Go with the floe

The Gulf Stream in slowing down but analysis and data collection on the impact remains limited. **Sam Turpin** joined a group of sailors who headed north to help in the gathering of essential information on what is going on.

“...how well did the probe work? Were you able to record the data?” asks oceanographer Cédric Courson. He has just appeared on the deck of the North About. The 15-metre yacht left Roscoff, in France, for Iceland about three weeks ago. Our crew of six carried a precious cargo of probes and sensors for taking measurements - plus me - the journalist accompanying this summer-long expedition. This is my first journey as far as the waters of the 66th parallel North and I’m making it aboard a legendary vessel: the North About is the only sailing boat to have made two Arctic circumnavigations via the Northeast and Northwest passage. The first took place over two seasons in 2001 and 2005, then an expedition led by explorer David Hempleman Adams highlighted the alarming manner in which the ice cap had shrunk by making the entire circumnavigation in an astonishing and also alarming seven weeks in 2015.

Now the boat is on a new mission that stays true to the alarm raised by Hempleman Adams. Captain, Tobias Carter and expedition leader Sophie Simonin have set a new mission for the North About for the past two years - operating through their organization UNU Mondo Expedition - that of serving as a logistic platform for scientific missions to the Arctic region and participating in a mission to raise young people’s awareness of the effects of climate change.

The wind picks up suddenly and...
which became very cramped after we had taken on board all the food for two months and the scientific equipment. The organisation of community life in a space of about 20 square meters and the harmony of between the crew members are obviously key components for the success of such an expedition. We learned to look after each other, we had to manage our respective fatigue and tensions that could appeared.

Cédric returns to the little electronic control unit attached to the guardrail, with a small solar panel set above it. Every 15 minutes the unit records the temperature of the sea, the salinity of the water and the relevant GPS coordinates, using a probe submerged in the water. He removes the flash drive and takes shelter in the cockpit to process the data on his laptop. “In the long run, this data is going to provide us with information about the stratification and mobility of ocean currents – and this is fundamental in analysing ongoing changes in the Gulf Stream, which flows past here, to the south of Iceland”, Cédric explains.

The western coast of Europe, from Great Britain to Spain, and including France and Portugal in between, would experience a drop in temperature of 1 to 3°C on average over the year, with great contrasts between colder winters and hotter, drier summers. London might alternate between scorching hot summers and long rainy periods over the rest of the year. Further east, Hamburg could experience drops in temperature of 10 degrees in winter. Meteorological phenomena such as storms and cyclones could become more frequent and more severe, affecting agriculture and biodiversity. On the other side of the Atlantic, the eastern coast of the United States would be under increasing threat from a rise in sea levels, because the...
weakening of the Gulf Stream current would prevent it from being able to carry such great quantities of water.

**The ocean conveyor belt**
The Gulf Stream is part of an incredible ocean water circulation mechanism known as AMOC (Atlantic Meridional Overturning Circulation), which could be likened to a central heating system of the Earth. Warm, less dense surface salt water travels back up to more northern latitudes, where it cools down. It then becomes denser and sinks down to the depths, as it makes its return journey back to the Equator and the southern hemisphere, eventually reaching the Antarctic. This "ocean conveyor-belt" system, causes a heat transfer from the ocean to the atmosphere, thus contributing to

**ABOUT THE BOAT:**
Northabout is a Chatham 47 designed by the famous French naval architect, Gilbert Caroff, she was custom built by adventurer Jariath Cunnane from County Mayo. She features a swing keel with internal ballast and was designed to be built in either aluminium or steel. In 2016, in order to highlight the rapid melting of the ice pack, renowned adventurer Sir David Hempleman-Adams purchased Northabout and sailed around the entire Arctic in one season. This was the second time the yacht had achieved this feat; the first undertaken over two seasons in 2001 and 2005. On the second time around, the yacht completed the trip in an unprecedented seven weeks, illustrating just how much the icecap has melted.

- **Designer:** Gilbert Caroff
- **LOA:** 49’ (14.95m)
- **Beam:** 14’6” (4.45m)
- **Draft:** (min) 3’3” (1m), (max) 8’2” ft (2.50m)
- **Displacement:** 33,731lb (15,300kg)
- **Construction:** reinforced aluminium

**BELOW**
North About heading into the Prince Christian Sand fjord (Greenland)
the creation of atmospheric disturbances.

The AMOC has weakened by 15 to 20% during the past 150 years, according to studies published in the scientific journal Nature by Niklas Boers and Stefan Rahmstorf.

While the Gulf Stream did in fact undergo slowdowns of this kind during the Ice Age and the Little Ice Age, which last plummeted the northern hemisphere into an Arctic climate 8,000 years ago, what concerns research scientists today is the pace at which the Gulf Stream appears to be slowing down today.

"It’s likely that the increase in rainfall and the influx of cold freshwater from the melting of Greenland’s glaciers and the Arctic pack ice – such meltwater being attributable to human activity – is seriously disrupting the ocean currents and could affect the entire thermohaline circulation cycle", Cédric continues. The Greenland ice sheet alone has been losing an average of 290 billion tonnes of ice each year since 1996. The cold freshwater is believed to be forcing the warm waters of the Gulf Stream to sink down to the depths and then to stagnate further south. The surface waters of the North Atlantic are consequently growing colder, a phenomenon which has already been seen for a number of years now around Labrador and Newfoundland, and to the south of Greenland. This cooling effect could, notably, be the reason behind the harsh winters experienced by the northeast of the United States and Quebec during the past few years.

"The oceans are the places that we know the least. We are better acquainted with the Moon and will soon be more familiar with the planet Mars than with our own oceans", notes Cédric, "and yet, out of three sources of the air that we breathe, two-thirds of the oxygen that is essential to us comes from the oceans, and only one third from plant cover". The oceans cover two thirds of the globe and are in fact the greatest emitters of the world’s oxygen, ahead of even the "planet’s lungs" that are the forests of the Amazon and the Congo Basin. They are also the biggest carbon sinks. They have been absorbing a third of our excess output since the beginning of the Industrial Age, thanks to a combination of two processes. The one is physical, and the other, biological. A quarter of the carbon dioxide gas present in the atmosphere dissolves naturally before being absorbed by the ocean surface waters – a physical process facilitated at low temperatures – then spread throughout the water column before being stored in the depths, driven by the ocean currents. "Then you have the phytoplankton – the hero of the sea!" Cédric enthuses. The phytoplankton, like other microscopic plant organisms, absorb the CO2 and store it within their skeleton. Part of it is released in the form of oxygen, while the rest is deposited on the ocean floor when they die. Studies carried out over the past few decades have highlighted the effects of the increase in temperatures in relation to the expansion of oceans and threats to marine biodiversity, such as loss of species and coral reefs. They have
also helped to establish the correlation between the heat transfers from the oceans and from the atmosphere, which modify the winds and give rise to phenomena such as El Niño. Many scientific researchers are now focussing on the oceans’ carbon-storing and recycling role, for the purpose of climate modelling. Today, their behaviour is one of the main issues in the fight against global warming. The rise in temperatures is making it increasingly difficult for CO2 to dissolve in the ocean waters, thus reducing their capacity for absorption and causing ocean acidification. The most pessimistic of scenarios even allow for the possibility that the oceans could themselves become emitters of carbon, as the forests of the Congo Basin have been for five years now. ‘If we want to know the precise role the oceans could play over the coming decades, we need to collect data on a grand scale’, Cédric explains. ‘The problem at present is that scientific missions have expensive requirements in terms of logistics and equipment, which considerably limit the number of samples we can collect and measurements we can take. There are fewer than 50 scientific vessels in the world equipped for collecting this type of data. This considerably reduces the opportunities to fine-tune our analyses. That’s why projects such as Unu Mondo Expedition are very valuable to us as researchers. But this is not enough in itself, and we can go further, notably by developing participatory science opportunities.”

This means developing durable, autonomous, self-monitoring and auto-diagnosing measuring instruments that are easy to install, reliable and affordable, which could be used to equip any type of ship or boat, as desired. “We are going to launch a trial involving 3,500 volunteer sailors, who will take light equipment on board, like that carried by the North About – but there are 14,000 yachts who travel the seas every year and could collect data during their journeys. The very fact of taking on an active role in the project also helps to increase the scale of public involvement in saving the planet”, the oceanographer notes. In this same spirit, the data collected is then shared, as open data, with all researchers. “This data is not intended to replace the readings collected by scientific expeditions but to complement them, to be able to map the changes taking place in the oceans more comprehensively”, Cédric concludes.