

A 100-year record of surface water temperature based on oxygen isotope ratios across bivalve mollusk shells, *Arctica islandica* (North Sea)

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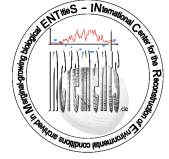
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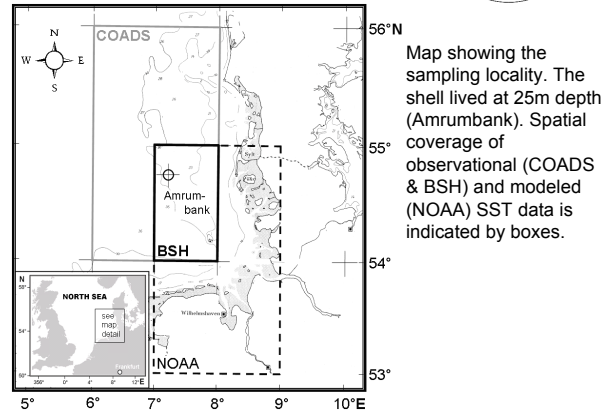
objective

Demonstrating the use of $\delta^{18}\text{O}$ ratios of long-lived bivalve mollusk shells, *A. islandica*, for century-long reconstructions of surface water temperatures.

Sea surface temperature (SST) measurements are rare and limited in distribution, especially in the boreal and temperate marine settings. In addition, no proxy records are available for these latitudes.

Here, we present a century-long SST chronology based on $\delta^{18}\text{O}$ ratios of the bivalve mollusk *A. islandica*.

Currently, our record covers the period of 1884-1983 and compares well with observational datasets such as COADS (Comprehensive Ocean-Atmosphere Data Set) or BSH (*Bundesamt für Seeschifffahrt und Hydrographie*) and modeled data NOAA (NOAA/NESDIS Extended Reconstructed).



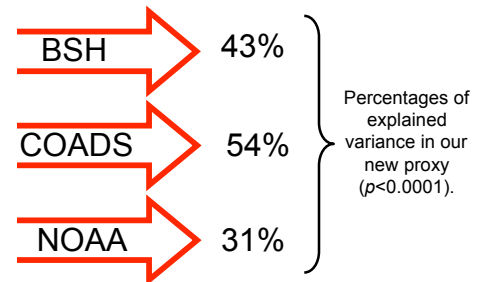
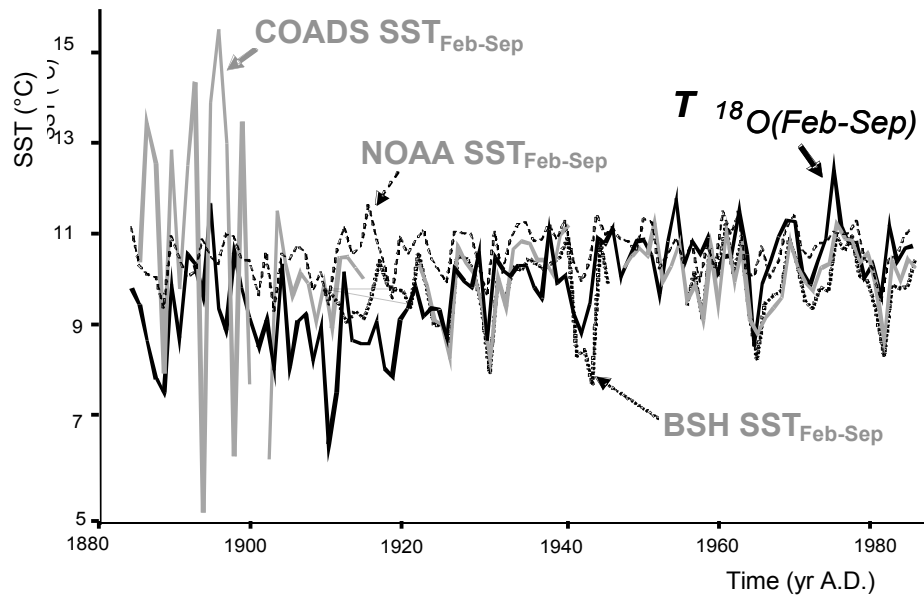
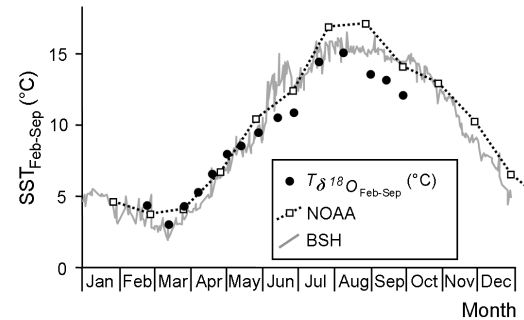
2cm

The bivalve mollusk *A. islandica* is one of the longest-lived (>375 years) animals. It occurs in boreal and temperate regions of the North Atlantic Ocean. The studied shell was 122 years old when collected alive. *A. islandica* regularly (daily, annually) accretes aragonite to its shell allowing for high-precision calendar dating of each shell portion.

Milling technique [resolution up to $65\mu\text{m}$ ~ 1-3 days of growth]. Samples (20 to $80\mu\text{g}$) were processed in a Finnigan Mass Spectrometer 253. Standard deviation is better than 0.06‰. The Grossman and Ku equation enabled us to calculate temperatures from these values.

Annual growth increment

1mm



summary

Temperatures reconstructed from $\delta^{18}\text{O}$ values of the shell aragonite closely matches SST

Intra-annual growth record enabled precise calendar dating of each shell portion and each isotope sample.

conclusion

A. islandica can be used as a proxy for long-term, high-resolution reconstructions of SST prior to instrumental measurements.



Emmy Noether Program



This study has been made possible by a German Research Foundation (DFG) grant to BRS within the framework of the Emmy Noether Program for the promotion of young scientists (SCHO 793/1).