Title: "Dynamo action in anelastic 3D simulations of an intermediate-mass star radiative envelope"

Paul Barrère[*,1], *Patrick Eggenberger*[1], *Carolina Rodriguez*[1], *Maxime Marchand*[1]

∗ *Proposed speaker*

[1] *Université de Genève, Observatoire de Genève, Versoix, Suisse*

Understanding stellar magnetism is of particular importance as magnetic fields are involved in several mechanisms that significantly impact stellar evolution, including the transport of chemical elements and angular momentum. Here, I focus on main-sequence intermediate stars whose structure is composed of a convective core and a radiative envelope. While convective motions in the core could drive a dynamo and produce the magnetic fields in the core during the red giant phase observed via asteroseismology, the magnetohydrodynamics (MHD) in the radiative envelope could explain their quasi-uniform rotation profile and the weak surface magnetic fields observed via asteroseismology and spectropolarimetry, respectively. I will present the results of new anelastic 3D MHD numerical simulations of the envelope of a $1.5\,M_\odot$-main-sequence star performed with the MagIC code. We demonstrate for the first time the existence of the Tayler-Spruit dynamo in a radiative zone with a realistic density gradient and a magnetic Prandtl number (ratio of viscosity to resistivity) as low as 0.6. The produced magnetic fields are concentrated around the rotation axis, as observed in previous simulations with uniform density (Barrère et al., 2026). While the magnetic field reaches $10^5 - 10^6\,$G where the dynamo acts, the radial magnetic field is estimated to reach around $1\,$G. In addition to confirming the importance of the Tayler-Spruit dynamo in the internal dynamics of stars, these new results will be of particular interest to interpreting magnetic field detections via asteroseismic and spectropolarimetric studies.