Title: **Numerical studies of jet formation and evolution in the solar atmosphere**

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Abstract

Using the Newtonian CAFE MHD code to perform 2.5D and 3D resistive MHD simulations in the solar atmosphere, we show that magnetic reconnection may be responsible for forming jets with some characteristics of Type II spicules and cool coronal jets. We numerically model the photosphere-corona region using the C7 atmosphere model. The initial magnetic configuration in the 2.5D case consists of two symmetric neighboring loops with opposite polarity, used to support reconnection. In this case, we include the thermal conduction effect along the magnetic field lines to study some spicule jets' properties. According to the simulation results, we find that thermal conductivity affects the jets' temperature and morphology. In particular, thermal conductivity causes jets to reach greater heights and increases the temperature of the jet-apex. Also, the heat flux maps indicate the head of the jet and corona interchange energy more efficiently than the jet's body.

In the 3D simulations, the initial magnetic configuration is a potential field, extrapolated up to the solar corona region from a dynamic, realistic simulation of the solar photospheric magnetoconvection model that mimics the quiet-Sun. In this case, we find that the jet's formation depends on the Lorentz force, which helps accelerate the plasma upward. The morphology, the upward velocity covering a range up to 130 km/s, and the timescale formation of the structure between 60 and 90 s, are similar to those expected for Type II spicules. Additionally, we analyze the jet dynamics' properties and find that the structure shows rotational and torsional motions that may generate torsional Alfvén waves in the corona region.