Differential rotation and magnetic activity of low-mass stars hosting companions

Stphane Mathis*†[1]

[1]SAp – CEA – France

Abstract

A large proportion of low-mass stars are binary or multiple. At the same time, since the discovery of 51 Pegasus b around a solar-type star in 1995, more than 3000 exoplanets have been discovered around cool stars of different masses and ages. When the host star and its companion(s) form a close system different kinds of Star-Planet Interactions among which tides take place. Then, depending on the mass ratio and the orbital properties different tidal flows are excited in the star, in particular in the convective envelope where they interact and compete with turbulent convection.
The key questions we have to answer are then: are tides able to modify the differential rotation profile compared to the case of single stars? Do tides modify the magnetic field generation and consequently the activity of the star?
In this work, we will provide first theoretical scaling laws allowing us to compare the driving of differential rotation by turbulent convection and tidal waves and consequences for magnetism in cool stars. Particularly, we will discuss the key physical parameters, which allow us to characterize the respective importance of the two processes.

*Speaker
†Corresponding author: stephane.mathis@cea.fr