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Modeling of unstable MHD equilibria in the solar corona and role of plasma pressure.

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Many coronal eruption models prescribe catastrophic evolution of the coronal magnetic structures once some control parameter changes beyond a certain threshold. Some driver mechanism is usually indicated to enhance this evolution of the corona. Theoretical models prescribes that when the parameter overcomes the given threshold the system goes through a discontinuous jump to a new equilibrium condition or to a no-equilibrium condition.
However, it is hard to address exactly what happens in this jump phase despite on the causes of the eruption.
In particular, we investigate the stability of coronal magnetic configuration in intermediate beta regime and we aim to study the role of diffusivity and of plasma pressure in the stability of flux ropes and in the early stage of an eruption.

For this purpose, we build a 2.5D magnetohydrostatic (MHS) model with non-negligible plasma pressure to describe a coronal atmosphere at equilibrium in an intermediate beta regime.
Then we let the system relax using it as initial condition of a time-dependent magnetohydrodynamic (MHD) numerical model and under the only perturbation due to numerical diffusivity.
We mainly consider two different initial equilibria to study the stability of an atmosphere without flux rope and an atmosphere with a flux rope.
We find consistent solutions for coronal MHS equilibrium which does or does not include a flux rope detached from the photosphere depending on the concentration of electric current in the atmosphere.

In our simulation, the numerical diffusivity can be a sufficient driver to stimulate a major rearrangement of the magnetic field as described by loss of equilibrium models.
Under these circumstances we are able to describe the role of the plasma during these very dynamic moments.
In this framework, we confirm that ordinary plasma resistivity cannot play the crucial role in stimulating eruptions.
Moreover, we find that the plasma plays a role in the dynamic of the magnetic structures and that
This study is an attempt to extend the analysis of many numerical and analytical catastrophe model to the plasma to ultimately give indicators on observable analysis.