The PMIP4-CMIP6 Last Glacial Maximum experiments: preliminary results and comparison with the PMIP3-CMIP5 simulations

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From PMIP3-CMIP5 to PMIP4-CMIP6

- **Updated models**
  - some models have a large climate sensitivity, but none of these are included in the present study (yet)
- **Updated boundary conditions**
  - in particular, a choice between three ice sheet reconstructions (cf. Figure => )

LGM ice sheets and and associated land sea masks: Bright colours show the LGM – modern altitude anomaly over the LGM ice sheets; pale colours show the altitude anomalies outside the ice sheets, both in metres. The ice-sheet and land–sea masks are outlined in red and brown, respectively.

Kageyama et al., GMD, 2017,
https://www.geosci-model-dev.net/11/1033/2018/
A first glimpse into the PMIP4-CMIP6 results, compared to PMIP3-CMIP5: mean annual temperatures

LGM PMIP4 mean annual temperatures mostly warmer than the PMIP3 ones, especially at mid to high northern latitudes

=> impact of new ice sheet reconstructions (northern hemisphere ice sheets lower than the PMIP3 ones)?
Atlantic westerlies are stronger and less wide in the meridional direction.

PMIP4 vs PMIP3 models show a shift of the westerlies over the Pacific and N America.

The PMIP4 models show less tendency towards AMOC deepening from LGM to PI than PMIP3 models, but the AMOC does tend to get stronger compared to PI.
Precipitation

LGM climate is drier but this signal is partly offset by less evaporation

Large changes in tropical precip from PMIP3 to PMIP4 models
Comparison to reconstructions

- Comparison to previous data sets:
  - Bartlein et al., 2011 for continental reconstructions
  - MARGO, 2009, for sea surface temperatures

+ Comparison to new data sets:
  - Cleator et al., 2019 for continental reconstructions
  - Tierney et al., 2019 for sea surface temperatures

Regional comparison still often unsatisfactory
Comparison of large-scale indicators: land vs ocean temperature anomalies

Averages over data sites only

« old » reconstructions

« new » reconstructions

The new reconstructions cover more points, their average is colder and models underestimate this cooling in the tropics.

The comparisons improve at the global scale.
Getting the global cooling using the models + reconstructions?

These plots show a relationship between the global cooling and the global cooling averaged over the documented sites, for each reconstruction (continental and marine).

These, given by the grey bar, can therefore yield a constrain on global cooling from PI to LGM. The results from both continental data sets are in agreement, while the SST reconstructions yield different global estimates. More work is needed to unravel why.
Thank you for your interest!