KONWERSATORIUM INSTYTUTU FIZYKI UMCS

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„Two-fluid model of the solar atmosphere”

Current numerical models of the solar atmosphere are essentially based on magnetohydrodynamics (MHD). These models assume that the solar atmosphere consists of only ionized gas. Meanwhile, plasma in the photosphere is only weakly ionized with one ion to 10^4 neutrals. In the chromosphere ionization factor grows with height and in the solar corona, plasma is essentially fully ionized. Because of the high concentration of neutral atoms in the lower atmospheric regions it is necessary to develop models that take the vertical variation of plasma ionization rate into account. Additionally, these models should realistically reproduce convection and associated with it number of dynamic phenomena such as waves, plasma outflows, spicules and other jets. Therefore, while performing numerical simulations, there is a need to take into account deeper regions of the convective zone. However, numerical simulations of the solar convection have been done so far within the framework of MHD.

In this talk I will present the numerical results obtained with the use of a newly developed numerical code JOANNA. This code solves two-fluid equations for a partially ionized plasma with mobile ions+electrons and neutral atoms. The code is modular and user friendly and it is also optimized to work on a large number of CPUs. The most interesting results obtained with a use of this code lead to an explanation of the observational data, such as of long-standing two central problems of solar physics, mainly the solar wind generation and coronal heating.

Uprzejmie zapraszam wszystkich pracowników, doktorantów i studentów Instytutu Fizyki.

Dr hab. Ryszard Zdyb, prof. UMCS
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