STAR-DISK INTERACTIONS ON YSO BY K2 AND SIMULTANEOUS GROUND BASED OBSERVATION

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Outline

Background: why variability

Light curve analysis: GI Tau

Lightcurve = \text{SPOT} + \text{EXT} + \text{ACC}

Including K2 light curves

Young stellar object group in KIAA-PKU
Introduction

Problem: Age/mass determination (PMS evolution tracks)

Possible solutions:

0. Different stellar population
   (e.g. Taurus Kraus+2017)

1. Observational uncertainty
   Bolometric correction (Pecaut+2013)
   Distance (waiting for Gaia)
   Spectral type -> Teff (Herczeg+2014)
   Non-uniform interstellar extinction

2. Binary/Multiple system (morning session)

3. Variability (Time domain)
   Spot / Extinction / Burst in Optical bands
   -> high cadence photometric observation
   -> K2 Light Curve: large sample!

Reviewed by Soderblom et al., 2014
Introduction

Typical light curves for variabilities

1. How to distinguish them?
2. Any relations among them?

Morphology or Multi-band photometry

- Spot
- Bursts
- Disk extinctions

Co-rotation warp: AA Tau (Bouvier+2007)

by COROT Alencar et al., 2010 and K2 Cody et al., 2017
Observations

Two years-long multi-band photometric monitoring of stellar variability on GI Tau (CTTS)

Method

Light curves

- Long term variation
- Periodicity analysis

Spot removed Light curves

- P = 7.03 d

Extinction measurement

- Rv = 3.85

Accretion rate measurement

Light curve = SPOT + EXT + ACC
Interpretations

Comparing with evolution tracks

Lightcurve = SPOT + EXT + ACC

Most common feature; Affect the $T_{\text{eff}}$ estimation!

Talk by Gully-Santiago
K2 light curves (C13) - Taurus (1-2 Myr)

— K2SFF; Vanderburg & Johnson 2014

— PDCSAP_FLUX

CTTS + WTTS ~ 140

Large quasi-periodic fraction

"Either periodic or not" in Pleiades (100 Myr)
Simultaneous ground based light curves

NOWT 1m (1.3\textsuperscript{d} x 1.3\textsuperscript{d}) Timezone +6
Simultaneous ground based light curves

Ground based color-magnitude diagram in 2 weeks

- $V - I$ (mag)
- $V$ (mag)
- Baraffe+2015
- $0.4 \text{ Msun}$
- $0.3 \text{ Msun}$
- $binned by 0.1 \text{ day}$

GI Tau
GK Tau
AA Tau
FZ Tau
FY Tau
V807 Tau

binned by 0.1 day

GI Tau
GK Tau
AA Tau
FZ Tau
FY Tau
Take home messages

1. **Multi-band** photometry - identify the variation mechanism.
2. Lightcurve = spot + extinction + accretion
3. K2 provide a large sample for variability on young stars
4. Good for period but a bit hard for amplitude analysis

Looking for post-doc position!