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Rossby and inertial modes in the Sun and stars

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Rossby waves are oscillating patterns in fluid vorticity which appear at very large scales in rotating hydrodynamic systems. If Rossby waves were first discovered in the Earth's atmosphere and oceans, and found to play an active role in controlling the global climate, they are now detected in the atmosphere of other planets of the Solar System as well. More recently, they have also been detected on the surface of the Sun, where they take the form of standing modes which extend from the surface down to the deep interior. These inertial modes are very sensitive to internal rotation, as well as the thermal structure and dynamics of the solar convective envelope, and are now being used to probe otherwise inaccessible properties of the deep regions of the Sun. These inertial modes also leave a signature in the photometric light curves of other solar-like stars, which is now detectable in Kepler data. This opens the possibility to extend the realm of asteroseismology to a brand new class of oscillations previously untapped, in particular in the context of the PLATO mission, due to launch in late 2026.

In this seminar, I will present the latest observational and theoretical developments in the study of Rossby and inertial modes, both in the solar and stellar contexts, and I will in particular explain how they can be used to better constrain the internal structure and dynamics of the Sun and stars.