AN INTRODUCTION TO THERMAL CONVECTION

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Abstract. In this lecture I propose a little tour of thermal convection and its applications in astrophysics. The first part of the lecture is devoted to a qualitative introduction to the convective instability using the Schwarzschild criterion; then, concentrating on the equations governing the fluid motions, I introduce the Boussinesq and anelastic approximations which are so often used in these problems. The following part focuses on the Rayleigh-Bénard model which is worked out in detail up to the Landau equation and the Lorenz strange attractor. Finally, I briefly sketch out some results on turbulent convection and end the lecture with the case of stellar convection.

Suggested readings:

- Chandrasekhar, S. "Hydrodynamic and hydromagnetic stability" (Dover, 1981) (Clarendon, 1961).

- Drazin, P. and Reid, W. "Hydrodynamic stability" (Cambridge, 1981), Chapter 2.

- Rieutord, M. "Une introduction à la dynamique des fluides" (Masson, 1997) Chapter 7.

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