
Thin coronal jets and plasmoid-mediated reconnection: Insights from Solar Orbiter observations and Bifrost simulations

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Résumé

Coronal jets are ubiquitous, collimated million-degree ejections that contribute to the energy and mass supply of the upper solar atmosphere and the solar wind. Solar Orbiter provides an unprecedented opportunity to observe fine-scale jets from a unique vantage point close to the Sun. We aim to (1) uncover thin jets originating from Coronal Bright Points (CBPs), revealing previously unresolved contributions to coronal upflows; and (2) improve our understanding of plasmoid-mediated reconnection and its observable signatures. We analyze eleven datasets from the High-Resolution Imager (HRI) 174 Å of the Extreme Ultraviolet Imager (EUI) onboard Solar Orbiter, focusing on narrow jets from CBPs and signatures of magnetic reconnection within current sheets and outflow regions. To support the observations, we compare with CBP simulations performed with the Bifrost code. We have identified thin coronal jets originating from CBPs with widths ranging from 253 km to 706 km: scales that could not be resolved with previous EUV imaging instruments. Remarkably, these jets are 30–85% brighter than their surroundings and can extend up to 22 Mm while maintaining their narrow form. In one of the datasets, we directly identify plasmoid-mediated reconnection through the development within the current sheet of a small-scale plasmoid that reaches a size of 332 km and propagates at 40 km/s. In another dataset, we infer plasmoid signatures through the intermittent boomerang-like pattern that appears in the outflow region. Both direct and indirect plasmoid-mediated reconnection signatures are supported by comparisons with the synthetic EUI-HRI 174 Å emission from the Bifrost simulations. The high spatial and temporal resolution of EUI-HRI 174 Å enables the detection of previously unresolved narrow jets and plasmoid-mediated reconnection signatures from CBPs. These findings highlight Solar Orbiter's unique capability and motivate future statistical studies to assess the role of such fine-scale phenomena in coronal dynamics and solar wind formation.

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