- **EMBARGOED UNTIL 6pm BST WEDNESDAY 11 APRIL 2018** -

Atlantic Ocean circulation is weakening; are our deep-sea ecosystems at threat?

Press release: 10 April 2018

After the recent snow in Western Europe brought on by the 'Beast from the East', many of us are asking ourselves if such unusual weather events will become more common. One of the possible factors influencing global climate changes is changes in ocean circulation; and the Atlantic Ocean circulation system that helps keep Western and Northern Europe warm is weaker today than it has been for over a thousand years, according to new research carried out within the framework of the EU-funded **ATLAS** project. Published in *Nature*, the study reports a marked weakening of Atlantic circulation over the past 150 years and it is likely that this trend will continue.

This circulation system, also known as the Atlantic Meridional Overturning Circulation (AMOC), plays an essential role in regulating Earth's climate through its redistribution of heat – regulating water patterns like the Gulf Stream. The AMOC is also important for carrying nutrients, oxygen and the larvae of marine organisms between different regions of the ocean, and controls the ocean's ability to absorb and store carbon.

The Ocean Conveyor. A global system of currents, often called the "ocean conveyor", carries warm surface waters from the tropics northward. At high latitudes, the waters cool, releasing heat to the atmosphere. The colder (and denser) waters sink and flow southward in the deep ocean. Credit: Jack Cook, Woods Hole Oceanographic Institution (WHOI).

The new study, conducted by **ATLAS** partners University College London (UCL, UK) and the Department of Fisheries and Oceans Canada, provides the first comprehensive ocean-based records to place recent changes in the AMOC in context of centennial climate change. By examining the size of sediment grains deposited by deep-sea currents, where larger grains imply stronger currents and

vice versa, scientists have reconstructed past circulation patterns. The abundance of marine organisms that prefer warm and cold water was then measured in different sediment layers to work out changing near-surface temperatures.

According to lead author Dr David Thornalley (UCL, UK), the new findings hint at a gap in current global climate models, "North Atlantic circulation is much more variable than previously thought, and it is important to figure out why previous models underestimate the AMOC decreases we have observed".

The apparent sensitivity of the AMOC revealed by this study has important implications for our understanding of future changes in the deep sea and to our climate. One important impact could be on marine ecosystems, the focus of research being undertaken by the **ATLAS** project. "We think that the AMOC has helped creatures, like deep-sea corals, to rapidly colonise new areas in the past, and so one worry is that a weaker AMOC might mean that populations become less connected and less resilient," explains **ATLAS** researcher Dr Peter Spooner (UCL, UK).

Deep sea ecosystem Credit: J Murray Roberts, University of Edinburgh (UEDIN).

Murray Roberts who coordinates the **ATLAS** project at the University of Edinburgh (Scotland, UK) explains, "One of our biggest challenges in **ATLAS** is trying to work out what predicted changes in these currents will do to deep Atlantic ecosystems, and to provide advice to policy makers so we can manage human activities in deep ecosystems."

The deep sea supports a wealth of biodiversity in both fauna and flora, including some important commercial fisheries. Changes in the AMOC have the potential to substantially alter the positions and depths of ocean currents, upon which corals and sponges depend for food. The AMOC also flushes much of the deep Atlantic with oxygenated water and so a weaker flow may reduce the availability of oxygen for deep ecosystems. A weakening of the AMOC can also result in temperature increases or decreases of several degrees centigrade, affecting some high-value fisheries as well as abundances of plankton, fish, sea birds and whales.

As for our weather, the AMOC is crucial to the world's climate, and an abrupt slowdown could trigger various disruptions globally, such as sudden rising sea levels, changes in the position of major rainfall and arid climate zones, and increased storminess across western Europe.

"We are just starting to understand how the AMOC is tied into a whole range of ecosystem effects and climatology implications," says Dr Spooner. "Our new research helps set the context for studying modern systems."

The full article will be published in *Nature* on Thursday 12 April 2018.

Full reference: David J.R. Thornalley, Delia W. Oppo, et al. 'Anomalously weak Labrador Sea convection and Atlantic overturning during the past 150 years'. https://doi.org/10.1038/s41586-018-0007-4

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Notes for Editors

This study was carried out by **ATLAS** partners University College London (UCL) and Fisheries and Oceans Canada, alongside Cardiff University, University of Reading and Woods Hole Oceanographic Institution (WHOI). It was funded by Horizon 2020 (EU), a National Science Foundation grant (USA) and the Leverhulme Trust (UK).

"A Trans-Atlantic Assessment and deep-water ecosystem-based spatial management for Europe – **ATLAS**" is a research and innovation action funded under the European Union's Framework Programme for Research and Innovation, Horizon 2020, Grant no. 678760 (**ATLAS**). It is the largest integrated study of deep Atlantic ecosystems ever undertaken. The four-year project was launched in May 2016, bringing together 24 partners (and one linked third party) from 10 European countries, the USA and Canada, and has a total budget of €9.4 million.

As well as the scientific importance, this study is a great illustration of the power of transatlantic cooperation between Europe, Canada and the USA through the 'Galway Declaration' (details at https://www.atlanticresource.org/aora).

The **ATLAS** Consortium will be gathering in Mallorca for the 3rd General Assembly from 8 – 12 April. This meeting will bring together individuals from all areas of the project: scientists, policy makers, industry stakeholders and social scientists to discuss the latest results emerging from the project.

For more information on the ATLAS project, please visit www.eu-atlas.org, follow @atlas_eu on Twitter or contact Prof J. Murray Roberts (murray.roberts@ed.ac.uk)

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