

## Climate-carbon cycle changes during 1000 years in doubled CO<sub>2</sub> concentration simulated by MIROC-ESM

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Transient climate response to cumulative carbon emission, so called TCRE, is defined as the ratio of global warming to cumulative anthropogenic CO<sub>2</sub> emission evaluated when CO<sub>2</sub> concentration reaches the doubled CO<sub>2</sub> level from pre-industrial state. This metric is useful because it gives us roughly estimates on future global warming induced by CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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