Using glacial sea surface temperatures to optimise the tuning of a general circulation model

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Climate models employ a number of parameters that can be adjusted to fit the model's output to climatologies. But the sensitivity of the model to these parameters can be different under modern and glacial boundary conditions. Adding glacial constraints could thus help optimise a tuning. We present a sensitivity analysis of FAMOUS, a fast GCM for both modern and glacial climate to 10 parameters that leads to the tuning of the model.

Ensembles of 100 runs are realised where the atmospheric and oceanic parameters are varied all together using a Latin Hypercube Sampling. This enables the study of the whole parameter space and takes into account the interdependency of the parameters. These simulations are realised under modern and glacial boundary conditions and compared to climatologies of present day and sea surface temperature reconstructions of the glacial climate. The sets of parameters that give the best fit between output and data for both climates are selected.

This method can lead to a non-unique solution composed of a small subset of runs that all have a relatively high skill score while having some differences in their climates. This reduced ensemble of simulations will be used later on in a study of the deglaciation from 21 000 years BP to 9 000 years BP.