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Signatures of nanoflare heating in a 3D Bifrost simulation

The solar corona is continuously studied through observations and numerical modelling due to its extreme temperatures. One of the prime candidates in understanding these temperatures is nanoflares, which are small-scale events associated with magnetic reconnection in the solar atmosphere. Observations of small-scale events with nanoflare energies are rare because signatures from non-thermal electrons are typically below the detection threshold. We investigate signatures in synthetic observables that arise from non-thermal electrons accelerated by magnetic reconnection in a 3D Bifrost simulation. Our analysis includes the transition region (TR) Si IV lines and the upper chromospheric Mg II h and k lines, which can be observed by space-based telescopes (e.g., IRIS). We also include the Ca II H and K and Ca II 854.2 nm lines that form deeper in the atmosphere and are readily accessible by ground-based telescopes (e.g., SST, DKIST). Our goal is to explore the impact of nanoflare events on the synthetic spectra and investigate the diagnostic potential of TR and chromospheric emission from small-scale events.

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