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Modeling Coronal Bright Points

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Coronal Bright Points (CBPs) are ubiquitous structures in the solar atmosphere composed of hot small-scale loops observed in EUV or X-Rays. They are key elements to understand the heating of the corona; nonetheless, basic questions regarding their energization, heating mechanisms, the chromosphere underneath, or the effects of
flux emergence in these structures remain open.

We have used the Bifrost code to carry out a numerical experiment in which a coronal-hole magnetic nullpoint configuration evolves perturbed by realistic granulation. To compare with observations, synthetic SDO/AIA, Solar Orbiter EUI-HRI, IRIS images have been computed, in addition to synthetic MUSE observables to show the potential diagnostics capabilities of the future mission.

The experiment shows the self-consistent creation of a CBP through the action of the stochastic granular motions alone, mediated by magnetic reconnection in the corona. The reconnection is intermittent and oscillatory, and it leads to coronal and transition-region temperature loops that are identifiable in our EUV/UV observables. During the CBP lifetime, convergence and cancellation at the surface of its underlying opposite polarities takes place. The chromosphere below the CBP shows a number of peculiar features concerning its density and the spicules in it. The final stage of the CBP is eruptive: magnetic flux emergence at the granular scale disrupts the CBP topology, leading to different ejections, such as UV bursts, surges, and EUV coronal jets.

Apart from explaining observed CBP features, our results pave the way for further studies combining simulations and coordinated observations in different atmospheric layers.

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