



ELSEVIER

Available online at www.sciencedirect.com

SCIENCE @ DIRECT®

Palaeogeography, Palaeoclimatology, Palaeoecology 212 (2004) 215–232

PALAEO

www.elsevier.com/locate/palaeo

Sea surface water temperatures over the period 1884–1983 reconstructed from oxygen isotope ratios of a bivalve mollusk shell (*Arctica islandica*, southern North Sea)

Bernd R. Schöne^{a,*}, Antuané D. Freyre Castro^a, Jens Fiebig^a, Stephen D. Houk^a, Wolfgang Oschmann^a, Ingrid Kröncke^b

^a*Institute for Geology and Paleontology, INCREMENTS Research Group, Goethe University, Senckenberganlage 32-34, 60325 Frankfurt/Main, Germany*

^b*Department for Marine Research, Senckenberg Institute, Südstrand 40, 26382 Wilhelmshaven, Germany*

Received 18 September 2003; received in revised form 28 May 2004; accepted 28 May 2004

Abstract

Although climate system modeling cannot be imagined without long sea surface temperature (SST) records, observational data is spatiotemporally incomplete and inhomogeneous prior to about 1950. Moreover, almost no high-resolution SST proxies exist from temperate and boreal marine settings. Here, we present a temporally equidistant, high-resolution SST proxy record of the southern North Sea during the period 1884–1983 calculated from oxygen isotope ratios ($\delta^{18}\text{O}_{\text{aragonite}}$) of *Arctica islandica* (L.), a bivalve mollusk shell. *Arctica islandica* produces daily growth increments, which enable precise intraannual dating. The growing season of specimens from about 25 m water depth (upper well-mixed layer of the ocean) started in February and ended in September. Observational (COADS, etc.) and $\delta^{18}\text{O}_{\text{aragonite}}$ -derived SST data during February through September compare well to each other, especially after 1950. Apart from similar overall SST trends, we found North Atlantic Oscillation-type cycles of 7–9 years in our proxy SST record and in various different instrumentally determined SST chronologies. No vital effects exist, so that $\delta^{18}\text{O}_{\text{aragonite}}$ ratios determined across the shell (i.e., throughout lifetime) of the studied specimen reflect ambient water temperatures that occurred during shell growth. Results of our study demonstrate that *A. islandica* provides long, independent and high-resolution SST proxy chronologies from higher latitudes. Such records can complement and further validate observational SST data and help improving climate system models.

© 2004 Elsevier B.V. All rights reserved.

Keywords: Sea surface temperature; Bivalve; Oxygen isotopes; Increment; Climate; North Sea

1. Introduction

Reliable climate models require temporally equidistant, long-term and high-resolution records of past

* Corresponding author.

E-mail address: B.R.Schoene@em.uni-frankfurt.de
(B.R. Schöne).