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MPI-AMRVAC: open-source grid-adaptive simulations for solar physics and applications to prominences

Wednesday, March 1, 2023 4:45 PM (13 minutes)

I will present recent additions to – and applications of – our open-source MPI-AMRVAC software (http://amrvac.org), designed to solve generic partial differential equations on any-dimensional, block grid-adaptive mesh hierarchies [2018, ApJS 234, 30 ; 2021, CaMWa 81, 316]. The MPI-AMRVAC 3.0 release is ready to go, and features various modules of direct interest to solar physicists, such as a novel plasma-neutral module to investigate solar chromospheric dynamics [2022, A&A 664, A55], or functionality for time-dependent data-driven applications [2021, ApJ 919, 39]. The ERC-funded project PROMINENT sets forth to study the 'coolest' part of the million-degree solar atmosphere: the prominence condensations formed by thermal instabilities. These represent state-of-the-art magnetohydrodynamic simulations, where the process of runaway condensations due to radiative losses is studied in unprecedented detail [2022, NatAstro 6, 942]. Our MPI-AMRVAC simulation toolkit shows that grid-adaptivity is essential to zoom in on details that may be resolved by future observing facilities. I will present an overview of ongoing and planned research activities to unravel the intricate multi-phase structure of the solar corona.

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