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# Understanding brightness variations of Sun-like stars on timescale of stellar rotation: A novel method to obtain stellar rotational periods

Eliana Maritza Amazo-Gomez<sup>\*1,2</sup>, Alexander Shapiro<sup>1</sup>, Natalie Krivova<sup>1</sup>, Ansgar Reiners<sup>2</sup>, Sami Solanki<sup>1,3</sup>, Greg Kopp<sup>4</sup>, Timo Reinhold<sup>2</sup>, Mahmoudreza Oshagh<sup>2</sup>, Julian Alvarado-Gomez<sup>5</sup>, and Rafael Garcia<sup>6</sup>

<sup>1</sup>Max-Planck-Institut für Sonnensystemforschung – Germany

<sup>2</sup>Institute for Astrophysics Goettingen – Germany

<sup>3</sup>School of Space Research, Kyung Hee University – South Korea

<sup>4</sup>Laboratory for Atmospheric and Space Physics [Boulder] (LASP) – 1234 Innovation Drive, Boulder, CO 80303-7814, United States

<sup>5</sup>Harvard-Smithsonian Center for Astrophysics (CfA) – 60 Garden Street, Cambridge, MA 02138, United States

<sup>6</sup>Laboratoire AIM, CEA / DSM – CNRS - Univ. Paris Diderot – IRFU / SAp, Centre de Saclay – Laboratoire AIM, CEA – France

## Abstract

Brightness variability of Sun-like stars has been associated with different timescale phenomena. SATIRE-S, a model developed at the Max Planck Institute for Solar System Research allows replicating observed variations of solar brightness at all timescales that have until now been resolved. Furthermore, it provides the opportunity to link the observed stellar brightness variations to the properties of the magnetic field. Our understanding of this link is now mature enough to be extended from the Sun to Sun-like stars. In this context, we analyse and compare the activity patterns on light curves of stars observed by the Kepler spacecraft and synthetic ones. In particular, we explored whether power spectra of stellar brightness variations can be used to estimate stellar parameters such as the rotational period and the inclination of rotation axis. Based on this analysis, we present a novel method that allows us to achieve better constrained stellar rotational periods from photometric time series observations on solar analogs. Moreover, our method will allow us to perform a better comparison between the stellar and the solar case.

**Keywords:** Solar analogs, magnetic features modulation, rotational periods, observational methods

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\*Speaker