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## Abstract

Close-in exoplanets might have lost substantial masses during their evolution due to atmospheric escape of upper atmosphere heated by intense stellar XUV (X-ray and EUV) radiation and dynamical Roche-lobe overflow. We develop a numerical model to simulate an evolution of planets considering thermal cooling and the mass-loss. An semi-analytical model of the radiation-recombination limited escape is developed and included in the model, as well as the energy-limited escape. The Roche-lobe overflow is also taken into account as a mass-loss process. The model is applied to the mass-loss of Hot-Jupiters and low-density Super-Earths which have H/He envelopes. First, basic properties of the mass-loss evolution are described using mass-radius relationships which combine a Hot-Jupiter regime with a Super-Earth regime and calculation of thermal evolution. Second, Evaporation of Hot-Jupiters is studied and compared with population of exoplanets. The population of planetary mass and radius can be reproduced with the evaporation of Hot-Jupiters having small cores. Third, our model is applied to the mass-loss of low-density Super-Earths. The results are consistent with the observed distribution of low-density Super-Earths which apparently have H/He envelopes. Also we attempt to constrain the composition of low-density Super-Earths whose composition is not constrained only from mass-radius relationships. In the end, some implications for planetary formation scenarios are shown using these results. Small cores of Hot-Jupiters are implied from the calculation of the evaporation of Hot-Jupiters. The results for Super-Earths suggest that capture of protoplanetary disk gas by Super-Earths and planetary migration are common processes. Differences of envelope masses might reflect differences of formation histories.