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Modelling the effect of glaciogenic dust on the LGM temperature

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Modelling climate of the Last Glacial Maximum (LGM) using General Circulation Models is a kind of benchmark of model ability to simulate climate change. Although the model and proxy data are complementarily partners to understand past climate changes, there have been discrepancy between them especially over the high latitudes for LGM. Underestimation of feedback by lacking processes in models such as mineral dust and vegetation are pointed out repeatedly in Intergovernmental Panel on Climate Change 5th Assessment Report.
Here we realized good dust distribution at the LGM by adding glaciogenic dust by Mahowald et al. (2006) on the LGM experiment submitted to Paleoclimate Modelling Intercomparison Project phase 3 using an Earth System Model, MIROC-ESM (Sueyoshi et al. 2013). Then, we evaluated the effect of additional dust on the surface temperature. The less cooling is reported around the Antarctica and the northern high latitudes compared to the standard LGM experiment. The aerosol-cloud interaction in the long wavelength plays an important role around the Antarctica. However, the resulting temperature change at the LGM is limited at the borehole sites over the high plateau of the Antarctica. On the other hand, in the northern high latitudes, the effect of ageing of snow dominates to warm the vicinity of the high dust emission area.