Geophysical Research Abstracts
Vol. 16, EGU2014-16187, 2014
EGU General Assembly 2014

Emulation of MIROC5 with a simple climate model

Yasuhiro Ishizaki (1), Seita Emori (1), Hideo Shiogama (1), Kiyoshi Takahashi (1), Tokuta Yokohata (1), and Masakazu Yoshimori (2)

(1) National Institute for Environmental Studies, Japan (ishizaki.yasuhiro@nies.go.jp), (2) Atmosphere and Ocean Research Institute, the university of Tokyo, Japan

We developed a simple climate model based on MAGICC6, and investigated the ability of the simple climate model to emulate global mean surface air temperature (SAT) changes of an atmosphere-ocean general circulation model (MIROC5) in the twenty-first century in representative concentration pathways (RCPs). Some previous research indicated that climate sensitivity, ocean vertical diffusion and forcing of anthropogenic aerosols (direct and indirect effects of sulfate aerosol, black carbon and organic carbon) are important factors to emulate global mean SAT changes of atmosphere-ocean general circulation models CMIP3. We therefore estimate these important parameters in the simple climate model using a Metropolis-Hastings Markov chain Monte Carlo (MCMC) approach. The estimated values of the important parameters by the MCMC are physically valid, and our simple climate model can successfully emulate global mean SAT changes of MIROC5 in RCPs with the estimated parameters by the MCMC approach. In addition, we estimated the relative contributions f each important parameter in sensitivity experiments, in which we change the value of an important parameter from the estimated one by the MCMC to the default value of MAGICC6. As a result, we found that the estimation of climate sensitivity is the most important factor for the emulation of the AOGCM, and the stimation of ocean vertical diffusion is also important factor. Although the estimations of the anthropogenic aerosols forcing are very important for the emulation of the AOGCM in the twenty century, the influence of them on the emulation of the AOGCM in the twenty first century is very small. This is because emissions of anthropogenic aerosols are projected to decrease in the twenty first century, and relative contributions of the forcing of anthropogenic aerosols also decrease. Carbon cycle models are not incorporated into our simple climate model yet. A sophisticated carbon cycle model is required to be incorporated into our simple climate model in future work.