

**Realistic numerical simulations of ion and neutral waves
in a quiet region of the solar atmosphere**

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We present results of realistic 2D numerical simulations of ion and neutral waves in the solar atmosphere that is described by non-adiabatic 2-fluid equations. These simulations are performed with the use of JOANNA code which adopts Godunov-type numerical methods. It is demonstrated that collisions between ions and neutrals determine a number of spectacular phenomena in the atmosphere such as plasma heating that reduces effects of radiative losses. Our numerical simulations reveal that the plasma outflows, associated with the granulation exhibit physical quantities consistent to the order of magnitude with the observational estimations for mass and energy losses.