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Magnetic field instabilities in neutron stars

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Neutron stars are incredibly dense compact objects having the strongest magnetic field in the universe known to date. The exact configuration of the field is not known and the simplest model that is often considered is that of a dipole. Such a dipolar poloidal field is however known to be unstable and the equilibrium configuration is an open problem of great astrophysical relevance. In order to study the field evolution in real-time, we perform magnetohydrodynamic simulations
using the publicly available code PLUTO. The field undergoes a cataclysmic rearrangement in few Alfven timescales. This develops a toroidal component with a comparable field strength as that of the poloidal component. We explore different initial conditions and discuss the different modes of instabilities visible in our simulations.

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