Contribution ID: **139**   Type: **Poster**

Realistic Simulations of Real Active regions

We present a method and application of data-driven simulations with the MURaM radiative MHD code. Combined with a bottom boundary driver that reproduces the evolution of observed magnetic field, the sophisticated energy equation accounts for thermal conduction along magnetic fields, optically-thin radiative loss, and heating of coronal plasma by viscous and resistive dissipation, which allows for a more realistic presentation of observational features of solar active regions and eruptions. To validate the method, the photospheric data from Cheung et al. (2019) are used to drive a series of numerical experiments. The data-driven simulation reproduces the accumulation of free magnetic energy over the course of flux emergence in the ground truth with an error of 3\%. The onset time is approximately 8\,min delayed compared to the ground truth. The data-driven simulation resembles key eruption-related emission features and plasma dynamics of the ground truth flare over a wide temperature. We conduct simulations of eruptive and non-eruptive emerging active regions. The model captures growth of magnetic energy in AR11158 for several days prior to a major flux rope eruption that occurs near the real time of the X2.2 class flare.

Primary author: CHEN, Feng (Nanjing University)

Session Classification: Coffee break and poster session 2

Track Classification: Diagnostic tools and numerical methods in solar physics