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Climate change and carbon dynamics using RCP scenarios by MIROC-ESM

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Earth system models (ESMs) have been developed to understand the mechanisms of long-term climate change, carbon cycle, and their feedbacks. In this study, past and future simulations (1850 ~ 2099) were conducted using the Model for Interdisciplinary Research On Climate ESM (MIROC-ESM). MIROC-ESM consists of atmospheric, ocean, and terrestrial components and includes both marine and terrestrial biogeochemical processes. The simulations were forced by four representative concentration pathways (RCP) scenarios describing the future changes in greenhouse gases, aerosols, and land use. The results showed that the temperature rise from 1850 ranged from 2.6 K in the RCP2.6 scenario to 5.9 K in the RCP8.5 scenario. The airborne fraction of emitted carbon, which indicates the capability of carbon uptakes by marine and terrestrial ecosystems, was 0.61 in the year of doubled CO2 with the experiment of 1% CO2 increment. The pattern of partitioning emitted carbon to the atmosphere, ocean, and terrestrial ecosystems varied among all RCP scenarios, according to the levels of their global warming.