Patterns of climate variability in the north atlantic

Results in Brief

Magnetic indicators enhance climate change models

High-resolution magnetic analysis has shown that the North Atlantic was subject to rapid climate change thousands of years ago during the Holocene period. The result of the research was a better understanding of the long-term variability of the North Atlantic's climate and improved models for predicting the effects of climate change.

CLIMATE CHANGE
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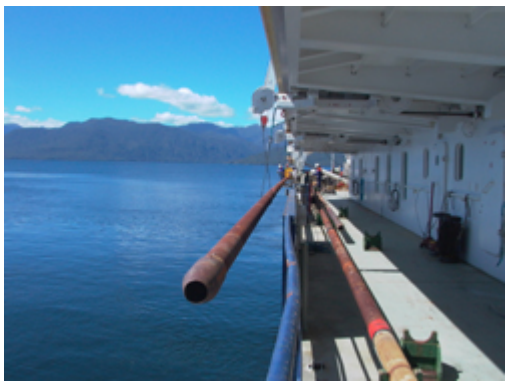

The top 25m of a core taken at a water depth of some 400m from the mid-outer shelf off north Iceland was subjected to high-resolution magnetic analysis. This area is a key boundary region for climate change. It is connected to atmospheric and oceanographic variations affected by the moving boundary between the cold and warm water masses at the Polar Front, and associated westerly winds.

An age model based on this core had been produced previously using tephrochronology to date samples. This technique utilises discrete layers of volcanic ash from a single eruption to create a chronological framework. The age model enabled accurate dating of significant variations in the sample's magnetic mineral concentration and grain size over the last 10,000 years.

The Holocene climatic optimum, which occurred in north Iceland between 10,000 to

6,000 years ago, was characterised by minor variations in the magnetic record. There is also clear evidence of increasing oceanographic instability from 6,000 years ago until now. The decreasing trend in the magnetic mineral content was associated with a change in the circulation pattern, and coincided with decreasing North Atlantic Deep Water formation.

Scientists from the PACLIVA project successfully identified a number of short-term intervals of decreased magnetic mineral content. The most recent interval occurred between 1020 AD and 1330 AD, which corresponds in time with the Medieval Warm Period. These events indicate periods of increased activity from the warm and highly saline Irminger current in relation to stronger input of NorthAtlantic waters into the Nordic Seas.

Spectral analysis of selected magnetic parameters indicated periods of increased activity, which lasted for hundreds of years. These were more clearly shown over the last 6,000 years than in the previous period. The changes could be due to persistent intervals in the North Atlantic Oscillation (NAO) lasting hundreds of years. These findings are an indication that the climate of the Holocene was more unstable than previously assumed. This demonstrates the importance of high-resolution climatic studies for this recent time period which should enable researchers to deliver more accurate predictions through the use of improved climate models.

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Project Information

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