

How can the Sun explain the Correlations between CaII and H α Emissions of Stars?

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The CaII and H α emissions are known to be correlated for the Sun, but several studies have shown that is not always true for other stars. Some stars indeed show anti-correlated relationships between their CaII and H α emissions. The only current hypothesis to explain this anti-correlation is the presence of filaments at the surface of these stars: filaments absorb more emission in H α than in CaII, which could cause a reversal of the correlation. The goal of this study is to investigate this hypothesis and try to validate it with a model.

First, we investigate the characteristics of the anti-correlated stars to define the stellar parameters that can affect the correlation between the CaII and H α emissions. We select a sample of 391 FGK stars and study their CaII and H α time series provided by HARPS instrument. We show that anti-correlated stars are less active than the correlated stars and that the correlation does not depend on the temperature of the stars, as previously supposed.

In the future, we plan to try to reproduce the observed anti-correlations by using the solar case and modifying the photospheric magnetic field configuration and its diffusion. These simulations will give us series of magnetograms, to be transformed into CaII and H α time series, from which the correlation will be inferred.