Energy balance climate model with CO2 dependent outgoing radiation: implication for the climate history through the Cenozoic

Takashi Ikeda [1], Eiichi Tajika [2]

[1] Geological Inst., Univ. of Tokyo, [2] Geological Institute, Univ. of Tokyo

We develop a latitudinal one-dimensional energy balance climate model with atmospheric CO2 dependent outgoing radiation, and analyze the mathematical structure of the steady state solutions. The results indicate the existence of the multiple solutions, and are very similar to that of previous studies in which solar radiation is selected as a climate forcing. Furthermore, we suggest a phase diagram of climate on parameter space of atmospheric CO2 and latitudinal diffusion coefficient, which are based on the characteristics of the steady-state solutions. Plotting the glacial history throught the Cenozoic implied from the geological evidences on this phase diagram makes it easy to understand the different climate evolution on each hemisphere.