Magnetohydrodynamic equilibria in barotropic stars

Cristóbal Armaza*[1], Andreas Reisenegger[1], Juan Valdivia[2], and Pablo Marchant[1,3]

[1]Pontificia Universidad Católica de Chile (PUC) – Departamento de Astronomía y Astrofísica Av. Vicuña Mackenna 4860 7820436 Macul, Santiago, Chile

[2]Universidad de Chile (UCH) – Departamento de Física, Facultad de Ciencias, Casilla 653, Santiago, Chile

[3]Universität Bonn – Argelander-Institut für Astronomie, Auf dem Hügel 71, D-53121, Bonn, Germany

Abstract

Although barotropic matter does not constitute a realistic model for magnetic stars, it would be interesting to confirm a recent conjecture that states that magnetized stars with a barotropic equation of state would be dynamically unstable (Reisenegger 2009). In this work we construct a set of barotropic equilibria, which can eventually be tested using a stability criterion. A general description of the ideal MHD equations governing these equilibria is summarized, allowing for both poloidal and toroidal magnetic field components. A new finite-difference numerical code is developed in order to solve the so-called Grad-Shafranov equation describing the equilibrium of these configurations, and some properties of the equilibria obtained are briefly discussed.

*Speaker