Séminaire organisé par

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ANGULAR MOMENTUM EVOLUTION IN LOW-MASS STARS: A FRESH LOOK

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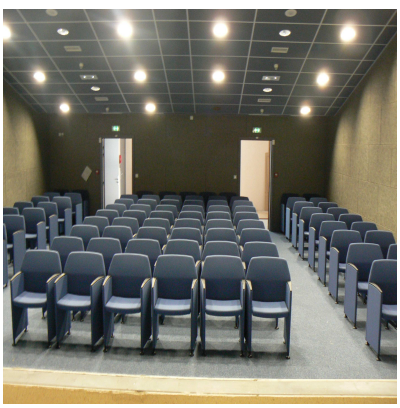
How angular momentum evolves in low-mass stars is one of the outstanding questions in stellar astrophysics, with implications for topics ranging from solar and stellar activity to the habitability of orbiting planets. The evolution is determined by a complex interplay between initial conditions during star formation, the evolution of stellar structure, and the behaviour of stellar magnetic fields, but a detailed theory has remained elusive. We present here an analytic model to address this issue. We first show that the empirical picture of angular momentum evolution arises naturally if rotation is related to magnetic field strength instead of (as assumed in prior studies) to magnetic flux. The evolution then becomes a strong function of stellar radius, explaining the main trends in rotation observed in low mass stars from open clusters to the field at a few Gyrs. Our model is also able to reproduce the empirical Skumanich law for solar-type stars (for very different reasons than usually assumed), as well as the observed lifetime of magnetic activity in very low-mass stars. Next, we present recent modifications to the theory -- more realistic wind velocities (in both the thermal and magnetocentrifugal limits, instead of the incorrect escape velocity formalism usually adopted), dipole field geometries, and core-envelope decoupling (using the most recent physically motivated analytic formulation) -- which bring our theory even closer in agreement to the observations. Finally, we briefly discuss further anticipated tests of the theory, and some implications for planet habitability around M dwarfs.

mardi 22 avril 2014

10h00 Salle 003 bât 709 - Orme des Merisiers



Le petit-déjeuner précèdera le séminaire

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