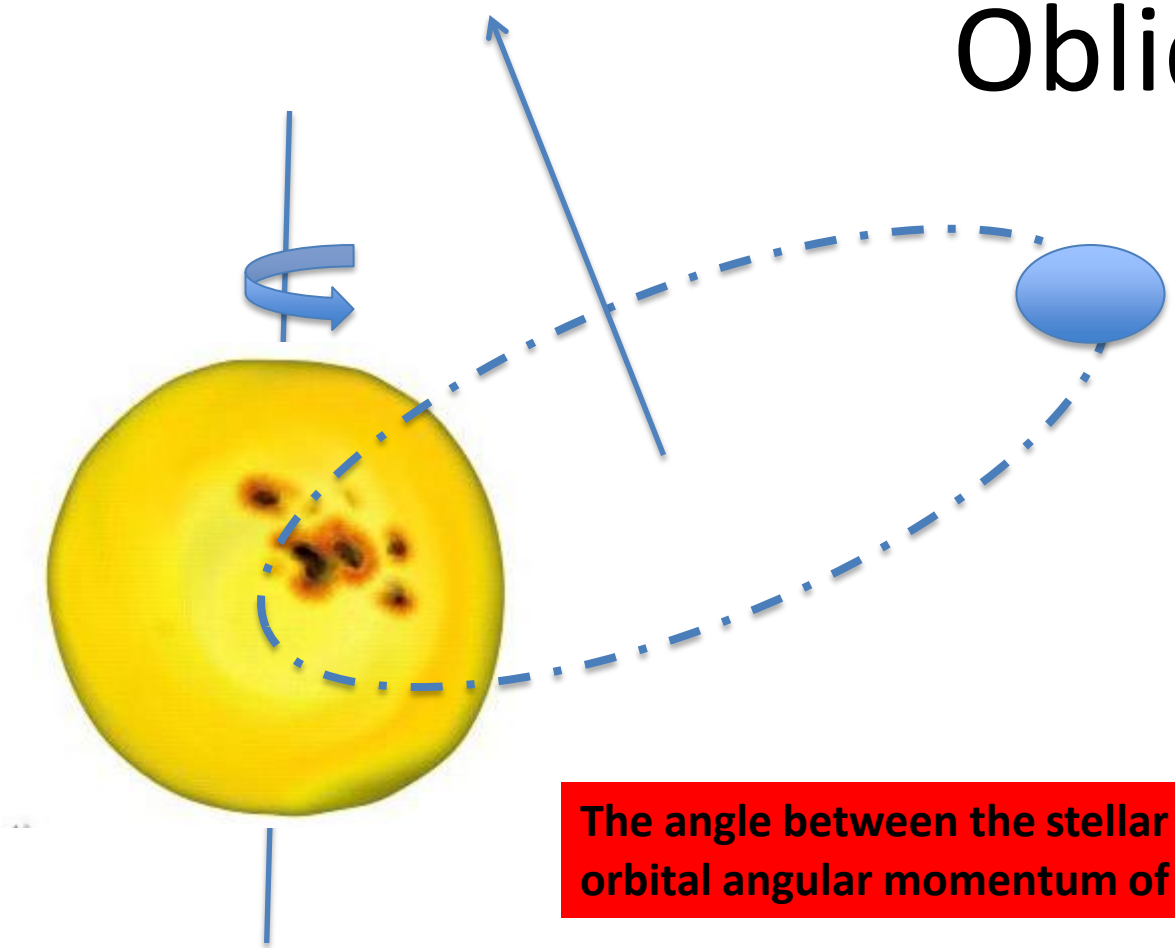
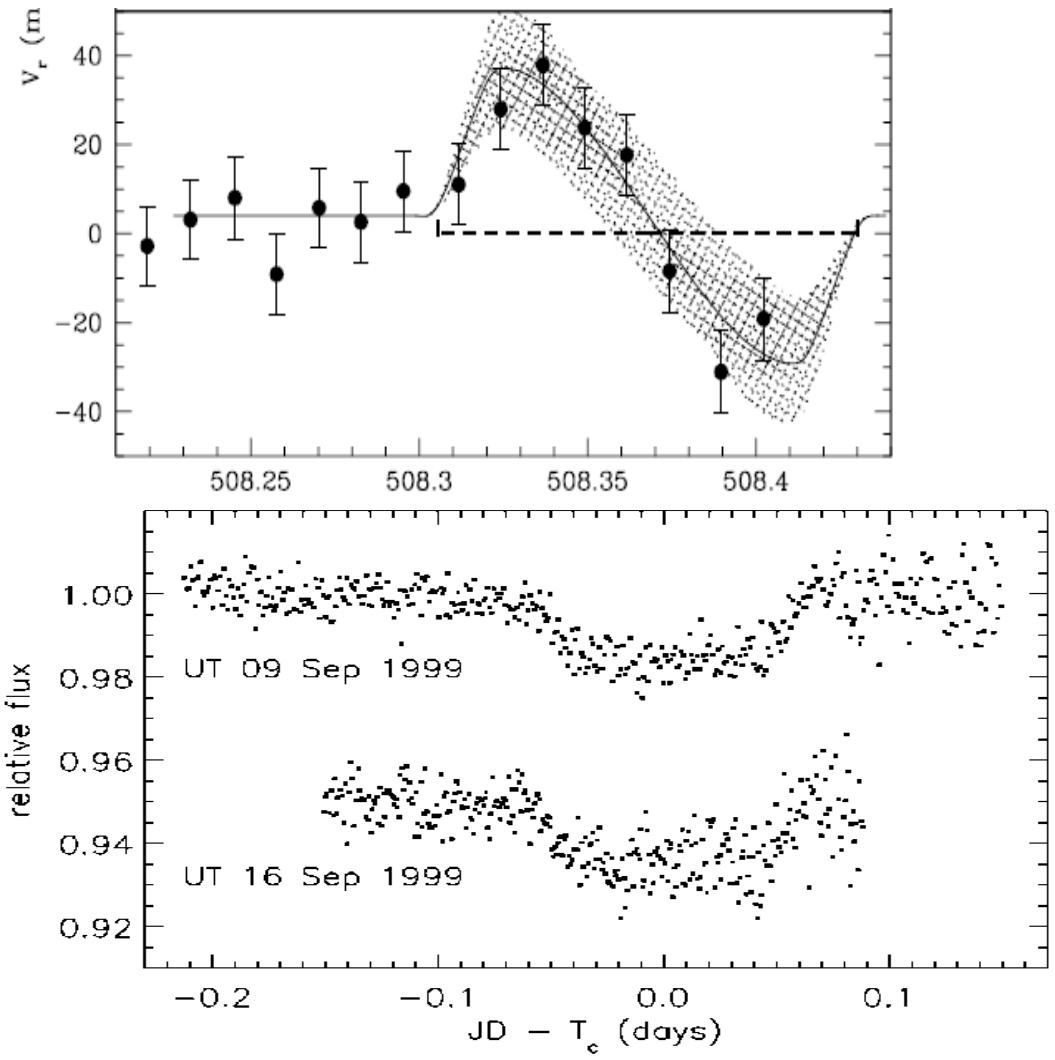
Obliquity



The angle between the stellar rotational axis and the orbital angular momentum of the planetary motion


v_r (m
40
20
0
−20
−40
508.25
508.3
508.35
508.4
relative flux
1.00
0.98
0.96
0.94
0.92
UT 09 Sep 1999
UT 16 Sep 1999
−0.2
−0.1
0.0
0.1
JD − T_c (days)

The Rossiter-McLaughlin effect

Gaudi & Winn 2007:

Rotational broadening

$$\Delta V_* \approx \left(\frac{r_{planet}}{R_*} \right)^2 V_{*,rotation}$$

Transiting planets

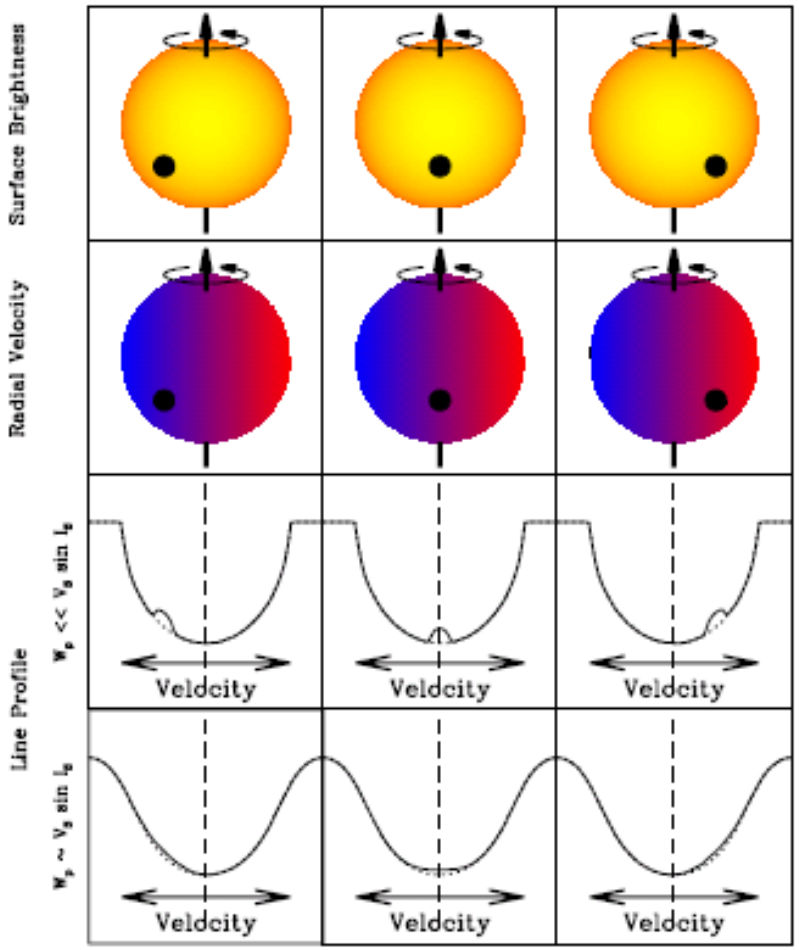


FIG. 1.— The physics of the RM effect. **Top row.** Three successive phases of an exoplanetary transit. **Second row.** Same, but the projected stellar rotation speed at each point has been color coded, neglecting differential rotation. At each phase, the planet hides a different velocity component. **Third row.** Illustration of an observed stellar absorption line, for the case of purely rotational broadening, i.e., the net broadening due to all other mechanisms is much less than the rotational broadening ($W_p \ll V_\oplus \sin I_\oplus$). The missing velocity component is manifested as a time-variable bump in the line profile. **Fourth row.** Same, but for the case $W_p \sim V_\oplus \sin I_\oplus$, in which other line-broadening mechanisms besides rotation are important.

The Rossiter-McLaughlin effect

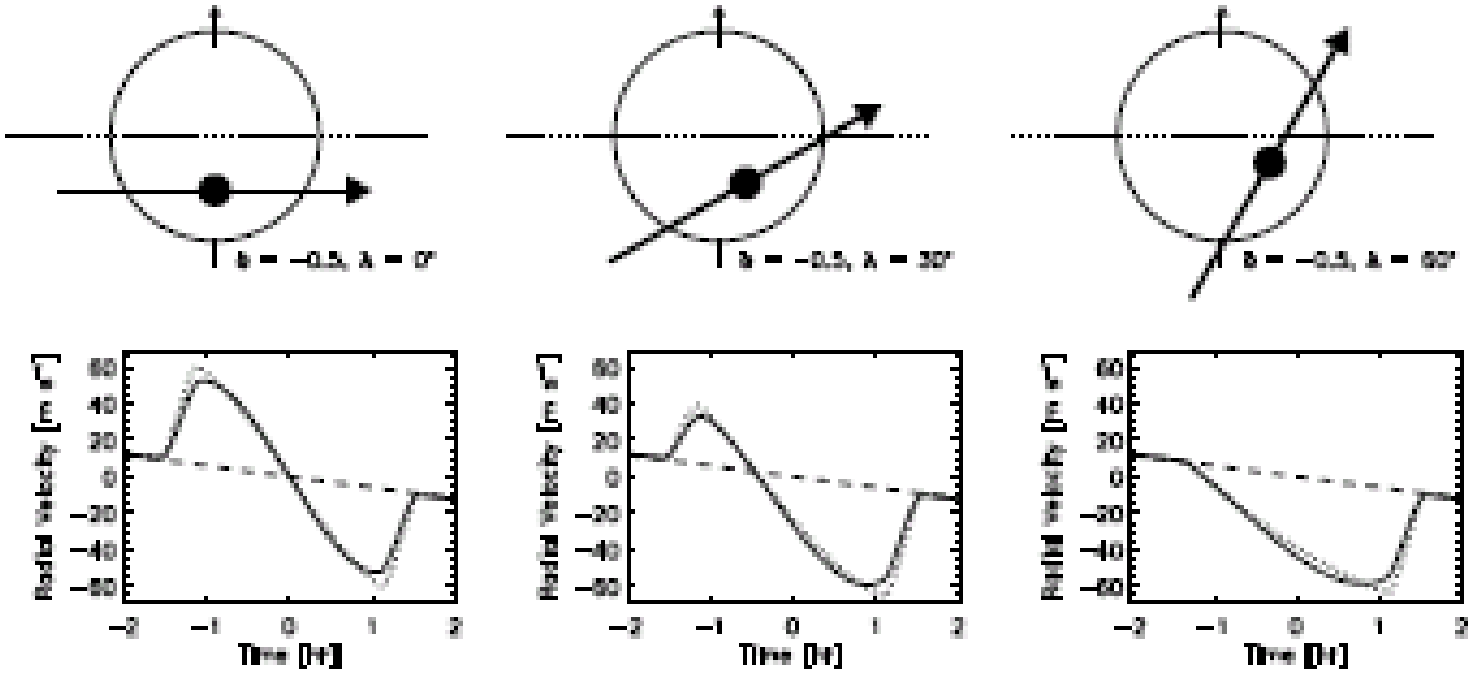


FIG. 2.— ... different possible trajectories of a transiting planet are shown, along with the correspon... as of Ohta et al. 2005). The trajectories all have the same impact parameter and produce... roduce different RM curves. The dotted lines are for the cases of no limb darkening (...

During the transit

Albrecht, Winn, Johnson et al. 2012

For effective temperatures higher than about 6250 K the obliquities have a broad distribution, while for lower temperatures the measurements are consistent with low obliquities.

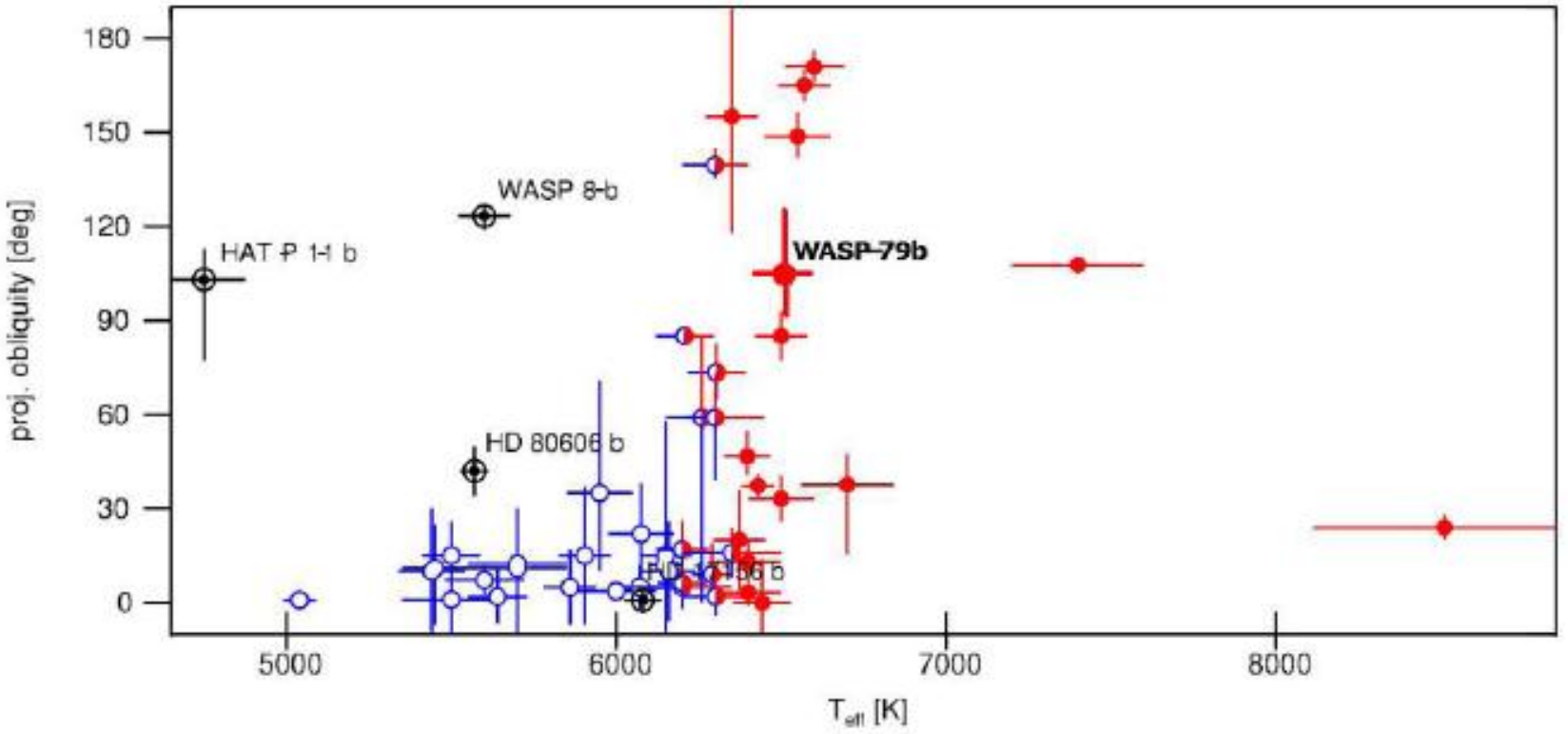


Figure 20. Projected obliquities and projected stellar rotation speeds as a function of the stellar effective temperature. Upper panel: measurements of projected obliquities as a function of the effective temperature of the host star. Stars which have temperatures higher then 6250 K are shown with red filled symbols. Blue open symbols show stars with temperatures lower then 6250 K. Stars which measured effective temperature include 6250 K in their 1σ interval are shown by split symbols. Systems which harbor planets with mass $<0.2\,M_{\rm Jup}$ or have an orbital period more then 7 days are marked by a black filled circle with a ring. Lower panel: projected stellar rotation speeds $v \sin i_\star$ of the stars in our sample. In addition, $v \sin i_\star$ measurements of stars in the catalog by Valenti & Fischer (2005) are shown as small dots.

Albrecht, Winn, Johnson et al. 2012

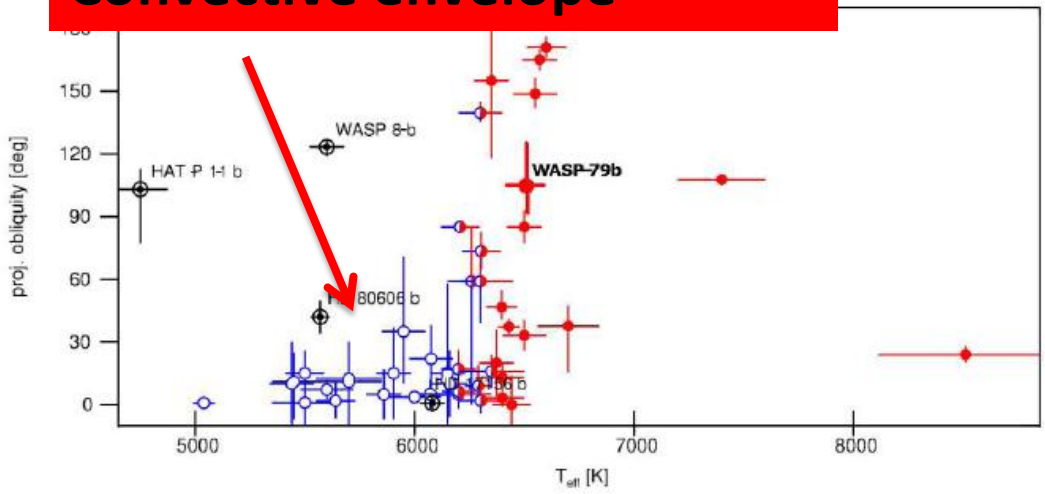
1. THREE-STAGE SCENARIO

Formation in the outer edge of the disc

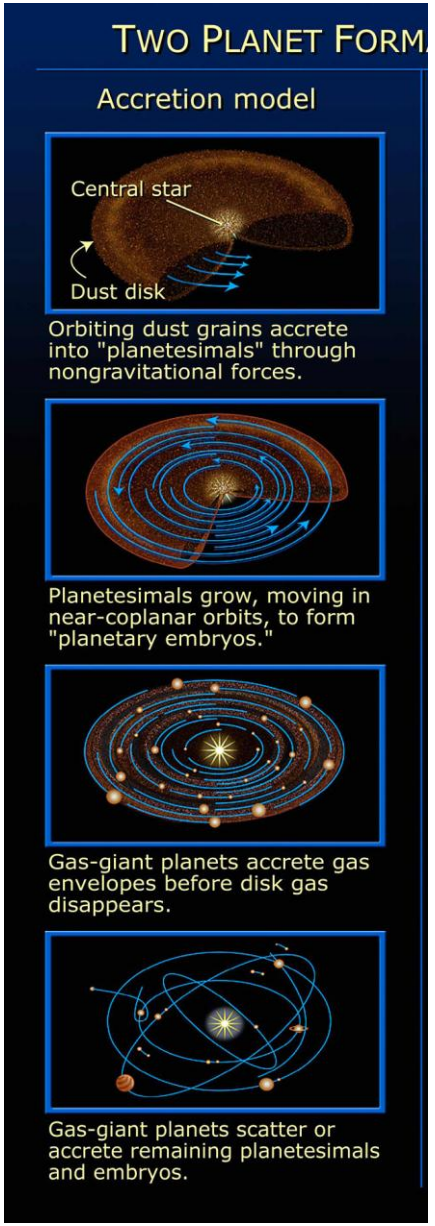
Planet-planet scattering

Re-alignment by tidal interaction

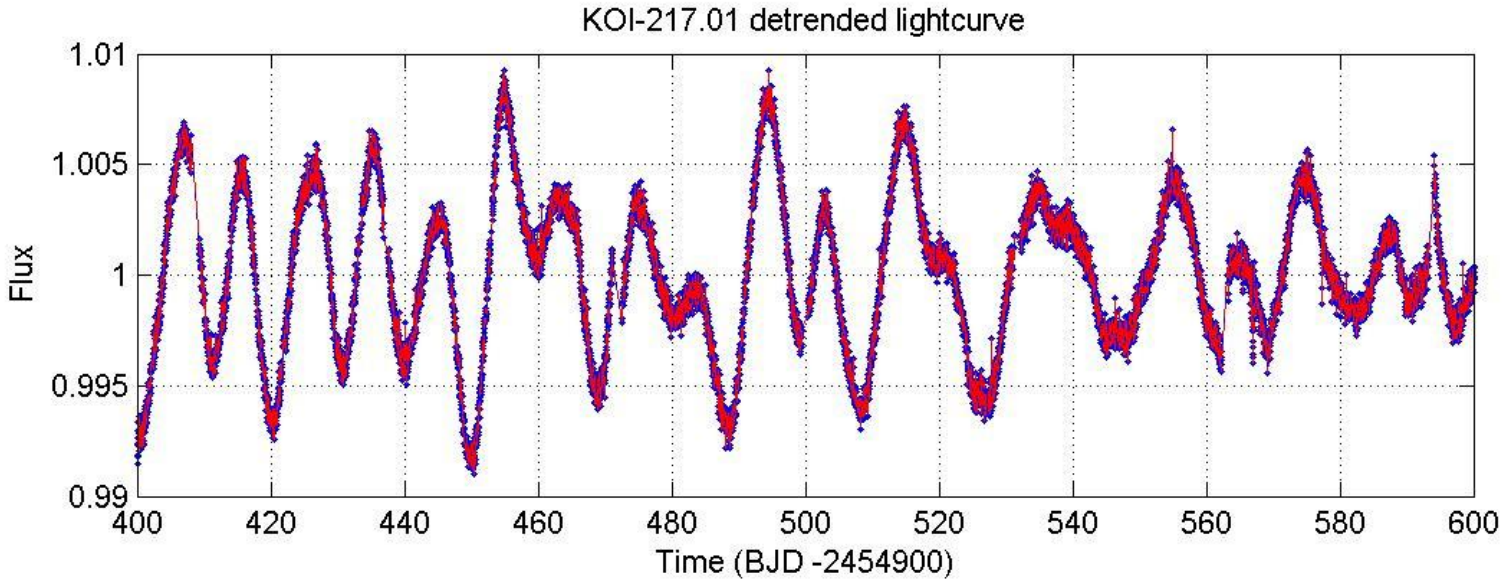
Convective envelope



http://www.americaspace.com/?p=71090



The CoRoT and Kepler revolution



The observed rotational amplitude depends on the inclination angle of the stellar rotation axis

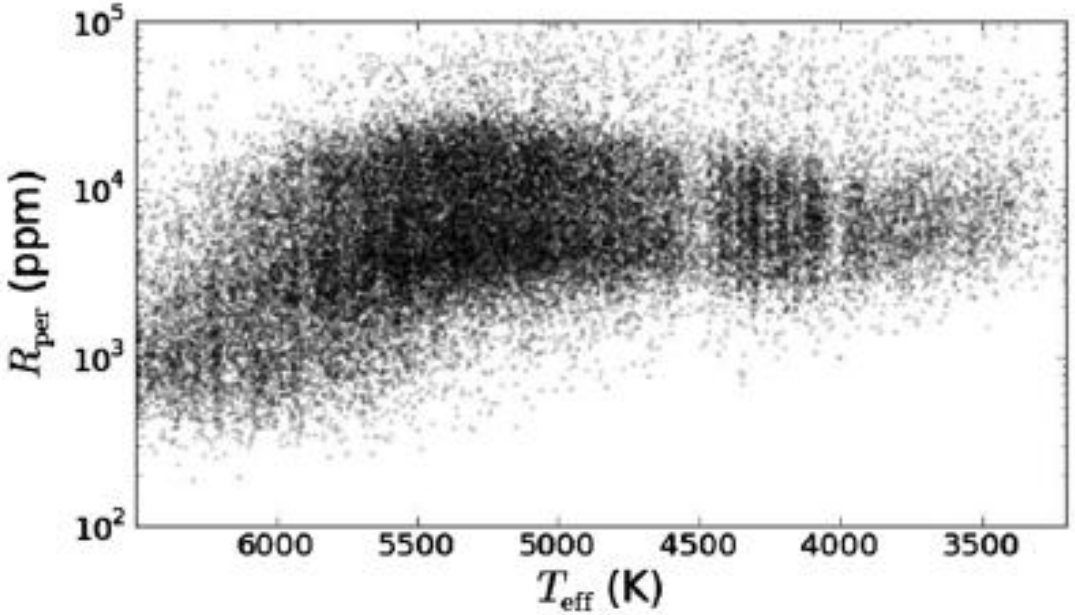


Figure 3. Distribution of periodic photometric variability amplitude, R_{per}, over the temperature range for all stars with derived rotation periods.