

## Parameter experiments of climates of various planets by the use of a general circulation model

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One of the interesting quests on exoplanets is to investigate the variety of their possible surface environments and circulation structures of their atmospheres. For the propose of accumulating knowledge on those questions, we have been developing a general circulation model and have been performing parameter experiments on possible climates of exoplanets by the use of a general circulation model.

The model used in this study is DCPAM (<http://www.gfd-dennou.org/library/dcpam/>), which has been developed in our group. The model is composed of a dynamics of the primitive equation system and a number of parameterizations, such as radiation, turbulent mixing, and so on. In this study, we focus on the atmospheres whose composition is the same as that of the Earth. The parameters on which we consider dependence of the atmospheres are obliquity, rotation period, and radius of the planets. The values of obliquity we adopt for our parameter experiments are 0, 23.4, 60, 90 degrees, those of rotation periods are 1, 3, 10, 30 Earth days, and those of radius are 6371, 4247, 3186 km. We have to note we have not completed all of the sets given by the arbitrary combinations of them; the values of the parameters are extended from those of the present Earth's parameters.

A several interesting features are observed in the results of those experiments. One of those is the morphological change of mean meridional circulation. The latitudinal width of Hadley cell becomes larger with the increase of rotational period. As a result, Ferrel cells disappear in the experiments with rotation periods of 10 and 30 Earth days. In the presentation, additional features of parameter dependence will be also presented.

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