Solar flare simulations with RHD codes Flarix and RADYN

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Abstract

Solar and stellar flares have been modelled using radiation hydrodynamical (RHD) codes since more than three decades and their current versions incorporate new physics as well as modern numerical methods. Namely the radiative-transfer parts, being time-dependent, are based on efficient accelerated lambda iteration (ALI) techniques, coupled to linearized and/or preconditioned kinetic equations.
This contribution will focus on comparison of two autonomous, methodologically different RHD codes, Flarix and RADYN, and their use to model the solar flare processes. RADYN code was developed by M. Carlsson at the University of Oslo for chromospheric modelling and has been extended and extensively used by others (J. Allred, A. Kowalski, G. Kerr etc.) for the flare modelling. Flarix code is being developed at the Astronomical Institute of the CAS in Ondrejov with the primary purpose of the flare processes modelling.

Both codes can model the time evolution of a 1D atmosphere heated by a specified process, e.g. by the beam electrons propagating from the injection point in the corona down to the lower atmosphere. In such a scenario time scales can be rather short and lead to a fast heating on even sub-second times.
Our aim is to compare Flarix and RADYN codes using exactly the same setup and model conditions. Although such a comparison was never done successfully before for this type of codes, we will present a close agreement between time evolution of modelled atmospheric structure for a test case of the electron beam heating.

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