Supporting Information for "A first intercomparison of the simulated LGM carbon results within PMIP-carbon: role of the ocean boundary conditions"

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Introduction

Figure S1 shows the ocean surface area of PMIP models and iLOVECLIM simulations. It supplements the multimodel comparison of ocean volume presented in Fig. 1. The total surface was computed using the fixed fields ("areacello") of the same models, which are either PMIP3 models whose LGM and PI outputs were downloaded from the ESGF, PMIP-carbon models, or the iLOVECLIM model with different boundary conditions. The resulting values are compared to the high resolution topographic data described in Sect. 2.3. The characteristics of PMIP-carbon models are presented in Table 1 and the iLOVECLIM simulations are described in Sect. 3.1.

Figure S2 presents the surface area of the vertical levels in the iLOVECLIM simulations, which illustrates that most of the observed differences in ocean volume (Fig. 1b) stems from the deep (and large) vertical levels.

Table S1 supplements Table 2 as it quantifies the ocean volume and difference Δ (with high resolution topographic data) in all iLOVECLIM simulations with different boundary conditions.

Figure S3 shows the carbon content of PMIP-carbon models computed in each reservoir (atmosphere, oceans, terrestrial biosphere, and total carbon) as mentioned in Sect. 3.3.

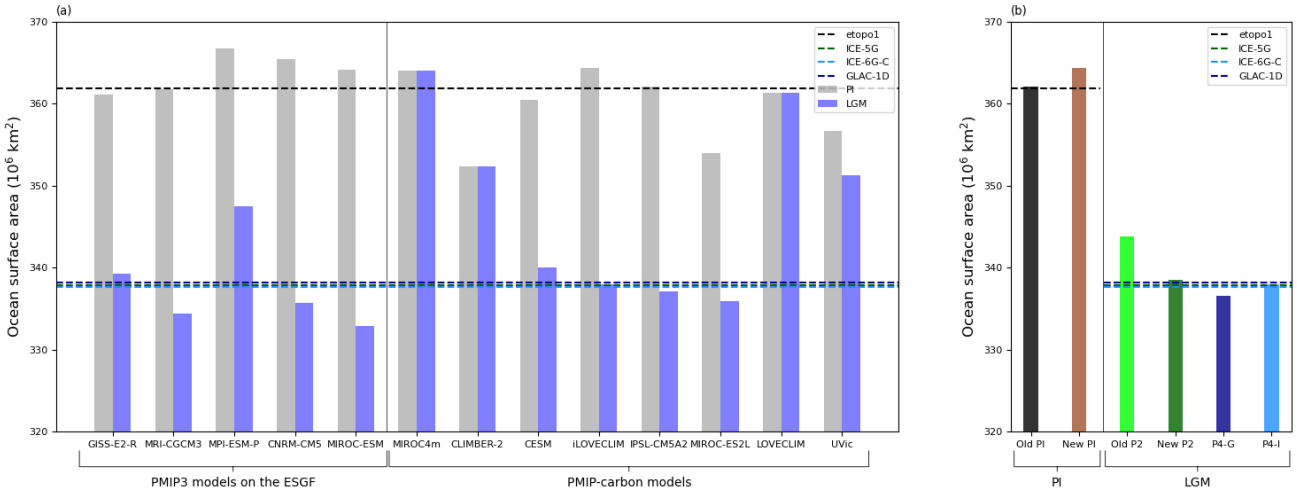

Figure S1. Ocean surface area in (a) PMIP models and (b) iLOVECLIM simulations. The iLOVECLIM reference simulations in (a) are 'New PI' and 'P4-I'. The horizontal dashed lines represent the ocean surface area computed from high resolution topographic data: etopo1 (361.9 millions of km^2), ICE-5G (337.9 millions of km^2), GLAC-1D (338.2 millions of km^2), and ICE-6G-C (337.6 millions of km^2).

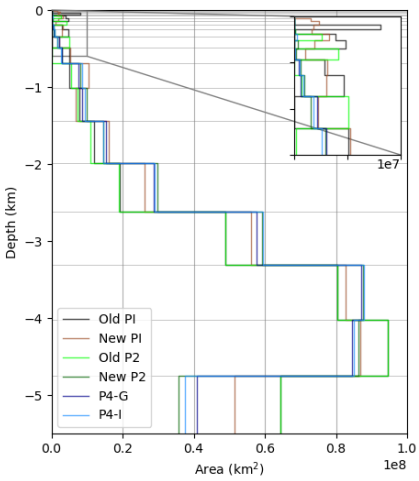

Figure S2. Surface area of each irregular vertical level in iLOVECLIM simulations.

Table S1. Quantification in iLOVECLIM simulations of ocean volumes and differences (Δ) with respect to the ocean volume computed from PI (etopo1) or from LGM topographic data (ICE-5G, GLAC-1D or ICE-6G-C). The volume changes between each LGM simulation and its PI restart are indicated, as well as the corresponding Δ. Finally, the associated relative volume changes can be compared to the ones computed from the topographic data: -2.88% (GLAC-1D) and -3.19% (ICE-6G-C).

Simulation name	Old PI	New P1	Old P2	New P2	P4-G	P4-I
Volume (10^{18} m^3)	1.387	1.343	1.379	1.289	1.296	1.291
Δ PI (%)	+3.86	+0.62				
Δ LGM (%)			+7.06	+0.02	-0.18	-0.05
PI−LGM (10^{16} m^3)			0.72	5.45	4.70	5.19
Δ PI−LGM (%)			-84.57	+17.14	+29.16	+20.85
Relative change (%)			-0.52	-4.06	-3.50	-3.87

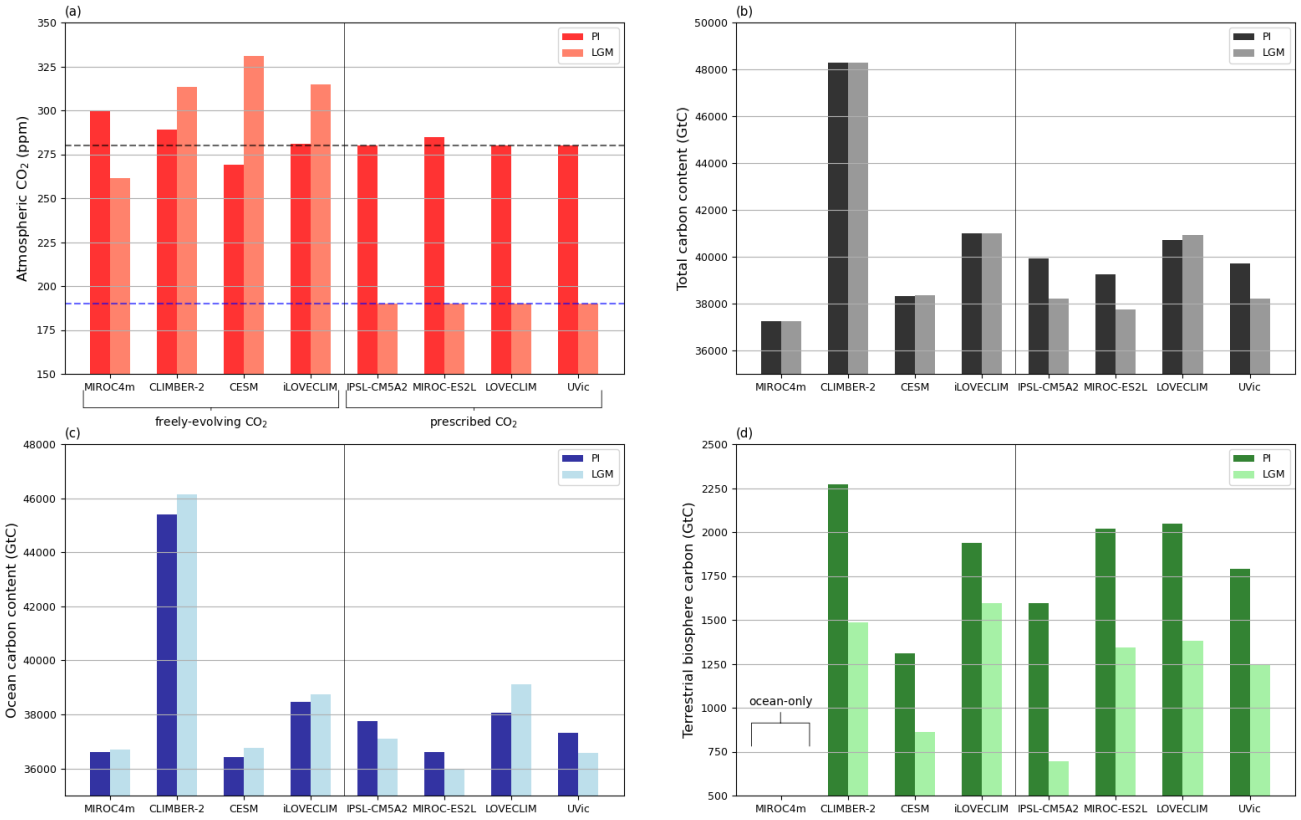

Figure S3. Carbon content of PMIP-carbon models in (a) atmosphere, (b) total system, (c) ocean and (d) terrestrial biosphere. The grey and blue dashed lines represents the atmospheric CO_2 concentrations at the PI (280 ppm) and LGM (190 ppm, Bereiter et al., 2015). Models have been run without accounting for additional processes at the LGM (e.g. permafrost, sediments, brines...), with the exception of MIROC4m-COCO and MIROC-ES2L in which dust-induced iron fluxes were changed at the LGM. The permafrost module is deliberately switched off in the CLIMBER-2(P) model, which is why we refer to it as CLIMBER-2 here.