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Magnetodisk dominated magnetospheres of Hot Jupiters: Implications for exoplanetary ENA cloud observations and stellar wind parameter diagnostics

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A more generic view of the 'Hot Jupiter' magnetosphere structure, based on the Paraboloid Magnetospheric Model (PMM) is provided. Besides of the intrinsic planetary magnetic dipole, PMM considers among the main magnetic field sources also the electric current system of magnetotail, magnetopause currents, and the ring current of magnetodisk. Due to the outflow of ionized particles from the hydrodynamically expanding upper atmosphere, 'Hot Jupiters' may have extended magnetodisks. The magnetic field produced by magnetodisk ring currents, dominates above the contribution of intrinsic magnetic dipole of a 'Hot Jupiter' and finally determines the size and shape of the whole magnetosphere. A slower, than the dipole-type decrease of magnetic field with the distance comprises the essential specifics of magnetodisk-dominated magnetospheres of 'Hot Jupiters'. This results in their 40 - 70 % larger scales, as compared to those traditionally estimated with taking into account of only planetary dipole. The predictions of new model are used for the estimation of size of the magnetosphere of the Hot Jupiter HD209458b for different parameters of stellar wind and planetary intrinsic magnetic dipole. Based on these estimations the hydrogen ENA cloud production around HD209458b has been simulated and superimposed with the recent HST spectral observations of the planet transits.