Contribution ID: **70** Type: **Poster**

A Coronal Loop Braided by Realistic Photospheric Motions

Wednesday, 26 May 2021 13:00 (40 minutes)

The corona of the Sun is built up by loops defined through the magnetic field. With high resolution observations made possible by new instruments, coronal structures can be increasingly well resolved. Observations show individual strands with diameters down to a few 100 km, and so far it remains open what defines these strands, in particular their width, and which processes lead to their heating.

The aim of our study is to understand how the magnetic field couples the different layers of the solar atmosphere, how energy generated by magnetoconvection is transported into the upper atmosphere and dissipated, and how this process determines the scales of observed bright strands in the loop.

To this end, we conduct high resolution 3D resistive MHD simulations with the MURaM code.
We study an isolated coronal loop that is rooted in a shallow convection zone layer. To properly resolve the internal structure of the loop, the coronal loop is modelled as a straightened magnetic flux tube.

We study the spatial scales and time scales of energy transport and find that motions on small spatial scales play an important role for the energy transport in the loop model.
The energy injected into the loop is generated by internal coherent motions, including persistent vortex motions, within strong flux tubes with near-kilogauss magnetic field strengths. While the loop shows signs of twisting and braiding by those internal motions, leading to small-scale reconnection events, there is little evidence of heating by braiding of magnetic field from different magnetic concentrations at a footpoint.

Turbulent behaviour develops in the upper atmospheric layers in response to the photospheric driving.
The coronal loop responds to the heating with the formation of bright transient strands.
The energy needed to heat these strands is supplied internal motions within a magnetic concentration.

With this model we can build a coherent picture of how energy and matter are transported into the upper solar atmosphere and how these processes structure the interior of coronal loops.

Primary authors: BREU, Cosima (Max Planck Institute for Solar System Research); Prof. PETER, Hardi (Max Planck Institute for Solar System Research); Dr CAMERON, Robert (Max Planck Institute for Solar System Research); Prof. SOLANKI, Sami K. (Max Planck Institute for Solar System Research); Dr PRZYBYLSKI, Damien (Max Planck Institute for Solar System Research); Dr CHITTA, L. Pradeep (Max Planck Institute for Solar System Research)

Presenter: BREU, Cosima (Max Planck Institute for Solar System Research)

Session Classification: Poster session: SQ3 and SQ6

Track Classification: Flare and Nanoflare heating