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Let's swing together on the Southern Ocean! #ST42 [fr]

Understanding how the oceans absorb carbon dioxide (CO₂), one of the main greenhouse gases, is essential in these times of global warming. During the scientific expedition SWINGS, the Southern Ocean will reveal some of its secrets thanks to 48 scientists coming from all countries, France, Spain, Germany, USA, Colombia, South Africa, England, Switzerland and a collaboration with Australia. Welcome on board!



The ship Marion Dufresne is often sailing in difficult conditions, like here in the Roaring Forties during the SWINGS campaign © Virginie Sanial/ University of Toulon

SWINGS (South West Indian Geotraces Section), is an oceanographic mission that takes place from January 11th to March 8th in the Southern Indian Ocean. Coordinated by Catherine Jeandel and H el ene Planquette, both researchers at CNRS, the main objective of the mission is to understand how this oceanic region participates in the subtraction of atmospheric CO₂. More specifically, this team of 48 researchers is studying how the different chemical elements essential to the development of life are transformed, transported by currents and sedimented into the abyss. Nutrient salts (silica, nitrate, phosphate, in particular), metals, and other trace elements are tracked from the surface to the bottom. Metals such as iron, nickel, copper, cobalt or zinc participate in enzymatic reactions during photosynthesis and are essential for the growth and proper functioning of phytoplankton. The very low concentration of chemicals in the water makes their analysis perilous. The samples taken must be protected from any contamination from rust, the ship's chimneys or even from the scientists themselves.

Another major challenge of the Swings program is to determine the different sources and modification processes of the chemicals elements over time. Do they come from winds, currents, sediments or deep hydrothermal sources? How are they transported within the ocean: as particles or dissolved in currents? How do they sediment and at what speed, for example? For this, other tracers such as radium or neodymium will be measured. They have the role of "indicators", because they allow us to define the origin of the matter or the speed at which it falls into the water.

This is a major task and studying the ocean and its vastness requires not only great coordination but also cooperation on an international scale. Indeed, given the diversity of expertise required, it is necessary to pool the strengths of the different oceanographic laboratories around the world. SWINGS is part of the global program [GEOTRACES](#) which has been building a chemical atlas of the oceans since 2010. A total of 32 countries are participating to study the biogeochemical cycles of trace elements and their

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In this context, SWINGS is also part of a French-Australian collaboration, in particular with Prof. Andrew Bowie and his team (University of Tasmania, Hobart). The SWINGS project will allow the reoccupation of the stations already documented within the framework of HEOBI, the Australian oceanographic campaign conducted on board the Australian RV Investigator research vessel in 2016 on which three members of SWINGS participated. Thus it will be possible to intercalibrate the acquired data and to cross-validate them between the two countries. It will also be a question of comparing the results obtained at the same sites several years apart, which is important in a variable natural system, and important for future collaborations!

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