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# ANIMATION SCRIPT

## CAN WE USE MUD TO UNDERSTAND CLIMATE CHANGE?

PROFESSOR DAVID THORNALLEY

TO MAKE THE MOST OUT OF THIS SCRIPT, YOU COULD:

- Stick it in your book as a record of watching David's animation
- Pause the animation and make notes as you go
- Add your own illustrations to the sheet
- Create your own animation to accompany it
- Add notes from classroom discussions
- Make notes of areas you will investigate further
- Make notes of key words and definitions
- Add questions you would like answered – you can message David through the comments box at the bottom of his article: **www.futurumcareers.com/can-we-use-mudto-understand-climate-change**

## SCRIPT:

Oceans are a key part of the Earth's climate system – they transport heat and store carbon from the atmosphere.

The Atlantic Meridional Overturning Circulation (or AMOC) is a system of ocean currents which includes warm water from the tropics flowing into the North Atlantic. The warm climate of the tropics means water evaporates from the ocean and it becomes salty. This salty water travels further north in the North Atlantic, where the climate is colder, and so the salty tropical water now also cools down. The cooler, saltier water sinks, and the dense water then flows southwards, before it eventually rises back to the surface in the Southern Ocean and also the tropical oceans.

Along with the water, large amounts of heat are transported around the Atlantic by the AMOC. The AMOC transports up to 25% of the Northern Hemisphere's atmospheric and oceanic heat.

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Carbon dioxide is absorbed into the ocean as cool water sinks – the carbon dioxide is stored in the deep ocean, so the AMOC also works to soak up some of the carbon dioxide in the atmosphere.

Professor David Thornalley, of University College London in the UK, has been studying the AMOC to understand how this system has varied in the past and how it may be affected by climate change.

If the water of the AMOC becomes too warm, or less salty due to melting ice or changing precipitation patterns, the circulation will weaken and could become unstable. Because climate change is causing increased global temperatures, David expects the AMOC to be weakening, and that this will continue.

David believes climate models are the best tools for investigating how climate may behave in the future. Climate models work by simulating certain features of the climate system, such as the global temperature response to greenhouse gas increases.

However, many important ocean processes take place on a very small scale, and many older climate models can only simulate large areas. It is also sometimes difficult to improve the models due to a lack of real-world data.

David's ambitious project uses marine sediment cores – samples of mud from the ocean floor – to create a dataset representing the North Atlantic over the past 7,000 years.

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David's team travels to sites around the North Atlantic and lowers metal pipes into the mud. When the marine sediment is pulled back up, the team can observe the layers in the sample and analyse their contents. David compares the uppermost layers of mud - deposited during recent years - to actual modern-day instrumental measurements, to make sure that the data does a good job of representing the AMOC.

Analysis of the mud can reveal the speed of past water currents, as the size of grains in the mud can indicate how currents have varied in the past. Different marine species like to live in different conditions, so by looking at what shells are present, the team can also ascertain whether the ocean was warm or cold, as well as what marine ecosystems existed in the past.

The team's analysis has shown that the AMOC has weakened in a way that has not been seen for at least 1,600 years.

David and his team now want to understand to what extent this change is due to human-induced warming, versus natural processes. The more they understand how the AMOC has varied in the past, the better they can understand the impact modern day climate change is having on our oceans.

What would you investigate in the field of climate science?