Supporting Information for "Southern Ocean ecosystem response to Last Glacial Maximum boundary conditions"

Himadri Saini[1,2], Karin Kvale[3,4], Zanna Chase[5], Karen E. Kohfeld[6], Katrin J. Meissner[1,2], Laurie Menviel[1]

[1]Climate Change Research Centre, University of New South Wales, Sydney, New South Wales, Australia

[2]The Australian Research Council Centre of Excellence for Climate Extremes, Sydney, New South Wales, Australia

[3]GEOMAR Helmholtz Centre for Ocean Research, West shore campus, Duesternbrooker Weg 20, Kiel, Germany

[4]Current address: GNS Science, 1 Fairway Drive, Avalon 5010, PO Box 30368, Lower Hutt 5040, NZ

[5]Australian Antarctic Program Partnership, Institute for Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania, Australia

[6]School of Resource and Environmental Management, Simon Fraser University, 888 University Drive, Burnaby, BC, V5A 1S6, Canada

Contents of this file

Introduction

The supporting information includes threee figures, each in agreement with the corresponding explanations provided in the main file.

References

Kohfeld, K. E., Graham, R., De Boer, A., Sime, L., Wolff, E., Le Quéré, C., & Bopp, L. (2013). Southern hemisphere westerly wind changes during the last glacial maximum: paleo-data synthesis. *Quaternary Science Reviews*, *68*, 76–95.

Lambert, F., Tagliabue, A., Shaffer, G., Lamy, F., Winckler, G., Farias, L., ... De Pol-Holz, R. (2015). Dust fluxes and iron fertilization in holocene and last glacial maximum climates. *Geophysical Research Letters*, *42*(14), 6014–6023.

Mahowald, N. M., Muhs, D. R., Levis, S., Rasch, P. J., Yoshioka, M., Zender, C. S., & Luo, C. (2006). Change in atmospheric mineral aerosols in response to climate: Last glacial period, preindustrial, modern, and doubled carbon dioxide climates. *Journal of Geophysical Research Atmospheres*, *111*(10). doi: 10.1029/2005JD006653

Ohgaito, R., Abe-Ouchi, A., O'Ishi, R., Takemura, T., Ito, A., Hajima, T., ... Kawamiya, M. (2018). Effect of high dust amount on surface temperature during the Last Glacial Maximum: A modelling study using MIROC-ESM. *Climate of the Past*, *14*(11), 1565–1581. doi: 10.5194/cp-14-1565-2018

Zhang, Y., Mahowald, N., Scanza, R. A., Journet, E., Desboeufs, K., Albani, S., ... Fomba, K. W. (2015). Modeling the global emission, transport and deposition of trace elements associated with mineral dust. *Biogeosciences*, *12*(19), 5771–5792. doi: 10.5194/bg-12-5771-2015

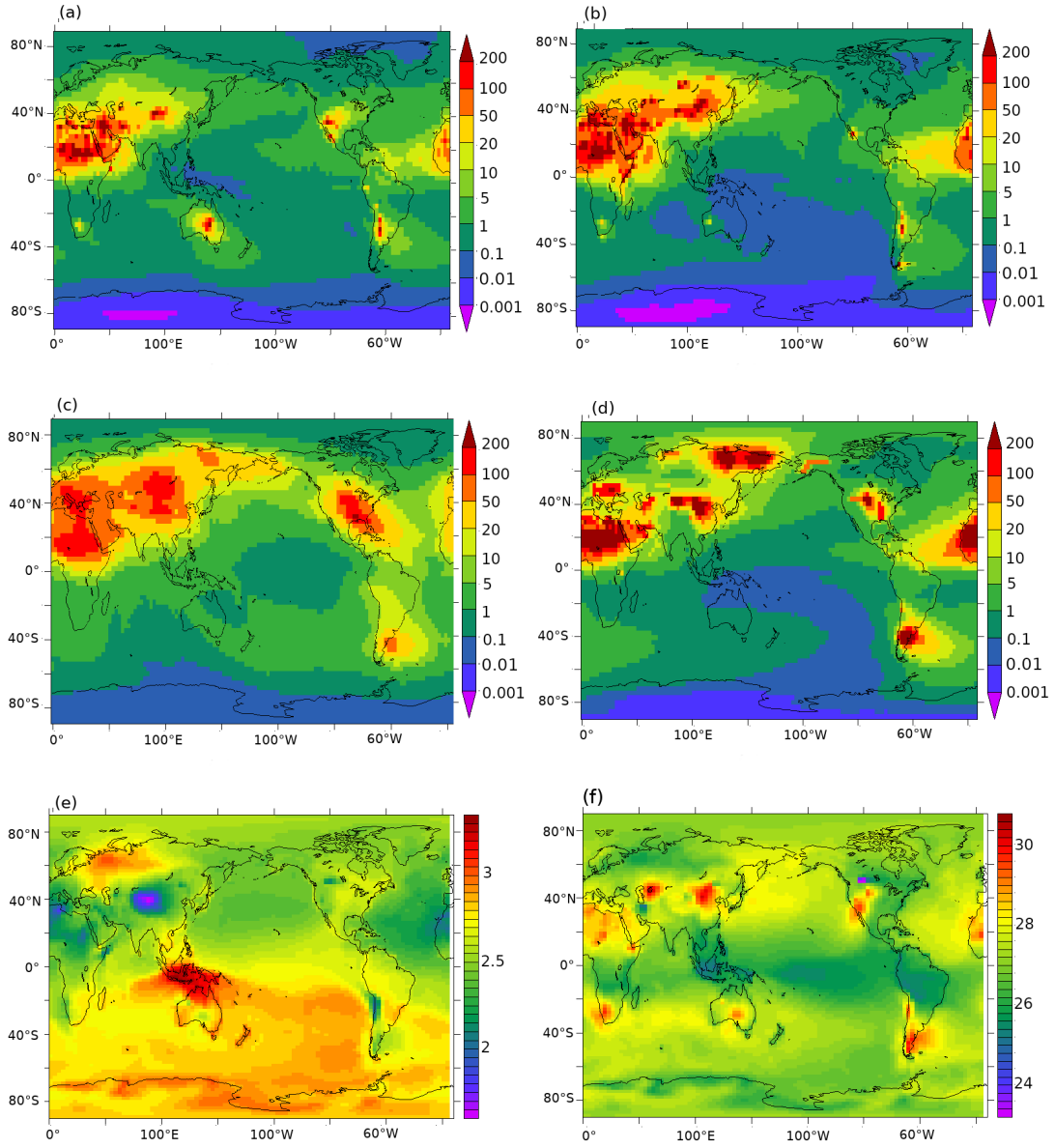

Figure S1. Modelled dust deposition fluxes from Mahowald et al. (2006) during (a) PI and (b) LGM, from Lambert et al. (2015) during LGM (c) and from Ohgaito et al. (2018) including glaciogenic dust sources during LGM (d) in (g $m^{-2}yr^{-1}$); Percentages of (e) iron and (f) silica in dust depositions (Zhang et al., 2015)

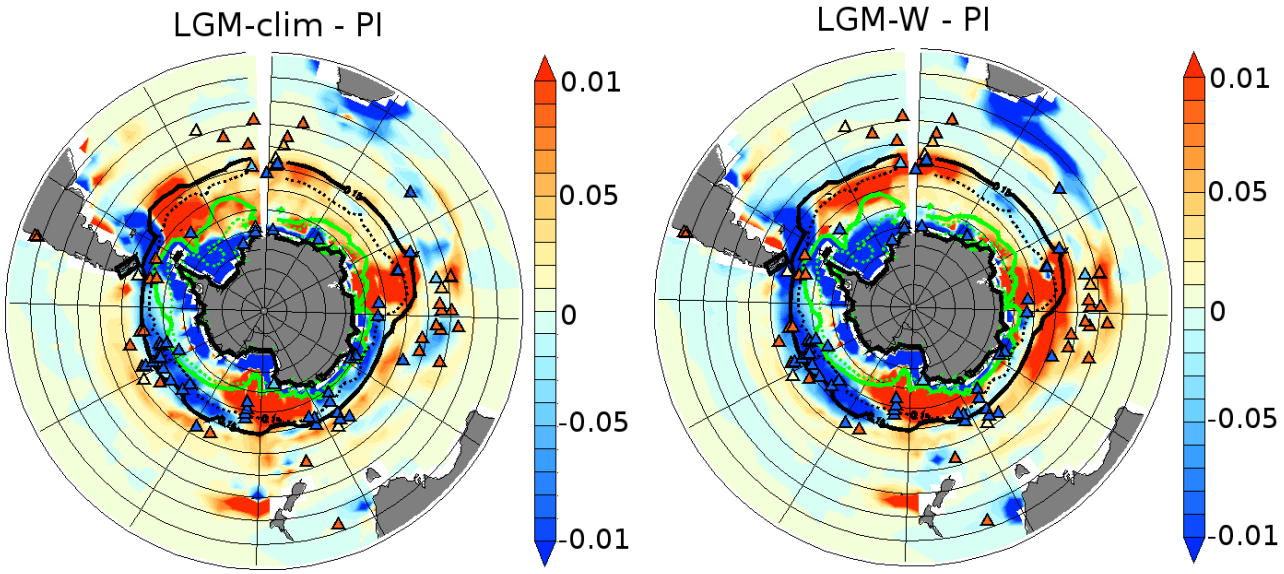

Figure S2. LGM-clim to PI (left) and LGM-W to PI (right) anomalies of opal flux at the bottom at the ocean-sediment interface with the LGM-Holocene opal flux proxies.; Qualitative changes in opal flux as estimated from proxy records (Kohfeld et al., 2013) are shown with significantly higher values represented by dark orange triangles, slightly higher values by light orange triangles, significantly lower values by dark blue triangles and slightly lower values by light blue triangles.

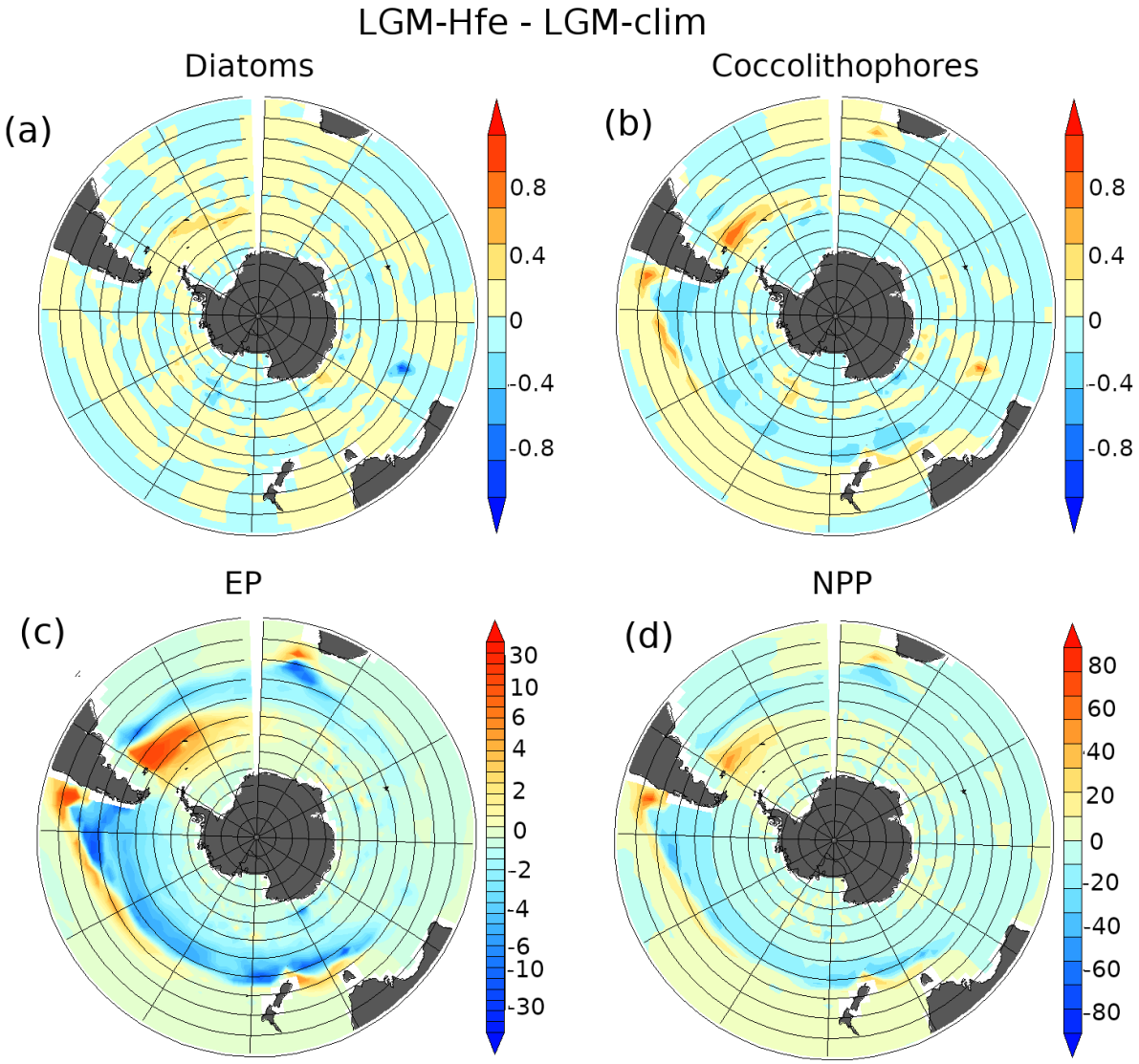

Figure S3. LGM-HFe to LGM-clim anomalies of annual mean (a) depth integrated diatom abundance (in g C m^{-2}), (b) depth integrated coccolithophore abundance (in g C m^{-2}), (c) export production at 177.5m (in g C $m^{-2}yr^{-1}$), and (d) depth integrated NPP (in g C $m^{-2}yr^{-1}$).