Data assimilation of sea surface temperature reconstructions from marine sediments in the North Atlantic over the past two millennia

GILSON G.[1], GOOSSE H.[1], EVANS M.N.[2], DE VERNAL A.[3], KLEIN F.[1] AND SAENGER C.[4]

[1] *Université catholique de Louvain*

[2] *University of Maryland*

[3] *Université du Québec à Montréal*

[4] *University of Washington*

The assimilation of paleo-sea surface temperature (SST) reconstructions from proxies into climate models allows combining those two complementary sources of information to better estimate past climate variability. Up until now, its application has been limited due to the mismatch in model-data variance and the spatio-temporal heterogeneity of SST proxy signals. This study aims at combining SST reconstructions from several proxy types with climate model results across the North Atlantic and North Atlantic-Arctic regions via data assimilation experiments over the last two millennia, a key period for understanding past climate variability. SST reconstructions used are from: 1) the Ocean2k SST synthesis database, 2) a dataset solely composed of dinoflagellate cysts, and 3) an Arctic proxy database. Marine proxies include dinoflagellate cysts, foraminifera, diatoms and alkenones, and are grouped according to their seasonality and ocean depth signal prior to the assimilation applications. In order to resolve the mismatch in variances between proxies and models, we present a model-data scaling experiment based on satellite observations and on the change in variance with timescale. Assimilating scaled time series leads to robust results at the local and regional scales. The best results are obtained with the summer SST reconstructions from the dinoflagellate cysts database. Nonetheless, the assimilation with scaled variances also works technically when combining proxies carrying contrasting seasonal and ocean depth signals. Regional reconstructions are then compared to higher-resolution terrestrial archives, and potential and limitations of the scaling procedure and the choice of proxies are discussed.

Oral preference