Numerical model of a partially-ionized solar atmosphere

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Abstract:
Solar processes for energy release and transport are essentially evaluated within a framework of single-fluid MHD. As the lower layers of the solar atmosphere contain large amount of neutrals, these processes need to be re-assessed by taking into account more realistic 2-fluid models of plasma. Two-fluid effects appear to be important for the quantification of the supply of energy, momentum and mass into the overlying chromosphere and corona, and therefore they are strictly associated with two major issue of heliophysics, mainly chromospheric and coronal heating and solar wind generation. With the use of JOANNA code (Wójcik 2017) we perform numerical simulations of 2-fluid wave phenomena. Particularly, we show that spicules and Alfvén waves are efficiently damped by ion-neutral collisions and therefore they are able to transfer significant amount of their energies into heat, contributing to the chromospheric heating and solar wind generation.