Atmospheric Escape from Magnetized Rocky Exoplanets

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Abstract

Recent Kepler and TESS observations discovered many rocky exoplanets in habitable zones around active main-sequence stars. The upper atmospheres of exoplanets are subject to two important energy sources derived from their host stars. First, the stellar photon flux in the X-ray and XUV bands ionizes and heats the upper atmosphere, driving atmospheric heating, affecting the conductance, and enhancing atmospheric escape. Second, the stellar wind's interaction with the exoplanet's intrinsic magnetic field transfers energy to the atmosphere through field aligned currents and Poynting flux. That energy is dissipated in the high latitude cusp and auroral regions through Joule heating which can inflate the atmosphere and also enhance the atmospheric escape rate. This presentation will discuss recent advances in modeling these energy inputs and their consequences for exoplanetary habitability. Also, I will discuss the development of a new model, the (exo) PLANETary Ionosphere-Thermosphere Tool for Research (PLANET-ITTR) and some early results from it.