Measuring stellar rotation and magnetic activity from photometric time-series

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Abstract

In the last decade or so, space-based photometric data have become pivotal for measuring stellar rotation and magnetic activity in solar-like stars. The presence of active regions at the stellar surface leaves a signature in the stellar brightness. Particularly, the crossings of dark magnetic spots, which co-rotate with the surface, lead to quasi-periodic brightness variations, known as rotational modulation. In addition, white-light flares, which are sudden increases of brightness, can also shed light on the magnetic properties of the stars and the environment around them. Therefore, photometric observations, such as those collected by Kepler, TESS, and future PLATO, can enable us to retrieve information on surface rotation and magnetic activity. This is in addition to the seismic signatures that will be addressed in Session B of this conference. In this talk, I will review the different diagnostics and methodologies that have been developed to retrieve rotation periods and proxies of magnetic activity from long-term brightness variations. I will also discuss the limitations of the methods and observations, particularly observational biases. The instrumental artifacts and their impact on the rotational analysis will also be addressed. Additionally, I will summarize what we have learned with previous space-based photometric missions and open questions that still remain, for which PLATO can help provide answers.

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