



Contribution ID: 58

Type: Talk

MUSE diagnostics of coronal heating from MHD modeling of magnetically stressed coronal loops

Tuesday, 28 February 2023 11:55 (13 minutes)

Chaotic photospheric motions progressively shuffle and braid the magnetic field confining plasma in coronal loops. The stressed field can suddenly lose equilibrium and develop instabilities, candidate to release magnetic energy into heat. There is long experience in modeling impulsive energy releases in coronal loops, from a purely hydrodynamic approach (e.g., Reale+2000, Testa&Reale2020), to a full-MHD approach (Guarasi+2014, Reale+2016, DePontieu+2022). In the MHD model an initial stratified atmosphere, including the steep transition region between the chromosphere and the corona, is in equilibrium with a loop-like magnetic field, which is progressively twisted by photospheric motions and can reconnect and release energy through anomalous diffusivity. The time-dependent 3D-MHD equations are solved numerically with the accurate Godunov-based PLUTO MHD code, including gravity, plasma radiative losses, and thermal conduction. In this configuration we are currently investigating MHD kink instabilities in twisted magnetic strands (e.g., Hood+2009). The initial helical current sheet progressively fragments in a turbulent way into smaller scale sheets, whose dissipation is similar to a nanoflare storm. The unstable loop expands and can disrupt nearby stable loops (e.g., Tam+2015), thus triggering an MHD avalanche (Hood+2016). Another target is reconnection jets, also called nanojets, observed in coronal loops, and linked to nanoflares (Antolin+2019).

We study them modeling the reconnection of two tilted coronal loops.

For all this work in progress, the combination of magnetic configuration and full loop atmosphere allows us to isolate the critical processes, still maintaining a high level of realism to address specific signatures in imaging and spectroscopic observations foreseeable with the MUSE mission.

Primary author: REALE, Fabio (University of Palermo)

Co-authors: Dr COZZO, Gabriele (University of Palermo); Dr PAGANO, Paolo (University of Palermo)

Presenter: REALE, Fabio (University of Palermo)

Session Classification: Corona

Track Classification: Corona