MHD modeling of chromospheric flows injected in coronal loops

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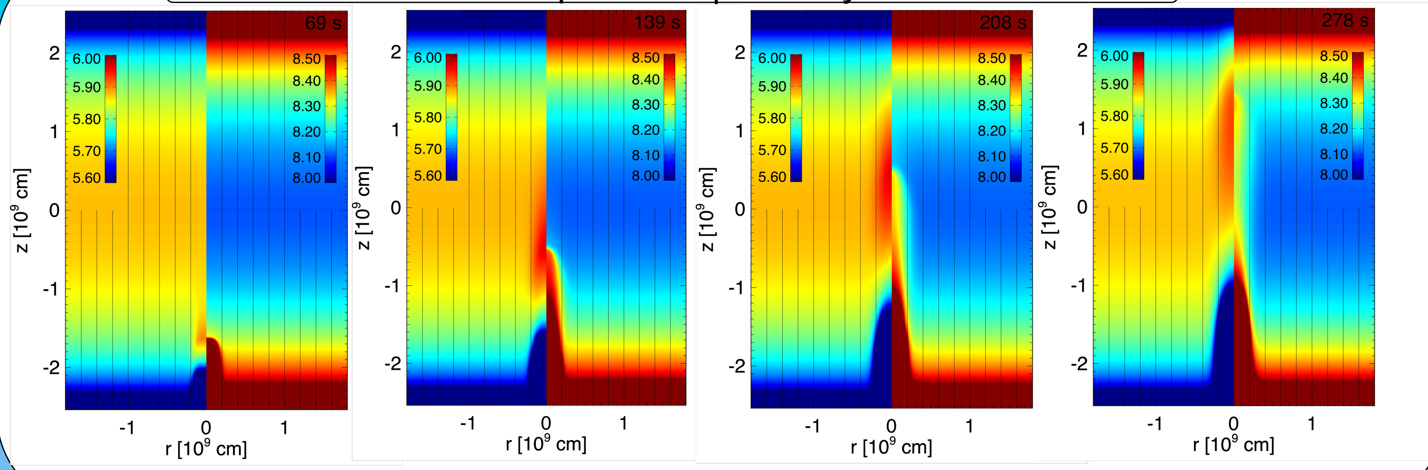
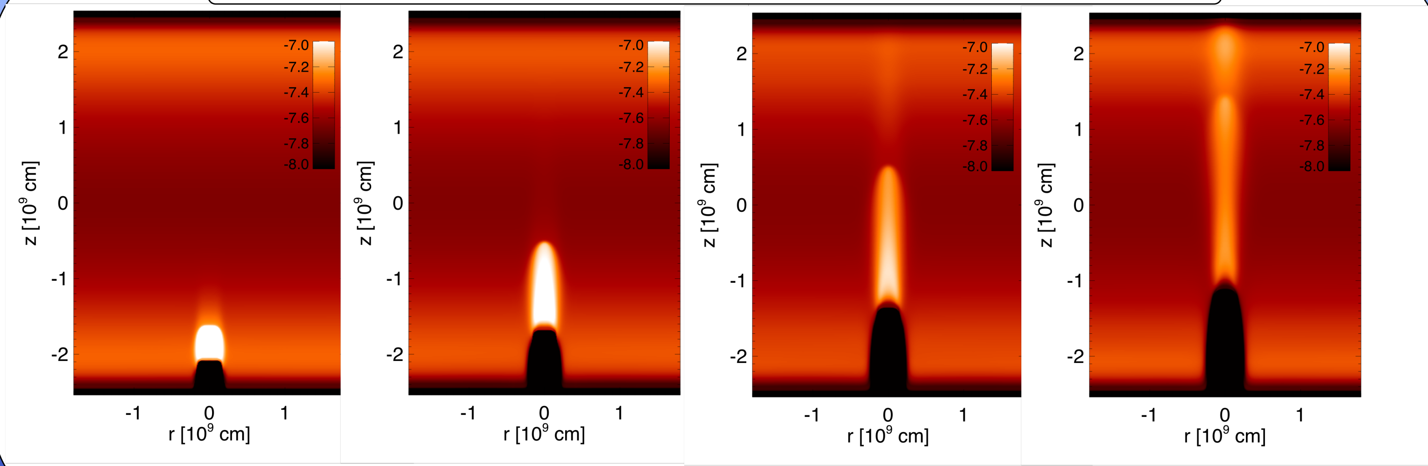
It has been recently remarked the possible importance of chromospheric flows for the structure, dynamics and heating of coronal loops. We use a complete MHD model to simulate the injection of a flow from the chromosphere upwards into a coronal loop. The model includes hydrodynamics, thermal conduction, radiative losses and the interaction with an ambient uniform magnetic field. The geometry is 2D cylindrical. The initial speed of the flow is 70 km/s and the density is about 10^{11} cm^{-3}. The flow moves in a coronal magnetic field of a few G. We show the evolution of the flow inside the loop. A 1 MK shock front develops ahead of the flow.

Temperature | Density



SDO/AIA 171 A



Rationale

- 2D MHD simulation (cylindrical geometry, r,z) of a dense cool jet upward in a coronal loop
- PLUTO MHD code (Mignone et al. 2007), synthesis of AIA 171 A (optically-thin) emission
- The jet flows and then falls back by gravity
- The shock ahead of the cool flow is ~1 MK and denser (density panels, upper row), a weak and faster thermal conduction front is also visible (red in the temperature panels, upper row)
- The post-shock region emits efficiently and is brighter than the surroundings in the AIA 171 A channel (lower panel)