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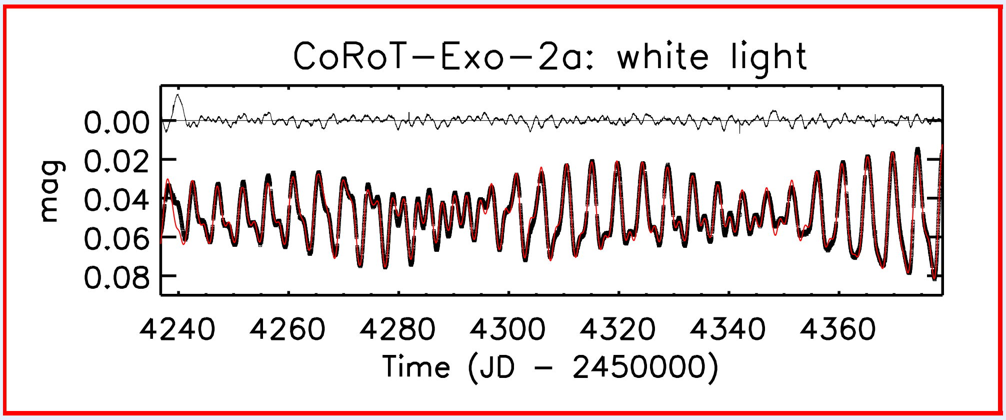
On the differential rotation of Exo-2a

H.-E. Fröhlich[1], M. Küker[1], A.P. Hatzes[2]

[1] Astrophysikalisches Intitut Potsdam, Germany
[2] Thüringer Landessternwarte, Tautenburg, Germany



Robust fit of the light curve by three dark circular spots differing in rotational frequency. The residuals, shown at the top, are ± 2 mmag.

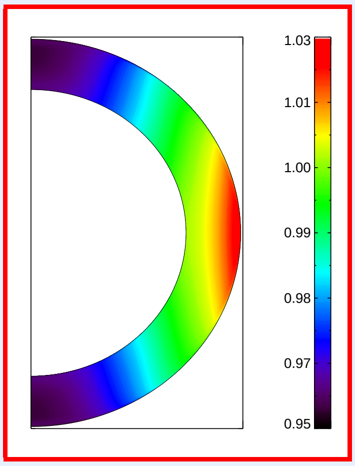
Relying on solar analogy, Lanza et al. (2009) analyzed Exo-2a photometry in terms of *short-living* spots and faculae. Accordingly, they divide the data set into 45 parts, resulting in an excellent fit ($\sigma \simeq 0.2$ mmag).

Alternative view: A simple model with three *long-living* dark features differing in rotational frequency. The ups and downs of spot coverage at the two 'active longitudes' are basically a beat phenomenon.

Why?

- Theory predicts considerable differential rotation for this type of star.
- Large dark features should have long lifetimes.
- The regular modulation in the light curve hints at a beat effect.

I. Theory:



Normalized rotation rate in Exo-2a's convection zone. At the surface the equator rotates about six per cent faster than at the poles. The differential rotation is caused by convective transport of angular momentum and large-scale meridional flow.

II. Spot modeling:

The 48-parameter problem has been solved by the MCMC method. Long-term spot evolution is modeled by Legendre expansion.

Plotted over Figure 4 of Lanza et al., our migrating spot model outlines the same activity pattern! Besides the two 'active longitudes' a slow rotation feature (red) is evident for $t \geq 4260$. The beat period is 60 days (two times the period found by Lanza et al.).

We thank Antonino Lanza and coworkers for kindly providing their longitude vs. time ME activity data.

Result: differential rotation of $k \geq 0.08$ (0.12 rad/day).