

Interaction between stellar wind plasma and the upper atmosphere of exoplanets

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Here we consider the interaction processes between the stellar wind plasma and the upper atmosphere layers of extrasolar planets. We use a test particle/Monte-Carlo code to model the interaction processes such as charge-exchange of the stellar wind protons with the neutral particles in the upper atmosphere, photo- and electron impact ionization, gravitational effects (Coriolis, centrifugal and tidal forces). The model allows to reconstruct the Lyman-alpha in-transit attenuation spectrum of the planet, which in the case of the Hot Jupiter HD 209458b can be compared with the HST observations. In the case of the Hot Jupiters possessing a thick hydrogen atmosphere Doppler broadening seems to contribute significantly to the attenuation of the stellar Lyman-alpha line. Judging by the Lyman-alpha spectrum, some conclusions about the atmosphere structure of the planet can be made. For the Hot Jupiters as well as for terrestrial-type planets a huge hydrogen corona of energetic neutral hydrogen is formed around the planet.

References

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