Geophysical Research Abstracts
Vol. 12, EGU2010-4133, 2010
EGU General Assembly 2010

Reconstructions of summer seawater temperatures and water mass variability on the North Icelandic shelf using the shell of the bivalve clam Arctica islandica

Paul G. Butler (1), Alan D. Wanamaker Jr (2), James D. Scourse (1), and Christopher A. Richardson (1)

(1) School of Ocean Sciences, College of Natural Sciences, Bangor University, Menai Bridge, Anglesey LL59 5AB, Wales, UK (ossa07@bangor.ac.uk), (2) Department of Geological and Atmospheric Sciences, Iowa State University, Ames, Iowa, USA

Within the context of MILLENNIUM, we have made significant advances in the techniques and applications of the Arctica islandica shell archive. A multi-centennial crossdated master chronology has been constructed using shells collected from the seabed at 80m depth in the vicinity of the island of Grimsey on the North Icelandic shelf. The chronology extends back to AD 1200 with a sample depth of at least four shells; with the addition of two earlier shells a tentative extension to AD 655 is suggested (although with a sample depth of just one or two shells). The chronology includes records from five animals which lived longer than 300 years, including one with a lifespan of 502 years.

There is a significant correlation ($r^2=0.53$; $p<0.0001$) during the period AD 1947-2005 between the chronology standardized growth indices (SGIs) and summer (JJA) seawater temperatures at 75m measured close to the collection site. In particular, the SGIs show a coherent response to the intrusion of relatively cold and less saline waters during the late 1960s known as the Great Salinity Anomaly (GSA). Using the GSA as an indicator of extreme cold events (JJA seawater temperatures < 3º C), we have reconstructed their occurrence during the past 800 years. Extremely narrow annual growth increments (corresponding to such extreme cold events) were most frequent in the 14th (13 events), 16th (19) and 19th (15) centuries and rather infrequent in the 13th (5 events), 15th (1), 17th (3), 18th (2) and 20th (6) centuries. These results indicate that the ocean climate north of Iceland was highly variable during the Little Ice Age (ca. AD 1300-1900) and that this mostly cold period was interspersed with substantial warmer intervals.

Determination of the marine radiocarbon reservoir correction (R) for the North Icelandic shelf indicates that the age of the regional water masses increased between ~AD 675 and AD 1900 (suggesting a progressively stronger influence of older Arctic waters and a weakening influence of younger Atlantic waters). Subsequent to AD 1900 this trend appears to have reversed, with the Atlantic water mass becoming more prevalent.