Orbital evolution of close-in super-Earths via atmospheric escape

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Recently, a lot of super-Earths close to their host stars have been discovered especially around M dwarfs. Orbital distributions of planets in multiple close-in super-Earth systems are different each other. The mass-radius relationship of the super-Earths indicates that some of them have a substantial atmosphere, while others have almost no atmosphere. The origin of these differences remains unclear.

Close-in super-Earths would undergo atmospheric escape via the energy-limited hydrodynamic escape driven by stellar X-ray and UV irradiations. Considering the angular momentum exchange of a system, the super-Earths those experience atmospheric escape and lose their mass must move outward. However, little attention has been given to the orbital evolution of the planets due to the mass loss by hydrodynamic escape of their atmosphere.

In this study, we aim to gain a better understanding of the origin of multiple close-in super-Earth systems by calculating the atmospheric mass loss and the orbital evolution of the planets. We also aim to make theoretical predictions for the future observations of super-Earths around M dwarfs.

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