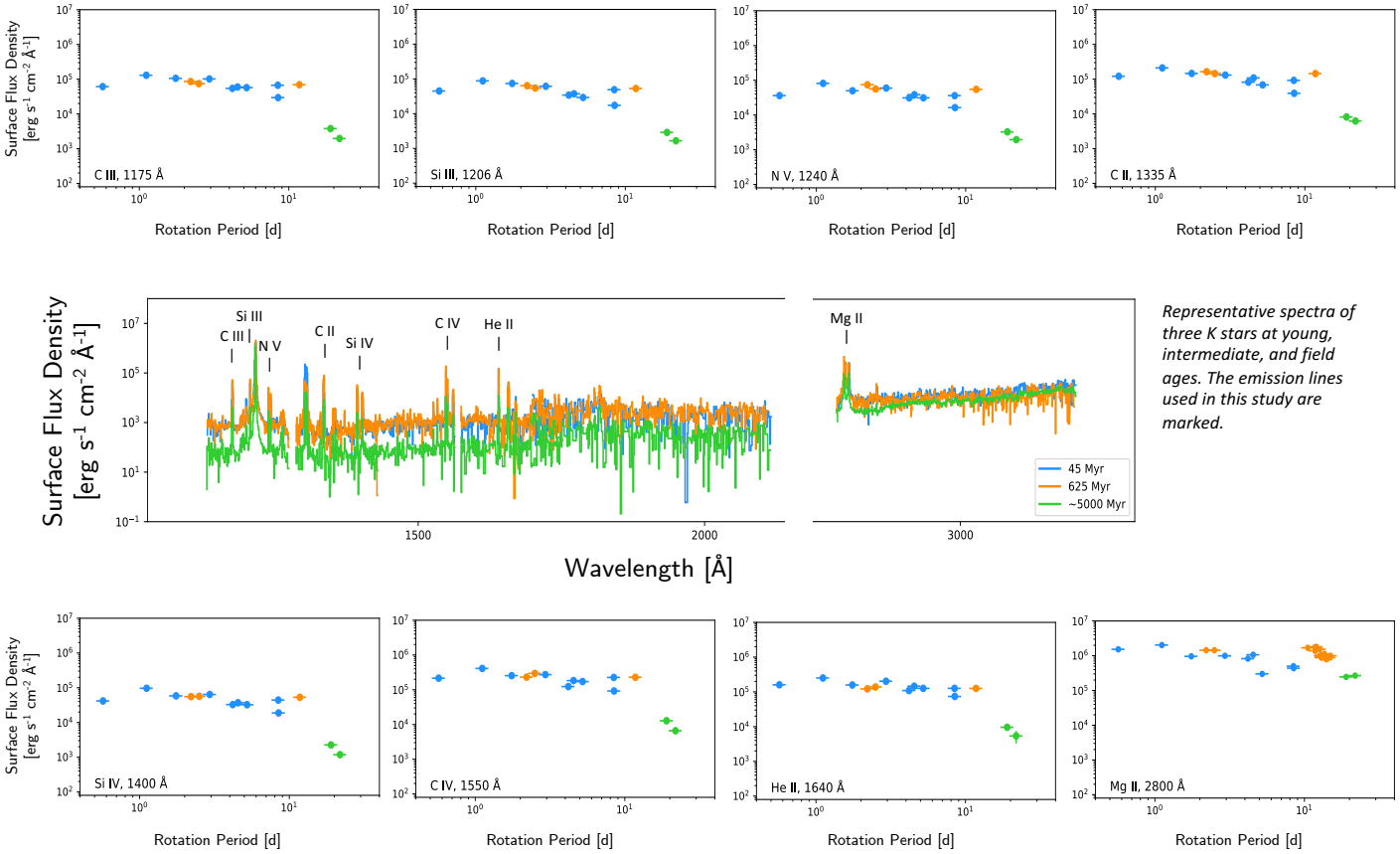
Biosignatures: The UV not only affects abundances but also the detectability of biomarkers due to the production of hazes in depleting atmospheres [e.g. 5, 6]

Who cares?

Stellar physics: These results give us an idea of what's happening in different parts of the star.

Planetary models: These results can be used as inputs into atmospheric models to more accurately determine the potential habitability of planets around K stars.

We observed **K stars (0.6 – 0.8 $M_\odot$) at ages 45 Myr, 625 Myr, and field age** using the Cosmic Origins Spectrograph (COS) on the *Hubble Space Telescope* (*HST*) to measure **the evolution of upper atmosphere emission lines in the ultraviolet (UV)**.



Representative spectra of three K stars at young, intermediate, and field ages. The emission lines used in this study are marked.

Our preliminary results show that **the UV flux remains constant through 625 Myr and a rotation period of ~15 days**, longer than that of M dwarfs [7]; however, more data is yet to be observed. These results may support the spin-down stalling hypothesis for K dwarfs [8, 9].

References

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