

## Natural resources and the environment

### Antarctic research may hold answers to climate change

Scientists from the CSIR and the University of Cape Town (UCT) have set sail for the Antarctic aboard the French vessel, *Marion Dufresne*. Dr Pedro Monteiro of the CSIR's ocean systems and climate research group is leading the South African team, who joins some 60 international scientists on the journey.



The team will investigate some of the biogeochemical processes that regulate ocean-atmosphere exchanges of carbon dioxide (CO<sub>2</sub>) in the Southern Ocean and hopes to gain insight into its role in climate change.

"We know that the sub-Antarctic region accounts for 30-50% of oceanic uptake of CO<sub>2</sub> generated by human activities, but we do not yet understand why that carbon sink is there, and how it is going to change with global warming," says Monteiro.

Scientists onboard the Marion Dufresne are sailing to the Antarctic Circumpolar Current hoping to gain insight into the role of biochemical processes in climate change

Recent findings suggest that the sink effect is being compromised by increased upwelling of CO<sub>2</sub>-rich circumpolar deep water due to shifts in wind patterns, but this is one of widely differing views. Research is needed to understand this mechanism and assess its importance in terms of long-term changes in atmospheric CO<sub>2</sub>.

The research is being conducted under the auspices of two South African research programmes in which both the CSIR and UCT are involved - the Southern Ocean CO<sub>2</sub> Observatory Programme and the Africa Centre for Climate and Earth Systems Science (ACCESS).

The research cruise forms part of the BONUS-GOODHOPE project, a five-year French initiative conducted with collaborating institutions from a number of countries under the framework of the International Polar Year\*.

The main objective of the BONUS-GOODHOPE project is to improve understanding of the ocean transport of heat, as well as the biogeochemical cycles that impact global climate. In the region south of Africa, waters originating from the Southern Ocean meet those from the Indian, Atlantic and Pacific Oceans. The region therefore plays an important - yet poorly understood - role in global thermohaline circulation, popularly known as the ocean conveyor belt, which is a key determinant of the earth's climate.

The multidisciplinary project combines physical oceanography with studies on trace elements and isotopes to generate models of the physical, chemical and biological processes taking place in this oceanic region.

Monteiro explains that the work focuses on the biological pump - the transfer of carbon from the ocean-atmosphere interface into deeper waters.

The team will measure ocean productivity and the rate of carbon transfer in a number of ways: in collaboration with Princeton University in the USA, team members will apply the triple oxygen isotope method with underway sampling. They will also use on-board experiments to measure the productivity response to iron addition in relation to latitude and light, and to measure new phytoplankton production using stable isotopes. Lastly, sediment traps will be deployed to measure the carbon flux to deeper waters.

The RV Marion Dufresne departed from Cape Town in early February and is sailing southwards along the Greenwich Meridian to the southern boundary of the Antarctic Circumpolar Current. The South African team members on-board include Dr Howard Waldron from UCT's Department of Oceanography, UCT graduate Dr Sandy Thomalla and Warren Joubert, a PhD student at the CSIR. In addition to collaboration with Princeton, the team will draw upon the modelling expertise of the Bjerknes Centre for Climate Research in Bergen, Norway.

*\* The International Polar Year is a large scientific initiative organised through the International Council for Science (ICSU) and the World Meteorological Organization (WMO) for the period March 2007 to March 2009. The IPY runs over two years to ensure full and equal coverage of both the Arctic and Antarctic.*

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