

Theoretical analysis of the Martian climate system with a seasonal change model

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Valley networks on the surface of Mars suggest existence of warm and wet climate in the distant past. In this study, we construct a one-dimensional energy balance climate model (EBM) with CO₂-dependent outgoing radiation, seasonal changes of solar radiation income, and areal extent of CO₂ ice cap. We have investigated behavior and evolution of the Martian climate system and, in particular, examined the effect of the seasonal changes of solar radiation by comparing the results of our former study of EBM with annual mean solar radiation. Major discrepancy between them is conditions for multiple solutions of the Martian climate system. In the seasonal change model, existence of multiple solutions at present condition depends on the present amounts of CO₂ in the ice caps and the regolith.