

A NEW APPROACH TO ESTIMATION OF THE ELECTROMAGNETIC ENERGY FLUX INTO AN OPEN MAGNETOSPHERE

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A problem of the electromagnetic energy input into the Earth's magnetosphere through an open tail magnetopause is reconsidered. It is marked that the formulae proposed previously by the various authors to describe the incoming Poynting flux were obtained with use of the assumptions too simplifying this problem. Nevertheless, these formulae are used up to now for a quantitative estimations of the magnetospheric energetics. This leads to confusion in the issue of an energy transfer from solar wind into the magnetosphere and, in turn, to advancing of the erroneous substorm scenarios. Therefore, now is just a time to revise the above-mentioned problem on the base of modern knowledge about a magnetospheric dynamics. Here, the new semi-empirical formula for the electromagnetic energy flux into an open magnetosphere is offered based on the present-day views both of a tail structure and dynamics. A proposed formula takes into account the known dependence of the lobe magnetic field on a tailward distance, a flaring of a tail magnetopause, and an influence both of the IMF and the solar wind dynamic pressure. It agrees qualitatively with the known magnetospheric models, the results of the MHD simulations of the tail processes governed by the southward IMF, and the modern notions about a substorm development. Application of the obtained formula to substorm dynamics is discussed. It is shown that the new model offers definite advantages over the older ones when describing time variations of the tail energy parameters during a substorm, and supports the substorm scenarios where a near-Earth tail plays a main role that may be caused by a focussing of the incoming electromagnetic energy just in this region.