[JJ] Evening Poster | P (Space and Planetary Sciences) | P-AE Astronomy & Extrasolar Bodies

[P-AE20]Exoplanet

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Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Exoplanetary science, which began with the discovery of a hot Jupiter in 1995, has reached a major turning point by the discovery of countless super-Earths by the Kepler mission. More recently, planets that are similar in size to the Earth and also receive similar amounts of stellar radiation (namely, located in the so-called habitable zone) have been discovered around nearby stars such as Proxima Centauri and TRAPPIST-1. As a result, not only theoretical, but also observational studies on the atmospheres and surface environments of Earth-like exoplanets have been started. Moreover, the number of planets discovered around early-type and late-type stars has become large enough that the occurrence rate and orbital distribution of planets around a wide variety of host stars have become clear. Thus, new observational insights, which become the basis of pan-planet formation theory, are now gathering. While exoplanets have been mainly targeted for astronomy until recently, it can be said that earth planetary science is finally becoming a research field to make a central contribution. In this session, we aim to share cutting-edge research results in exoplanetary science which is in such a transition period.

[PAE20-P02]Condensation Growth Model of Cloud Particles with Size Distribution for Exoplanetary Atmospheres

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Keywords:super-Earth, Dust Clouds

The atmospheric properties are the keys to understand the planet formation or evolution after planets are formed. Recent transit observations reveal that a number of super-Earth has featureless transition spectra, which imply the presence of high-altitude clouds.
Cloud models for exoplanetary atmospheres are important to understand the atmospheric properties.

Previous studies investigated the cloud-top height of exoplanets which have the featureless transmit spectra using the single size approximation. However, it is unclear that the size distribution of cloud particles is enough narrow and the featureless transmission spectra have not been reproduced by the single approximation models for some exoplanets.

In this study, we investigate the size distribution of dust cloud particles and cloud-top height of the super-Earth GJ1214 b, using a microphysical model that takes into account the size distribution through the vertical transport and condensation growth of cloud condensate nuclei (CCNs).
We find that low CCN number density leads to broader size distribution of cloud particles. The cloud-top height ascends higher than the height calculated by the single size approximation model, yet is still low to explain its featureless transmission spectra in the case of the atmospheric metallicity is the solar metallicity.

Our results suggest that the size distribution of the cloud particles is a key to understanding the cloud formation in the exoplanetary atmosphere. We need to investigate the size distribution for higher metallicity cases and consider collisional growth of cloud particles in future studies.