EGU2020-13279
https://doi.org/10.5194/egusphere-egu2020-13279
EGU General Assembly 2020

PMIP-carbon: towards a multi-models comparison of climate-carbon interactions at the Last Glacial Maximum

Nathaelle Bouttes[1], Ruza Ivanovic[2], Ayako Abe-Ouchi[3], Hidetaka Kobayashi[3], Laurie Menviel[4], Akira Oka[3], Akitomo Yamamoto[3], and the PMIP-carbon members[*]

[1]LSCE/IPSL, Gif Sur Yvette, France (nathaelle.bouttes@lsce.ipsl.fr)
[2]Univ Leeds, Sch Earth & Environm, Leeds, W Yorkshire, England
[3]Univ Tokyo, Atmosphere & Ocean Res Inst, Kashiwa, Chiba, Japan
[4]Univ New South Wales, Climate Change Res Ctr, Sydney, NSW, Australia
[*]A full list of authors appears at the end of the abstract

More and more climate models now include the carbon cycle, but multi-models studies of climate-carbon simulations within the Climate Model Intercomparison Project (CMIP) are limited to present and future time periods. In addition, the carbon cycle is not considered in the simulations of past periods analysed within the Paleoclimate Modelling Intercomparison Project (PMIP). Yet, climate-carbon interactions are crucial to anticipate future atmospheric CO_2 concentrations and their impact on climate. Such interactions can change depending on the background climate, it is thus necessary to compare model results among themselves and to data for past periods with different climates such as the Last Glacial Maximum (LGM).

The Last Glacial Maximum, around 21,000 years ago, was about 4°C colder than the pre-industrial, and associated with large ice sheets on the American and Eurasian continents. It is one of the best documented periods thanks to numerous paleoclimate archives such as marine sediment cores and ice cores. Despite this period having been studied for years, no consensus on the causes of the lower atmospheric CO_2 concentration at the time (around 180 ppm) has been reached and models still struggle to simulate these low CO_2 values. The ocean, which contains around 40 times more carbon than the atmosphere, likely plays a key role, but models tend to simulate ocean circulation changes in disagreement with proxy data, such as carbon isotopes.

This new project aims at comparing, for the first time, the carbon cycle representation at the Last Glacial Maximum from general circulation models and intermediate complexity models. We will explain the protocol and present first results in terms of carbon storage in the main reservoirs (atmosphere, land and ocean) and their link to key climate variables such as temperature, sea ice and ocean circulation. The use of coupled climate-carbon models will not only allow to compare changes in the carbon cycle in models and analyse their causes, but it will also enable us to better compare to indirect data related to the carbon cycle such as carbon isotopes.

PMIP-carbon members: PMIP-carbon members