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UCT oceanographer part of team to receive €12m grant for climate change project

International research team involving UCT academic receives ERC Synergy Grant for interdisciplinary project

Associate Professor Sarah Fawcett Photo: Robyn Walker

The University of Cape Town (UCT) biogeochemical oceanographer, Associate Professor Sarah Fawcett, is part of an international research team that has received funding from the European Research Council (ERC) to better understand the ocean's role in ongoing and future and climate change.

Fine-scale ocean dynamics play an important role in the exchange of heat and carbon between the ocean and the atmosphere. They influence the ocean's ability to mitigate

climate change, as well as how the ocean is affected by climate change. The WHIRLS project zooms in on such fine-scale processes and explores their impact on climate, marine biogeochemistry and biodiversity. Fawcett will work with physical oceanographers and numerical modelers from Germany, France and Sweden to improve our understanding of the ocean's fine scale, and ultimately, our ability to predict future changes in marine systems and climate.

The research will focus on the world's most energetic region, the Agulhas Current System around South Africa. "The Agulhas system is not only unique in terms of its vigorous circulation, intense air-sea heat and carbon uptake and the particularly high productivity and diversity of its marine ecosystem," said Fawcett. "It also plays a key role in the global ocean circulation and strongly influences regional and global climate."

Heat and carbon are the primary factors influencing regional and global climate. The ocean absorbs huge amounts of heat, limiting the effects of global warming. When the ocean releases heat to the atmosphere, the climate becomes warmer and wetter, and vice versa. Carbon that enters the ocean is distributed by ocean currents and taken up by phytoplankton. These tiny plants form the base of the marine food web and are key to marine biodiversity. Additionally, carbon stored in the ocean is removed from the atmosphere for hundreds of years, which also helps to mitigate climate change.

The exchange of heat and carbon between the ocean and the atmosphere, as well as their distribution within the ocean, is driven by larger currents and smaller eddies – and by even smaller circulation features, termed "whirls". Through the WHIRLS project, funded by one of the ERC's prestigious and highly competitive Synergy Grants, Fawcett, an Associate Professor in UCT's Department of Oceanography; Professor Arne Biastoch from GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany; Professor Sabrina Speich from the Ecole Normale Supérieure of Paris, France; and Professor Sebastiaan Swart from the University of Gothenburg, Sweden, will implement a synergistic and interdisciplinary approach to investigate these fine-scale processes. WHIRLS will be funded at the level of almost 12 million euros over six years, with 2.3 million euros awarded to UCT.

The project will employ the latest observational capabilities, from ship-based measurements to autonomous instruments and satellites. It aims to characterize in three dimensions all the relevant physical processes, resolved at time scales from days to seasons. WHIRLS will observe, model and track the interactions among the atmosphere, surface ocean and the ocean interior, and will investigate vertical mixing and the pathways of heat, nutrients and carbon within the ocean.

The collected data will be used to design and verify high-resolution models and to enable them to address fine-scale dynamics and their effects – responding to the urgent imperative to represent processes at the scale of kilometres in Earth system models. The model results will improve climate predictions and projections. WHIRLS contributes to the United Nations Decade of the Ocean Science for Sustainable Development and helps to address South African and European scientific priorities.

"WHIRLS is basically about fine-scale processes having large-scale impacts", said Professor Biastoch, ocean modeller at GEOMAR and coordinator of the project. "Whirls refer to processes on scales of less than 100 kilometres. This might still sound large, but such patterns are small in the context of the global ocean, and are currently poorly resolved in ocean observations and climate models."

- View the list of winners.

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