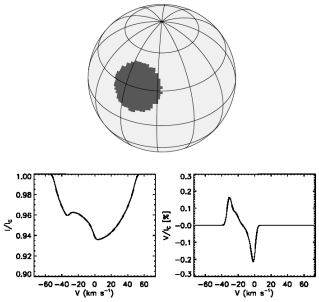

UNIVERSITÄT BERN

Philosophisch-Naturwissenschaftliche Fakultät

Astronomisches Institut

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Masterarbeit Astronomie, Gruppe Spaceweather:

Reconstructing the surfaces of stars

MOTIVATION

Stars are that far away that even the best telescopes usually cannot resolve their surfaces. Therefore, indirect methods are used to reconstruct the surfaces of stars. These methods have evolved considerably, and it is possible to know e.g. if stars have starspots, planets, how fast they rotate, or if they have eruptions. All this is derived from lightcurves - the temporal variation of intensity - sometimes also by analyzing different wavelengths.

However, such reconstructions usually have large error bars. For example, two small starspots or one large starspot may lead to the same lightcurve. Additionally, simplifying assumptions are often made, for example that starspots are circular blobs of a constant temperature. The goal of this project is to develop a lightcurve inversion algorithm that will be highly customizable to reconstruct the surfaces of stars and their magnetic field.

TASKS

- Learn the theory on radiative transfer, spectra, and observations.
- Program a well-documented and clean code that takes a stellar lightcurve and then outputs possibilities of a reconstructed stellar surface.
- Potentially use methods from machine learning to speed up the reconstructions and/or better constrain the parameter space.
- Investigate different types of stars and data, to for example correlate the occurrence, temperature, and sizes of starspots to stellar eruptions.

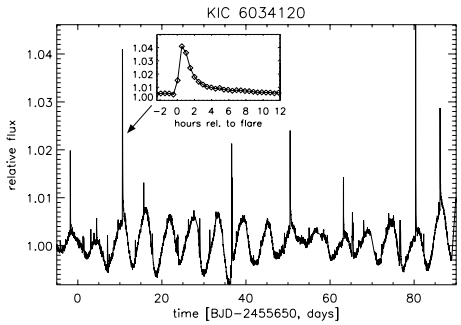

Figure 1: Lightcurve from a star that erupts often. Adapted from Maehara et al. 2012.

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