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Aula A1 (CRM).

Thermal convection in rotating spherical shells**FERRAN GARCIA**

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ABSTRACT:

The study of thermal convection in rotating spherical geometry is fundamental to explain many geophysical and astrophysical phenomena such as the generation of the magnetic fields, or the differential rotation observed in the atmospheres of the major planets. The difficulties associated with the experimental studies enhance the importance of the three-dimensional numerical simulations, such as those presented in this talk.

In order to obtain the evolution equations, the Boussinesq approximation is applied to the mass, momentum and energy conservation equations, which are rewritten in terms of toroidal and poloidal potentials. Together with the temperature field, they are expanded in spherical harmonics over the sphere, and in the radial direction a collocation method is used. Semi-implicit schemes, based in backward differentiation formulae (IMEX-BDF), implemented with order and time step control (VSVO), are used for time integration.

At low Prandtl number (ratio between the thermal diffusive and the viscous time scales), and with non-slip boundary conditions, the nonlinear dynamics is explored by means of temporal evolutions. Stable flows (periodic orbits, tori, and connecting orbits) are obtained and their physical properties are studied.