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Observing stellar flares with Bayesian Blocks and Super-resolution techniques in A-type stars observed by Kepler.

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Abstract

Flares are a sudden release of energy in the stellar atmospheres that can be observed photometrically at all wavelengths across the spectrum, especially in UV and X rays. The origin is the reconnection of magnetic field lines. They are observed in solar-type stars since there is a dynamo mechanism and a convective envelope that can support the magnetic field lines. On the other side, theoretical models predict a very thin, if any, convective envelope in A-type stars but some observations point to a convective envelope that might be effective in producing granulation effects and even magnetic activity. In order to detect and characterize stellar flares we need a systematic and self-consistent detection algorithm. Nevertheless, to date all the results obtained by flares detection and their characterization that can be found in the literature are based on a set of ad-hoc criteria that are verified manually with no physical support. We are developing an automatic detection pipeline based on Bayesian Blocks detection and wavelet decomposition that will be capable to detect a flare candidate and reject false positives providing at the same time physical parameters that can be useful for the characterization of stellar activity in A-type and other stars. Here we will introduce the algorithm for flares detection using a sample of Kepler stars and the characterization of the candidates using superresolution techniques.