Further particulars: Research scientist in Decadal Climate Variability – SRF33079

The subpolar North Atlantic (SNA) is an important region of the global ocean. It is the region where Atlantic and Arctic waters interact, and it plays an important role in the formation and maintenance of the Atlantic Meridional Overturning Circulation (AMOC). It is also a highly variable region, particularly on decadal timescales. Observations have shown large multi-decadal time changes in sea surface temperatures, upper ocean heat and salt content, and ocean circulation. Changes in the SNA have also been linked with substantial, and wide-ranging, climate impacts across both ocean and atmosphere. For example, changes in SNA have been associated with changes in the rate of Greenland Ice Sheet melt, and Arctic sea ice loss, as well as important impacts on the ocean circulation further south, including the Gulf Stream and the AMOC. In the Atmosphere, changes in the SNA have been linked to changes in the North Atlantic Oscillation, jet speed and position, regional rainfall shifts, and the number of hurricanes, amongst others. Excitingly, the SNA also appears to be one of the most predictable places on Earth on decadal timescales, with state-of-the-art decadal prediction systems exhibiting large skill in predicting changes in the SNA up to a decade ahead. Therefore, as the SNA is thought to influence a wide range of phenomena, then there is prospect for improved predictions of a number of climate impacts.

However, there is still large uncertainty of if, and how, the SNA impacts on the wider climate, not least because there are several routes through which the SNA could affect the wider climate. For example, there are oceanic routes, i.e. by modulating the path of the Gulf Stream, or the volume of Atlantic waters entering the Arctic. In particular, surface flux (or buoyancy forced) variability over the SNA can lead to subsurface density anomalies that can propagate and interact with the circulation further south, particularly in the Gulf Stream region, which can change local and basin-wide ocean heat transports and upper heat content and SSTs. Changes in SST gradients across the SNA or wider North Atlantic, or changes in air-sea heat fluxes, can also drive significant changes in the atmosphere. However, the atmospheric response can be different in different seasons, and understanding the relative roles of different regions, for example the tropics or extra-tropics, in forcing an atmospheric response is challenging due to the co-variability between regions. There is also evidence for coupled feedbacks within the SNA system. Hence, decadal variability in the SNA, and across the wider North Atlantic, could be more coupled than previously thought.

The overarching objective of the project is to characterize the linkages between anomalous buoyancy forcing of the SNA and impacts on the wider North Atlantic coupled system on decadal timescales, and to determine the oceanic and atmospheric processes that control these impacts. In particular, we will address the primary hypothesis that buoyancy forcing over the SNA is the primary controller of Atlantic Decadal-to-Multidecadal *coupled* variability due to its key role in shaping the Thermohaline Circulation (THC) across the North Atlantic basin and, subsequently, the upper ocean changes that result in an atmospheric response. Specifically, we will better characterise: the role that the propagation of buoyancy-forced subsurface density anomalies in the North Atlantic Ocean in driving significant decadal variability at lower latitudes; the role of SNA SSTs in driving changes in the atmospheric eddy-driven jet in summer and winter; and we will further test the hypothesis that subsurface SNA density anomalies are key for successful predictions of major changes in the SNA on decadal timescales, and associated changes in AMV.

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The post is based at the Department of Meteorology at the University of Reading, within NCAS. NCAS is a distributed institute of NERC comprising groups at several universities, with more than 50 scientists at Reading, contributing to a core-strategic programme and national capability in modelling and understanding the climate system. The Department of Meteorology is a thriving centre for atmospheric and ocean science with more than 200 research and academic staff and 40 research students. In the most recent UK Research Assessment Exercises 86% of the research of the Department was graded as world-class or internationally excellent.

WELLBEING, EQUALITY AND DIVERSITY

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