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## Data assimilation of oceanic proxies in the North Atlantic over the Common Era

Hugues Goosse<sup>1</sup>, **Gaëlle Gilson**<sup>1</sup>, François Klein<sup>1</sup>, Guillaume Lenoir<sup>1</sup>, Anne de Vernal<sup>2</sup>, Michael N. Evans<sup>3</sup>, and Casey Saenger<sup>4</sup>

<sup>1</sup>Université Catholique de Louvain, Earth and Life Institute, Centre de recherches sur la terre et le climat G. lemaître, Louvain-la-Neuve, Belgium ([hugues.goose@uclouvain.be](mailto:hugues.goose@uclouvain.be))

<sup>2</sup>Université du Québec à Montréal, Centre de recherche en géochimie et géodynamique (Geotop), Montréal, Canada

<sup>3</sup>University of Maryland, College Park, Geology, College Park, MD, USA

<sup>4</sup>University of Washington, Joint Institute for the Study of the Atmosphere and Ocean, Seattle, WA, USA

The mismatch between oceanic proxy data and climate model results over the past millennia has been a long-lasting challenge. Although both are valuable sources of paleoclimate information, there is a strong discrepancy in variance between models and proxies, so that they cannot be compared directly. In addition, local sea-surface temperature (SST) reconstructions are often inconsistent among proxy types. We first performed several offline data assimilation experiments with different standardized SST proxy datasets using the climate models LOVECLIM and CESM in order to investigate the effect of proxy selection on local and regional reconstructions over the Common Era (0-2000 CE). All experiments work technically at the local scale, but the spatial pattern of the reconstructions vary with the type(s), number and density of proxies, and, where there is no proxy, the choice of the model. We then developed empirical scaling factors based on independent SST observations to correct for the discrepancy between model and proxy amplitude. While it is essential to scale proxies, scaling the model leads to complications because of the biases in the sea ice extent. Data assimilation of scaled proxies results in coherent SST reconstructions at the scale of the North Atlantic, with timing and amplitude that are in agreement with those given by forced models. Finally, results are compared to online data assimilation experiments.