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Modeling Jets in the Corona and Solar Wind

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Coronal jets are transient, collimated eruptions that occur in regions of open or semi-open magnetic fields in the solar corona. Our understanding of these events has significantly improved in recent years, owing to improved observational capabilities and numerical simulations. Yet, several important questions concerning coronal jets remain largely unanswered. For example: What exactly are the physical mechanisms that heat and accelerate the plasma? And to what extent do jets contribute to the heating of the corona and in providing mass and energy to the fast solar wind?

Here we present a "new generation" of coronal-jet simulations that will allow us to address such questions in more detail than before. In contrast to previous simulations, our code models the large-scale corona in a spherical domain, uses an advanced description of the energy transfer in the corona ("thermodynamic MHD"), and includes the solar wind. As a first application, we consider a purely radial coronal magnetic field and a simple coronal heating function that decreases exponentially with height above the surface. We produce so-called standard and blowout jets by continuously driving the system at the lower boundary with data extracted from flux-emergence simulations. We discuss the formation, dynamics, and evolution of the jets, as well as their contribution to coronal heating and the solar wind.