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Using data assimilation to estimate the consistency between different proxies and model results

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Multiple proxies and the results from climate models can be combined through data assimilation to produce a reconstruction of the past climate changes that is consistent with both. This can help (1) to understand if the hypotheses proposed to explain the variations of proxies are compatible between them and with the physics of a climatic model (2) to improve the interpretation of the climatic records based on different archives and model-data comparisons. Here, this method is applied to the mid-Holocene climate using the LOVECLIM model and a dataset including 47 publicly available surface temperature proxies. When applying this dataset in data assimilation experiments, the constraint is weak and the disagreement between the simulation with data assimilation and the proxies remains large. Our objective is to document and understand the origin of these incompatibilities in order to improve the consistency between the proxy data and the model results.