EGU21-9745
https://doi.org/10.5194/egusphere-egu21-9745
EGU General Assembly 2021

From clouds to crust - Cloud diversity and surface conditions in atmospheres of rocky exoplanets

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One of the fundamental questions for planetary science is how surfaces of other planets similar to the rocky bodies in our solar system look like. What is the rock structure like? Will there be water? Are there any active atmospheric cycles? How can these different conditions be detected?

The current space missions and ground based instruments allow the detection of specific gas species and some cloud compositions in atmospheres of giant exoplanets. With instruments installed in the near future and space crafts currently being build or planned, these kind of observations will be available for planets with smaller sizes and an overall rocky composition. We aim to further understand the connection of the conditions of the upper atmosphere with the conditions on the crust of the planet (temperature, pressure, composition).

Our equilibrium chemistry models allow us to investigate the expected crust and near-crust-atmosphere composition. With this, we investigate the conditions under which liquid water is actually stable at the surface of a planet and not incorporated in hydrated rocks. Based on this crust - near-crust-atmosphere interaction we build an atmospheric model, which allows us to investigate what kind of clouds are stable and could be present in atmospheres of rocky exoplanets. This allows us to predict what clouds on other planets could be made of. Potential detection of cloud condensates and the high altitude gas phase can constrain the overall surface conditions on those planets.