



A possible explanation of the heliospheric ENA ribbon discovered by the Interstellar Boundary Explorer (IBEX)

Vladislav V. Izmodenov (1,2,3), Dmitrii B. Aleksashov (2,3), Sergey V. Chalov (2), Dave McComas (4), Michael S. Ruderman (5), Yuri G. Malama (2,3)

(1) Moscow State University, Faculty of Mechanics and Mathematics, Moscow, Russian Federation (izmod@ipmnet.ru, +7-(0)95-9382048), (2) Institute for Problems in Mechanics Russian Academy of Sciences, Russia, (3) Space Research Institute (IKI) Russian Academy of Sciences, Russia, (4) Southwest Research Institute, San Antonio, TX 78228, USA, (5) Sheffield University, UK

We present new kinetic-gasdynamic model of the solar wind interaction with the local interstellar medium. The goal of this model is to explain the heliospheric ENA ribbon (McComas et al., Science, 326, 959-962, 2009) that is the most prominent feature seen in the full sky maps of heliospheric ENAs and discovered by Interstellar Boundary Explorer (IBEX).

The ribbon is the region of the enhanced fluxes of ENAs crossing almost entire sky. Soon after the ribbon's discovery it was realized (McComas et al., 2009) that the enhancement of the fluxes is in the directions where the radial component of the interstellar magnetic field around the heliopause is close to zero.

In this paper we propose of physical model that explains the nature of the ribbon by the secondary charge exchange of the interstellar H atoms with the interstellar pickup protons outside the heliopause. The proposed model is further advancement of the kinetic-gasdynamic model by Malama et al (2006) where pickup protons were treated as a separate kinetic component. Izmodenov et al. (2009) have shown in the frame of Malama's model that the interstellar pickup protons outside the heliopause maybe a significant source of ENAs at energies above 1 keV. The difference of the current work with Izmodenov et al. (2009) calculations is in the assumption of no-scattering limit for newly created pickup protons outside the heliopause. It will be shown that in this limit the model can qualitatively explain the existence of the heliospheric ENA ribbon.