Geophysical Research Abstracts
Vol. 12, EGU2010-12137, 2010
EGU General Assembly 2010

Magnetic communication in extrasolar planetary systems

Andreas Kopp (1), Bernd Heber (1), Klaus Scherer (2), and Horst Fichtner (2)
(1) IEAP, Christian-Albrechts-Universität zu Kiel, Germany, (2) Theoretische Physik IV, Ruhr-Universität Bochum, Germany

Hot Jupiters revolve around their host stars on very close orbits within a few days. This vicinity between star and planet leads to features unknown from the solar system, the most interesting of which is their magnetic interaction. The latter is manifested by a so-called hotspot in the stellar atmosphere moving across the stellar disk with the orbital period of the planet, which is phase-shifted with respected to the substellar point. A possible explanation for this phenomenon can be found by applying the Jupiter-Io scenario to these systems: the planetary ionosphere perturbs the stellar magnetic field. While this perturbation propagates in form of a field-aligned electric current along the Alfvén characteristics towards the star, the planet continues its orbit, so that an observer sees the transits of hotspot and planet at different times. Adopting a Weber-Davis model for the stellar wind, we can explain the observed phase shifts of all five planetary systems known so far to show such a behaviour: HD 179949, HD 189733, HD 192263, τ Boo A, and υ And. We support our findings by numerical simulations of the field-aligned current system evolving between planet and star. The stellar parameters derived from fitting the model to the observed phase angles, moreover, allows to estimate the stellar winds and, thus, the astrospheres around these stars.