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A Model of the Hα Transmission Spectrum of HD 189733b CHENLIANG HUANG, PHIL ARRAS, University of Virginia, DUNCAN CHRISTIE, University of Florida, ZHI-YUN LI, University of Virginia — The hot gas in the upper thermosphere of hot Jupiter sets the boundary condition for understanding the rate of gas escape. Among current detections, Hα transmission spectrum may play an important role in understanding the conditions in the planet's thermosphere. I present a detailed atmosphere model and comparison of Hα model transmission spectra to the data, with the goal of constraining the temperature and particle densities in the region where the absorption line is formed. A hydrostatic atmosphere is constructed. Ionization equilibrium and balance of heating and cooling processes are enforced at each level of the atmosphere. The Lyα radiation intensity is computed using a Monte-Carlo code which includes resonant scattering. Both the incident stellar Lyα and internal sources due to recombination cascade and collisional excitation are included. The atomic hydrogen level population is computed including both collisional and radiative transition rates. The model transmission spectra are in broad agreement with the HD 189733b observation data by Jensen et al and Cauley et al. The base layer of thermosphere is optically thick to Hα, and temperature is in the range $3000 \sim 6000$ K.

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