



Stellar ultraviolet excesses in the Kepler field

M. Olmedo^{1,2}, D. Olmedo¹, M. Chávez¹, E. Bertone¹, E. E. Mamajek³, and J. Lloyd^{4,5}

¹ Universidad de Monterrey, Av. Ignacio Morones Prieto 4500 Pte., 66238 San Pedro Garza García, Mexico, e-mail: manuel.olmedo@udem.edu

² Instituto Nacional de Astrofísica Óptica y Electrónica, Luis Enríque Erro #1, Tonantzintla, 72840 Puebla, México

³ Jet Propulsion Laboratory, M/S 321-100, 4800 Oak Grove Drive, Pasadena, CA 91109, USA

⁴ Carl Sagan Institute and Cornell Center for Astrophysics and Planetary Science, Cornell University, Ithaca, NY, USA

⁵ California Institute of Technology, 1200 East California Boulevard, MC 278-17, Pasadena, CA 91125, USA

Abstract. We present a preliminary catalog of stars in the *Kepler* field that have a near ultraviolet (NUV) excess over the photospheric level, indicative of a significant stellar activity. NUV data come from the *GALEX CAUSE Kepler* catalog by Olmedo et al. (2015). The NUV excess level does not seem to correlate with the rotation period, but the percentage of stars with excess increases with increasing metallicity.

Key words. techniques: photometric – stars: activity – ultraviolet: stars

1. Introduction

In August-September 2012, the *GALEX* space telescope has fully mapped, in the near ultraviolet band (NUV; 1771–2831 Å), the *Kepler* field, where more than 3000 exoplanets have been discovered, as part of a program funded by Cornell University (P.I. James Lloyd). From these observations, we constructed the *GALEX CAUSE Kepler* photometric catalog (GCK; Olmedo et al. 2015) which includes 660,490 point sources, 475,000 of which have a counterpart in the *Kepler* Input Catalog (Brown et al. 2011). The GCK catalog also contains about 70% of the 200,000 stars with *Kepler* light curves in the *Kepler* Stellar (KS) database. The GCK catalog complements the wealth of data available for this stellar field obtained through multiple observational pro-

grams, both photometric and spectroscopic, at different wavelength ranges (e.g., 2MASS, SDSS, KIS, HST). The aim of this work is to derive UV excesses of KS stars included in the GCK catalog. The UV emission excess, above the photospheric value, is an indicator of stellar activity, which is mostly generated in the chromosphere and can strongly affect the circumstellar region and the atmosphere of nearby exoplanets.

2. NUV excess in the Kepler field stars

For each star in common in the KS and GCK catalogs, we computed the corresponding synthetic photospheric photometry, for the NUV, V, J and K bands, based on theoretical spectra obtained from model photospheres (Husser

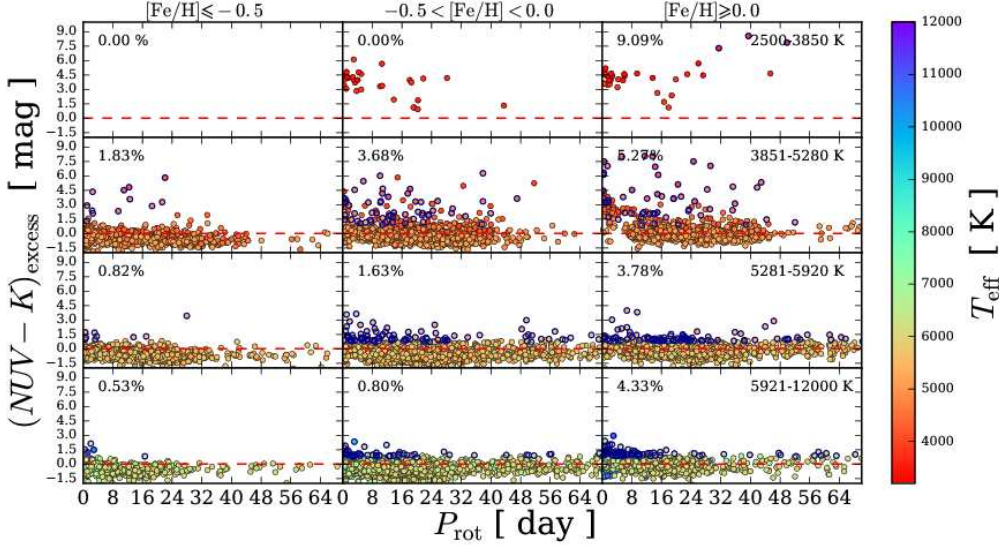


Fig. 1. $(\text{NUV-K})_{\text{excess}}$ vs. rotation period of a subsample of GCK–KS stars, in bins of T_{eff} (rows) and $[\text{Fe}/\text{H}]$ (columns). The color of the dots indicates the T_{eff} . Blue-countoured dots represent UVex stars; the percentage of UVex stars is indicated in each panel.

et al. 2013), assuming the effective temperature (T_{eff}), surface gravity, and overall metallicity from Mathur et al. (2017).

We calculate the NUV excess as $(\text{NUV-K})_{\text{excess}} = (\text{NUV-K})_{\text{obs}} - (\text{NUV-K})_{\text{phot}}$. We then identified the most UV active stars (UVex) in the GCK–KS crossmatch catalog as those sources that deviate more than 3σ from the average $(\text{NUV-K})_{\text{excess}}$ value, in bins of T_{eff} . We found 2468 UVex stars. In Fig. 1, we plot the $(\text{NUV-K})_{\text{excess}}$ for a sub-sample of the GCK–KS objects with rotation periods (P_{rot}) from McQuillan et al. (2014), Reinhold & Gizon (2015), and Mazeh et al. (2015), divided in bins of T_{eff} and $[\text{Fe}/\text{H}]$. We do not observe a clear dependence of the NUV excess values on P_{rot} , even though the UVex stars tend to cluster at low values of P_{rot} , especially for warmer stars. On the contrary, the percentage of UVex

stars shows a positive correlation with metallicity in the whole T_{eff} interval. More details on this work will be provided by Olmedo et al. (in preparation).

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