Post-doc position in Lyon

Models of compressible geophysical and astrophysical convection

Convection modelling is still mostly represented by the Boussinesq approximation which fails to account for important aspects of convection in large systems under significant gravitational compression. These aspects include: sound propagation, significant density stratification, large energy dissipation due to viscosity or Joule heating. In numerical models, sounds are often filtered out, so that the full set of dynamical and thermal equations is cast into an anelastic model. Next, an anelastic liquid approximation is often made for planetary convection while another approximation is made in stellar convection whereby temperature gradients are expressed using entropy gradients. Each approximation corresponds to a range of phenomena that can no longer be modelled. We plan to benchmark these different levels of approximation, starting with 2D modelling and determine the domain of validity of each of them.

Numerical models of thermal convection will be implemented and their solutions will be analyzed in a wide range of dimensionless parameters, so that the hierarchy of the different approximations can be based on the actual outcomes and not only on prior assumptions.

The applications of this work will be studied during this post-doctoral project and concern the dynamics of planetary cores and mantles, giant gas planets as well as stellar dynamics. Other more difficult questions will be addressed like convection in accretion discs and accretion/differentiation of terrestrial planets. In the latter cases, convection models are somewhat "pushed to the limits" but must be well understood to make progress in our knowledge of these early stages of the solar system.

Applicants with a strong background in numerical modelling in fluid mechanics, geophysics, astrophysics, physics or applied mathematics (parabolic partial differential equations) are invited to apply for this post-doctoral position (one year, renewable one year). The applications will consist in a CV, a list of publications and a letter of motivation in which the applicant should explain why his or her background is adequate for the job. Applications must be sent to Thierry Alboussière before 30 April 2013. A shortlist of applicants will then be interviewed in May 2013.

Labex LIO: Lyon Institute of Origins

Group: Terre et Planètes. **Laboratoire de Géologie de Lyon**, LGL-TPE, UMR5276.

Duration : 1 year, renewable 1 year. Starting date: 1 October 2013.

Contact: Thierry Alboussière (`thierry.alboussiere@ens-lyon.fr`) and Stéphane Labrosse (`stephane.labrosse@ens-lyon.fr`).