Reduced-dimension methodology to reconstruct spatial fields of mean state Atlantic Ocean SST anomalies over the past 8 ka

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**ABSTRACT**

This study presents a methodology to reconstruct the spatial evolution of Atlantic Ocean surface temperatures (SSTs) using reduced-dimension methods with alkenone proxy records scattered throughout the domain. In the reduced-dimension methodology, present day spatial patterns of the full gridded SST field are linearly related to the present day SST patterns of the limited field - a field comprised of present day SSTs at 17 core locations. This relationship is used in conjunction with a Holocene limited SST field to project Holocene full field SSTs. The spatial reconstructions suggest an enhanced dipole pattern during early Holocene (12 ka BP) that weakens to present day with gradual warming of the tropics and cooling in the subtropics.

**DATA**

Contemporary Data:
- NOAA NCEI Extended Reconstruction
- Gridded 2° x 2°
- Annual averages (April to following May)
  - [Smith et al. 2008]

Holocene Data:
- 17 Alkenone SST records
  - See Figs. 1 and 2.
  - Original calibrated SSTs used
  - [Various refs]

**CALIBRATION**

Using the reduced-dimension model, which relates the full-field spatial patterns of SSTs to SSTs at each of seventeen core locations, we can reconstruct the contemporary 1854-2015 period. To determine skill, we correlate these reconstructed SSTs and actual SSTs at each grid point and plot the squared correlation coefficient. The best skill is seen in a band that extends from the northeastern coast of South America to the NW coast of Africa and up into the northeastern Atlantic. The worst skill is located in the southern sub-tropics and the central part of the Atlantic, where few SST records exist.

**RESULTS**

The resulting spatial temperature evolution shows cooling in the sub-tropics and warming in the tropics, which is consistent with other studies [Kim et al. 2004; Lohmann et al. 2013]. These results agree with those of Lohmann et al. [2013] who noted that simulated Holocene SST patterns underestimate alkenone-based SST trends. Future work involves including more records to make this an expansive multi-proxy study and to develop a way to differentiate between long term trends and AMOC variability.

**ACKNOWLEDGEMENTS**

This poster presents preliminary results of a research collaboration between CIRES, University of Colorado at Boulder and Lamont-Doherty Earth Observatory funded through an NSF postdoctoral research grant.

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