

# **New findings from CMIP5 long-term projection using the Earth Simulator**

by

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## **Abstract**

An Earth system model (hereafter referred to as MIROC-ESM) has been developed under KAKUSHIN (a national research initiative on climate change projection in Japan) by integrating substantial bio-geochemical and other process models into a climate model. MIROC-ESM includes, in particular, a dynamic vegetation model (SEIB-DGVM), where species of vegetation compete each other under a given climate to attain a balanced distribution. MIROC-ESM is developed, among others, to simulate climate system – carbon cycle feedback in the long-term projection.

Outcomes related to CMIP5 long-term projection experiments using the Earth Simulator have been analyzed with emerging new scientific findings, as follows:

- CO<sub>2</sub> Emission rate from fossil fuel estimated by MIROC-ESM as necessary to cause a RCP concentration scenario is smaller than that estimated in RCP and is almost zero at the middle of the 21<sup>st</sup> century
- CO<sub>2</sub> concentration caused by MIROC-ESM from a RCP emission rate is, in response, larger than the respective RCP concentration; A 300 year projection under RCP4.5 with stabilized concentration beyond 2100 shows long-term still rising steady tendency in global mean surface temperature beyond 2100; and
- Most boreal-deciduous forests transform into boreal-evergreen forests in 300 years, while most tropical forests remain the same