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# Hydrographical variability and major ecosystem changes as recorded in the growth of Arctica islandica from the northern North Sea

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Reconstruction of marine climate variability on regional to global scales requires a network of climatically sensitive annually resolved archives from key oceanographic locations. The small number of records existing to date impedes the application of a network approach. In this study, we aim at improving the spatial coverage of annually resolved paleo proxy records by investigating the impact of climate variability on sclerochronological records of A. islandica from the Viking Bank in the northern North Sea. The northern North Sea has an excellent oceanographic setting because its hydrography is primarily controlled by the major Atlantic water inflow to the North Sea. Using annual growth increment measurements of 30 shells we constructed a 265-year shell-growth chronology spanning the time interval AD 1748-2013. Chronology statistics (Rbar (>0.5) and EPS (>0.85)) indicate a robust signal of a common environmental forcing controlling shell growth for the major part of the record. Comparison with other sclerochronologies from the oceanographically related locations reveals a coherency on longer time scales, which is likely a response to a common environmental driver or a combination of such drivers. No significant correlation on the year-on-year level has been found between the chronology and time series of temperature and salinity from the area close to the study site. However, the timing of major hydrographical anomalies described for the region (Great Salinity Anomalies) coincide with a decrease in shell growth; likely in response to an impact on lower trophic levels, i.e. plankton composition and abundance. Spectral analysis of the chronology reveals a 21-26 year periodicity recorded in the shell growth. The variability on a similar time scale has been observed in multiple records from the North Atlantic and in model outputs. It has been suggested to represent one of the dominant scales of multi-decadal variability especially pronounced prior to the 20th century. In our chronology this variability is clearly observed prior to the 1920's and fades out towards present day. This change coincides with the most significant regime shift in the North Atlantic observed in the 20th-century, connected with dramatic warming and increasing Atlantic inflow. Hence, our data show that growth chronology from the Viking Bank region has a high potential to be used in climate variability studies and can significantly contribute to the development of a spatial sclerochronological network.