

Climate-carbon cycle changes during 1000 years in doubled CO₂ concentration simulated by MIROC-ESM

*Tomohiro Hajima¹, Kaoru Tachiiri¹, Michio Kawamiya¹

1. Japan Agency for Marine-Earth Science and Technology

Transient climate response to cumulative carbon emission, so called TCRE, is defined as the ratio of global warming to cumulative anthropogenic CO₂ emission evaluated when CO₂ concentration reaches the doubled CO₂ level from pre-industrial state. This metric is useful because it gives us roughly estimates on future global warming induced by CO₂ emission on the basis of current and future emission amounts. Since TCRE just characterizes the transient response of climate-carbon cycle, we cannot know what will happen after CO₂ concentration is stabilized (or reduced) after mitigation policies adopted. To estimate the warming degree in such condition and to understand climate-carbon dynamics in the concentration-stabilized phase, we conducted simulations where CO₂ concentration is abruptly doubled from pre-industrial state and fixed over 1000 years, by using an Earth system model (MIROC-ESM). We confirmed from the simulations that after 1000 years have passed, global warming and land carbon uptake almost ceased but weak carbon uptake by the ocean continues.

Keywords: carbon cycle, climate change, Earth system model, TCRE