



**XXXII SCAR Delegates' Meeting**  
**Portland, USA, 23-25 July 2012**

Agenda Item: 5.4.1  
Person Responsible: M Sparrow

# **The Southern Ocean Observing System (SOOS)**



## Executive Summary

**Title:** The Southern Ocean Observing System (SOOS)

**Authors:** M Sparrow, L Newman

**Introduction/ Background:** The Southern Ocean is a fundamental part of the Earth system. It forms a vital connection between the major ocean basins and the upper and lower layers of the global ocean. The Southern Ocean strongly influences global climate, biogeochemical cycles and the functioning of the ecosystem. The rapid changes being experienced by the Southern Ocean have profound ramifications for the future of the planet. These changes include large-scale warming that exceeds global averages, including several “hotspots” of regional warming. The upper and lower limbs of Southern Ocean overturning have freshened due to changes in hydrological cycles and ice melt. The rate at which the Southern Ocean draws down anthropogenic carbon dioxide from the atmosphere has likely weakened. Acidification is underway with far reaching implications for marine species and populations. The climatic changes are already impacting Southern Ocean ecosystems. There is a critical need to observe and understand the Southern Ocean as it remains one of the most under-studied regions of the world. Sustained observations will be needed to detect, interpret and understand the on-going physical, chemical and biological changes and to predict what the future holds.

**Important Issues or Factors:** The SOOS was launched in August 2011 with the mission to coordinate and expand the efforts of all nations that gather data from the Southern Ocean. A SOOS International Project Office is supported by IMAS in Australia and a SOOS Scientific Steering Committee has been formed.

**Recommendations/Actions and Justification:** Delegates are asked to note progress with the SOOS and approve the introduction of a separate budget line for this activity.

**Expected Benefits/Outcomes:** The development of a coherent and efficient observing system that will deliver the observations required to address key scientific and societal challenges, with SCAR as a leader (along with SCOR) of this effort.

**Partners:** The Scientific Committee on Oceanic Research (SCOR) provides matching funds to support the SOOS. The SOOS is also endorsed by the Partnership for Observations of the Global Ocean (POGO), and the Climate Variability and Predictability (CLIVAR) and Climate and Cryosphere (CliC) projects of the World Climate Research Programme. The IPO is supported by the Australian Antarctic Division with additional support from Antarctica New Zealand and the Integrated Marine Observing System

**Budget Implications:** \$8,000 a year to support the meetings of the SOOS Steering Committee and related activities (matching funds with SCOR)

## The Southern Ocean Observing System (SOOS)

### **Introduction**

The Southern Ocean is a fundamental part of the Earth system. It forms a vital connection between the major ocean basins and the upper and lower layers of the global ocean. The Southern Ocean strongly influences global climate, biogeochemical cycles and the functioning of the ecosystem<sup>1,2,3,4</sup>. The rapid changes being experienced by the Southern Ocean have profound ramifications for the future of the planet. These changes include large-scale warming that exceeds global averages, including several “hotspots” of regional warming<sup>5,6</sup>. The upper and lower limbs of Southern Ocean overturning have freshened due to changes in hydrological cycles and ice melt<sup>5</sup>. The rate at which the Southern Ocean draws down anthropogenic carbon dioxide from the atmosphere has likely weakened<sup>4</sup>. Acidification is underway with far reaching implications for marine species and populations<sup>7</sup>. The climatic changes are already impacting Southern Ocean ecosystems<sup>8</sup>. There is a critical need to observe and understand the Southern Ocean as it remains one of the most under-studied regions of the world. Sustained observations will be needed to detect, interpret and understand the on-going physical, chemical and biological changes and to predict what the future holds.

The Southern Ocean Observing System (SOOS) was launched in August 2011 with the mission to coordinate and expand the efforts of all nations that gather data from the Southern Ocean. A specific aim is to develop a coherent and efficient observing system that will deliver the observations required to address key scientific and societal challenges. The SOOS will focus its efforts on collecting data that will address six scientific challenges:

- The role of the Southern Ocean in the planet’s heat and freshwater budget
- The stability of the Southern Ocean overturning circulation
- The role of the ocean in the stability of the Antarctic Ice Sheet and its future contribution to sea-level rise
- The future and consequences of Southern Ocean carbon uptake
- The future of Antarctic sea ice
- Impacts of global change on Southern Ocean ecosystems

The objectives of the SOOS are to:

- Design and implement a comprehensive and multi-disciplinary observing system for the Southern Ocean
- Advocate and guide the development of new observation technologies
- Unify existing observation efforts and leverage further resources
- Effectively integrate and coordinate national and international projects and programmes, across traditional disciplinary boundaries and between nations
- Facilitate and develop a data system that provides seamless access to essential data products for the Southern Ocean

### **Sponsorship, Endorsement, and Support**

The SOOS is a joint initiative of the Scientific Committee on Antarctic Research (SCAR) and the Scientific Committee on Oceanic Research (SCOR) and is endorsed by the Partnership for Observations of the Global Ocean (POGO), and the Climate Variability and Predictability (CLIVAR) and Climate and Cryosphere (CliC) projects of the World Climate Research Programme.

The SOOS was launched in August 2011 with the opening of the International Project Office (IPO), which is hosted by the Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Australia. The hosting is confirmed for a 5-year period and includes the salary of an Executive Officer. The Australian Antarctic Division has also provided some support for office costs for the 2011/2012 financial year.

Antarctic New Zealand have also recently provided funds to support the IPO. The SOOS IPO is physically located within the offices of the Australian Integrated Marine Observing System (IMOS), which provides in-kind support for the IPO. Discussions are currently underway with the Australian Ocean Data Network (AODN) and IMOS e-marine Information Infrastructure (both similarly located with IMOS) for in-kind use of the AODN Data Portal infrastructure in development of the SOOS Southern Ocean Data Network. SCAR and SCOR both provide support for the annual SOOS Scientific Steering Committee meeting.

## **Activities and Milestones**

**Organisation and development of SOOS leadership, governance and policies:** The SOOS Scientific Steering Committee (SSC) was proposed from a pool of international nominees by the Co-Chairs, Dr. Michael Meredith (British Antarctic Survey) and Mr. John Gunn (Australian Institute of Marine Science) and the Executive Officer, Dr. Louise Newman, and approved by the SCAR and SCOR Executives. The 15 SSC members cover broad disciplinary and geographic representation. Several ex-officio representatives were also selected, including the SCAR Executive Director. The first SSC meeting was held in Feb 2012 (Salt Lake City, Utah). Following the meeting, John Gunn stepped down from the Co-Chair position due to a change in his employment and Dr. Oscar Schofield (Rutgers University, USA) was selected as the new Co-Chair. The next SSC meeting will be held in China in April/May 2013 alongside a topical SOOS workshop. SOOS Governance and Terms of Reference, SSC Governance and Terms of Reference, and the SOOS Endorsement Policy were developed and officially approved by the SSC.

**Communicating the SOOS to stakeholders:** The SOOS *Initial Science and Implementation Strategy* was published (download from [www.soos.aq](http://www.soos.aq)). The SOOS Communication Strategy was developed and approved by the SSC. The SOOS corporate identity was developed and numerous SOOS publications were produced. The SOOS was presented at national and international meetings by the Executive Officer, SSC members, Co-Chairs and ex-officio representatives. The SOOS website is under development ([www.soos.aq](http://www.soos.aq)) and a Facebook page has been set up. Connections were made to several important international science programmes of key relevance to the SOOS.

**Implementation of SOOS science activities:** The SOOS Data Management Sub-Committee (DMSC) was developed, along with the draft SOOS Data Management Policy, DMSC Terms of Reference, and DMSC workplan (there is strong cross membership with SCADM). The first DMSC meeting will take place alongside the SCAR Open Science Meeting in July 2012. Proposals have been prepared for a SCOR Working Group, and a Framework 7 activity. An Under Ice workshop is being organised in collaboration with Argo, towards development of an international strategy for observations under ice (sea ice and shelf ice). The workshop will be held on the 22 October 2012 in Hobart, Australia. The SOOS will engage with and support a number of development activities and meetings during 2012, including Sentinel, FRISP, ASPeCT etc., and will use these to progress the detailed design of the observing system and steps to its implementation.

## **The Role of SCAR**

SCAR was one of the original organisations that proposed the concept of a SOOS. The SOOS SSC was originally the SCAR/SCOR Oceanography Group, the latter of which led the development of the initial Science and Implementation Plan (along with the CLIVAR/CliC/SCAR Southern Ocean Panel). The IPO is supported by Australia (IMAS) but the meeting of the SOOS SSC are supported jointly by SCAR and SCOR. Funding requirements have to date been supported by SSG-PS, the Co-sponsorships budget line and the SRP AGCS, the latter of which finishes this year. Now the SOOS IPO and SSC are in place and the SOOS is now a major SCAR activity with a high profile and impact the Delegates are asked to approve a separate budget line for this item of up to \$8,000 to support the activities of the SOOS SSC and associated activities.

## References

1. Rintoul, S.R., et al., 2001: Monitoring and understanding Southern Ocean variability and its impact on climate: A strategy for sustained observations, In: C.J. Koblinsky and N.R. Smith (Eds.), *Observing the Ocean in the 21<sup>st</sup> Century*, Bureau of Meteorology, Melbourne, Australia.
2. Sarmiento, J.L., et al., 2004; High-latitude controls of thermocline nutrients and low latitude biological productivity, *Nature*, 427: 56-60.
3. Le Quere, C.L., et al., 2007: Saturation of the Southern Ocean CO<sub>2</sub> sink due to recent climate change, *Science*, 316: 1735-1738.
4. Meredith, M.P., et al., 2012: Sensitivity of the overturning circulation in the Southern Ocean to decadal changes in wind forcing, *Journal of Climate*, doi: 10/1175/2011JCLI4204.1
5. Böning, C.W., et al, 2008; The response of the Antarctic circumpolar Current to recent climate change, *Nature Geoscience*, 1: 864-869.
6. Gille, S.T., 2008: Decadal-scale temperature trends in the Southern Hemisphere Ocean, *Journal of Climate*, 16: 4749-4765.
7. Rintoul, S.R., et al., 2012: *The Southern Ocean Observing System: Initial Science and Implementation Strategy*, Scientific Committee on Oceanic Research and Scientific Committee on Antarctic Research, ISBN: 978-0-948277-27-6
8. Schofield, O., et al., 2010: How do polar marine ecosystems respond to rapid climate change? *Science*, 328: 1520-1523.