Antarctic Near-shore and Terrestrial Observation System

2015 ANTOS International Workshop Report

April 2016

Executive summary

Antarctic Near-Shore and Terrestrial Observation System (ANTOS) is a SCAR Action Group, established in August 2014. It is a biologically focussed initiative to coordinate a cross continent- and cross national programme-scale assessment of environmental variability and change. A major aim is to foster and facilitate collection and sharing of long-term automated climate and associated environmental observations across Antarctica and national programmes. In August 2015, a workshop was held to develop an implementation plan for ANTOS. The workshop was attended by 25 researchers from 12 countries (Australia, Belgium, Chile, France, Germany, Italy, Japan, Korea, NZ, Sweden, UK, USA).

At this workshop key characteristics of locations, parameters to measure, frequencies, scales and gradients of measurement, and the technical requirements of the system were discussed (i.e., what do we need to measure and monitor in order to detect change, where do we need to do this, and how?). The strong consensus was for locations that share basic characteristics of (a) representative biodiversity for the region concerned, (b) environmental features likely to be informative in a context of change studies, and (c) the practicality of access and working conditions. A 3-tiered approach both to platform complexity and cost was recommended, to enable wide national programme involvement and achievement of the scientific goals. At all tiers, biologically relevant attributes of change need to be assessed within six broad criteria (physical environment, colonisation, diversity, distribution, functional and genetic). ANTOS installations will use a suite of agreed methodologies to enable robust cross-programme and continent-wide comparisons of information. An ANTOS database will be designed and established to allow easy access to the real-time data that is intimately linked with existing databases and follows internationally accepted protocols.

The strength of ANTOS is its (i) unification of researchers over the necessity for, and the extreme value of, a long-term vision for observation systems to understand biological systems in a changing environment, and (ii) the comprehensive continent-wide approach. The value of this information in informing policy and management of the region at national and international levels cannot be understated.

Take home messages:

For scientists	Participation in ANTOS will ensure standardised measurements of biology and environments across wide spatial scales, and will contextualise field-based and remote sensing biological research. The ANTOS network will be pan-continental and designed to be adaptable and provide a continuous telemetry capability for regional observations.
For policy makers	Managing and understanding Antarctic ecosystems in the light of environmental change poses a significant challenge. It requires confidence in identification of trends and changes in these ecosystems. ANTOS has been established in recognition of the need for this basic information, which is crucial for informing management approaches and policies.
For National Antarctic Managers	Involvement in this pan-Antarctic initiative will have wide benefits for all nations through improved knowledge of existing environmental patterns and processes at scales relevant to ecosystems and biology, as well as their predicted response to change across the continent. These observations can significantly reduce the uncertainties in logistics planning and operations.

The above organisations are thanked for their support of this workshop.

1 Background

In April 2014, SCAR (through support from the Tinker Foundation) commissioned 75 Antarctic scientists and policy makers from 22 countries to undertake the first ‘Antarctic and Southern Ocean Horizon Scan’. This initiative ultimately identified six priority research areas and associated questions that urgently need to be addressed in the next two decades (Kennicutt et al. 2014a, b). A significant number of these questions are directed towards climate change and the critical need for long-term observations to underpin our ability to predict how the continent is likely to respond. Before we can predict and identify changes in these ecosystems, we first need to understand existing patterns and processes, and the magnitudes and rates of natural variability in both marine and terrestrial systems, at spatial and temporal scales relevant to their biota and communities.

Antarctic Near-Shore and Terrestrial Observation System (ANTOS) is a SCAR Action Group (2 years in duration), established in August 2014. ANTOS was formed in response to the widespread recognition of the need for information on variability in environmental parameters that influence Antarctic ecosystems. It is a biologically focussed initiative to coordinate a cross continent- and cross national programme-scale assessment of environmental variability and change. The first major activity of this Action Group to further the development of ANTOS and meet the needs of SCAR, was a two-day international workshop, held in Hamilton, New Zealand, in August 2015. The activities and outcomes of the workshop are the subject of this report.

1.1 Aims of ANTOS

The central tenet of ANTOS is to identify and interpret the response of long-term environmental change to Antarctica’s continental and sub-Antarctic near-shore and terrestrial ecosystems. Consequently, ANTOS aims to **establish an integrated, coordinated transcontinental and trans-regional observation system to track variability and change, both in biota and their environments**. In essence, ANTOS will **provide robust data to contextualise change** across an entire global region in both near-shore and terrestrial realms. Furthermore, ANTOS will **provide a platform** for current and future science programmes to operate within, which will allow locally collected data to be leveraged into a much larger continental scale reference network.

The specific goals of ANTOS are to:

- Establish an observation network to address key scientific questions;
- Create a tiered approach to observations, facilitating and encouraging buy-in and involvement of national programmes with different levels of resourcing, logistic, and scientific capabilities;
- Stimulate the development of new observation technologies, data capture, and data sharing;
- Provide opportunity for alignment of national and international programs and projects, and also an observational platform for SCAR science activities;
- Provide information to assist evidence-based conservation decisions and policy in Antarctica and the sub-Antarctic.

1.2 International relevance

Increasing profile is being given to the responsibility of Antarctic Treaty nations to monitor, manage responsibly, and conserve the Antarctic environment. This is recognised as a key output of the current generation of SCAR biological research programmes. However, even now, there is a scarcity of robust environmental data collected at biologically relevant scales and over sufficiently long timescales—particularly to allow analysis in comparison with WMO meteorological datasets and climate trends. Likewise, knowledge of Antarctic biodiversity, including functioning and process, especially for microbial groups, remains far from complete. ANTOS will provide a vehicle for delivery of these fundamental data gaps, firstly to the Antarctic research community, and then to SCAR bodies and the Antarctic Treaty System (ATS).

2 The workshop

To develop a clear vision for the implementation of ANTOS, a workshop was held over two days in Hamilton, New Zealand in August 2015. It was attended by 25 researchers from 12 countries (see Appendix A; 16:9 male:female). Six of these participants attended 'virtually', by participating in hour-long internet summary sessions that were held each evening following the main workshop.

The workshop agenda is provided in Appendix B. Day 1 of the workshop began with an overview of the history of ANTOS and a review of (and an agreement on) its aims. Several presentations were given which described existing initiatives of relevance to ANTOS. Breakout groups then discussed questions to be addressed and key parameters to be measured in marine and terrestrial systems, respectively. Day 2 followed with information on existing programmes and a discussion of technology that was potentially relevant to ANTOS. Marine and terrestrial breakout groups then designed a tiered system of increasingly complex 'nodes' or towers for the ANTOS system. The workshop concluded with a summary of the discussions, and recommendations for the final year of the ANTOS action group and into the future. Below, we detail the major discussion topics.

2.1 Suggested configuration philosophy of ANTOS

ANTOS should be of interest to all national programmes. The consensus of the meeting was that a tiered configuration approach to the ANTOS sites and installations would encourage greater participation and longer-term engagement, especially from national programmes whose resources are limited and/or where long-term commitment would be difficult to obtain. Consequently, the design includes a three-tiered approach, from basic and relatively inexpensive to more complex and more expensive.

Our goal is to have ANTOS sites around the Antarctic continent, initially with at least one in each of the Antarctic and Sub-Antarctic Conservation Biogeographic Regions to begin to meet the goal of wide spatial coverage. These will form the basis of ANTOS core 'nodal sites'. Within sites data will be collected ranging from simple to more complex relating to scientific questions and instrumentation with installations.

At all levels of surveillance, *biologically relevant attributes of change will be made within six broad criteria*: physical environment, colonisation, diversity, distribution, function, and genetics. These criteria were chosen as they encompass desirable parameters required for detecting, understanding, and interpreting change in both marine and terrestrial systems.

Ideally, all *ANTOS installations within ANTOS sites should be identical in design and makeup* (for marine and terrestrial, respectively). While any instrumentation does not need to be a specific type/brand, it does need to measure a suite of agreed parameters at the specified resolution and temporal scale so that data can be harmonised and usefully compared. We envisage that participating national programmes will elect to engage at a level commensurate with their current and projected science needs. We also recognise the great value of existing long-term data sets and of incorporating these programmes/sites in ANTOS.

Widespread engagement with ANTOS is key. The success of ANTOS will be measured by the continental coverage and national programme participation, and by long-term sustainability of the monitoring effort. The workshop participants felt that the highly comparable data collected will not only be immediately important at local scales, but will become increasingly valued as the most comprehensive continental scale long-term data set of its kind on Earth.

2.2 Nodes

An instrumentation network of core nodal sites will be established in terrestrial (including freshwater and ice/snow where appropriate) and nearshore environments. These sites will share basic characteristics of representative biodiversity for the region concerned, environmental features likely to be informative in the context of change studies, and practicality of access and working. The goal is a network of sites representative at a transcontinental scale linking through Antarctica and the sub-Antarctic islands to other southern continents. This is likely to be achieved through a step-wise development, building initially on a core set of existing and relatively well documented locations, while at the same time identifying additional locations suitable for *de novo* construction/installation of new nodal sites.

2.3 Location of nodal sites

Site selection will consider the following attributes: biodiversity, existing information, transition zones, terrestrial-nearshore links (where appropriate), and gradients. Since the network will be ecosystem focused the node locations should be chosen to access the unique biological attributes in any given region in both the marine and terrestrial systems. Ideally this would mean utilizing *a priori* knowledge from participating programmes to recommend locations suitable for long-term observations of change.

We recognise that invaluable long-term observations are (or have been) made in some parts of Antarctica. Consequently, we recommend a survey of international programmes to identify the location, parameters measured, and duration of those existing sites to assess their potential for inclusion as ANTOS nodes based on the above attributes. Additionally, a formal analysis of useful site locations would be beneficial in order to identify regions with key characteristics in terms of expected change, and potential for identifying and detecting this change. Critical to the success of ANTOS will be continent-wide coverage.

2.4 Tiered measurement system

A tiered measurement system is suggested to better enable wide participation. The complexity and diversity of data types, inference and interpretability increases as the tiers increase. Within the marine and terrestrial systems, we have identified and agreed on a basic array of information that should be collected (e.g., standard macroclimatic data on land). This is because global models of climate are not yet precise at local or regional scales. One important consideration when scoping this design was the inclusion of measurements that would help elucidate linkages between the marine and terrestrial realms.

The design philosophy of an ANTOS installation is to monitor a broad range of biometrics (and biological proxies) that sense at different levels of biological resolution (e.g., hourly biological activity assessment to decadal measurements of vegetation coverage). This will provide the greatest ability to capture and validate change as it happens. We suggest that many installations could be made in areas near to current established stations or permanent camps, to allow ease of access during the summer months. However, sites must represent as unmodified a system as possible and not be under the influence of the station/camp itself.

2.4.1 Terrestrial measurements

Each site established would consist of a hardware installation coupled to a level of local or regional biological and geochemical assessment, mapping, and monitoring on a temporally graduated schedule depending on the Tier level chosen.

We envision three primary tiers, starting at a relatively simple enhanced telemetered AWS system (ANTOS Tier 1) graduating up to a 10 m tower with regional monitoring and local wireless slave sub-node telemetry capabilities (ANTOS Tier 3). We believe a strategy where the ANTOS installations are identical in design and makeup and where all acquired data are telemetered daily to a central location will provide the most efficient, effective, and comparable monitoring approach possible.

The description of each ANTOS Terrestrial Tier level commitment is outlined in Table 1. The backbone to each installation would be an Iridium-telemetered AWS. The basic unit would be designed to require an initial investment of under $20,000 USD. With each of the successive Tier levels, there is a significant increase in both the parameters being sensed and the level and frequency of on-ground assessment and monitoring required. Key to each ANTOS installation will be the ability to expand with little additional investment. New sensors can be easily added to meet current local research needs.

Each installation will require hardware accompanied by some level of local or regional level biological and geochemical assessment, mapping, and monitoring on a temporally graduated schedule depending on the Tier level chosen. ANTOS Tiers 2 and 3 as described offer a wireless expandability opportunity to accommodate new remote environmental sensing technologies as they are developed and introduced. The telemetry streaming capability will be developed and maintained to enable additional sensors to be brought online as needed by the hosting programme. The Tier 2 and 3 installations will also offer the ability to receive data and transmit instructions to any local near-shore telemetry device.

2.4.2 Marine measurements

The tier distinction is based around different levels of understanding. ANTOS Tier 1 measurements will document basic information on parameters that might be expected to vary and/or change (i.e., what is changing), and includes physical, biological and community level information (Table 2). ANTOS Tier 2 measurements will help interpret why those variables measured in ANTOS Tier 1 might be changing, and ANTOS Tier 3 will elucidate the mechanisms and processes behind the observed changes.

We acknowledge the importance of considering scales (temporal and spatial) at which these assessments are made, and incorporating known and anticipated gradients. We suggest that marine measurements target coastal areas, and that for increasing feasibility of study and comparison around the continent, they are restricted to shallow water (e.g., < 30 m deep).

Table 1. Suggested configuration of the terrestrial component of the ANTOS system at each Tier of observation. AWS = automatic weather station; RH = relative humidity; PAR = photosynthetically active radiation; PAM = pulse amplitude modulation fluorometry; nzTABS = New Zealand terrestrial Antarctic biocomplexity survey (www.nztabs.aq)

Components	**Tier 1 – local** ($)	**Tier 2 – local** ($$)	**Tier 3 – regional** ($$$$)

Location of site	• Delimit site
	• Area
	• Geography
	• History
	• Establish photo points (repeat every 5 years)
		• Delimit site
		• Area
		• Geography
		• History
		• Establish photo points (repeat every 5 years)
		• Satellite imagery (every 10 years)
		  • MODIS: basic snow cover assessment
			• Delimit site
			• Area
			• Geography
			• History
			• Establish photo points
			• Satellite imagery (every 5 years)
			  • MODIS, ISAT, Worldview 2 & 3
			  • GIS modelling of site characteristics

Terrestrial systems			
Biodiversity (5 yearly)	Basic local survey: • Composition • Distribution • Basic vegetation mapping	Complete survey (nzTABS style: 10 yearly) • Composition • Distribution • Comprehensive vegetation mapping (5 yearly)	Complete survey (nzTABS regional style) • Comprehensive composition survey • Distribution • Comprehensive vegetation mapping Spectral mapping Population genetic survey
AWS	• Wind speed and direction • Air temp (2 for calibration) • RH (air) • Light • PAR • Dew point • Soil moisture and temp	• Wind speed and direction • Air temp (2 for calibration) • RH (air) • Light • PAR • Dew point • Precipitation/snow fall • Active layer (soil moisture and temp – 10 cm intervals) • Possibly - wireless capability for local slave sensor arrays	• Wind speed and direction • Air temp (2 for calibration) • RH (air) • Light • PAR • Dew point • Precipitation/snow fall • Active layer (soil moisture and temp – 10cm intervals) • Wireless capability for local slave sensor arrays
Aeolian Collections	Passive	Active including composition and particle size	Active including composition and particle size Ice core analysis

Respiration	NA	CO_2 flux (Local)	• Soil CO_2 flux (regional) • Soil CO_2 flux subsurface array • Gas cycling
Biological activity	NA	PAM - photosynthesis	• PAM – photosynthesis • Eddy covariance • Transcriptional activity
Soil Geochemistry (5 yearly)	• Basic Nutrients • EC • Conductivity	• Nutrients, TOC, TON • Elements (ICP-MS) • EC • Conductivity	• Nutrients, TOC, TON • Elements (ICP-MS) • EC • Conductivity • Isotopic chemistry
<u>Limnetic systems</u>			

Hydrology	• Stream Flow (5 yearly)
	• Lake Levels (5 yearly)
	• Geochemistry (5 yearly)
	    • Nutrients, TOC, TON
	    • EC, Conductivity
		• Stream Flow (yearly)
		• Lake Levels (yearly)
		• Geochemistry
		    • Nutrients, TOC, TON
		    • EC, Conductivity
		• Permafrost degradation/thermokarsting
			• Stream Flow (yearly)
			• Lake Levels (yearly)
			• Geochemistry
			    • Nutrients, TOC, TON
			    • EC, Conductivity
			• Permafrost degradation/thermokarsting
			• Hydrological modelling of site

Biological activity	NA	PAM - photosynthesis	PAM – photosynthesis Eddy covariance

Table 2. Suggested configuration of the marine component of the ANTOS system at each Tier of observation. CTD = Conductivity, Temperature, Depth; ARMS = Autonomous Reef Monitoring Structure; ROV = remotely operated vehicle; AUV = Autonomous underwater vehicle; NA = not applicable. See glossary for definition of programme acronyms.

Change	Tier 1 ($)	Tier 2 ($$)	Tier 3 ($$$$)
Physical	Remote sensing (e.g., of ice conditions, Chla, etc)	Monitoring array/sedimentation • Currents • Fluorometer • Light • PAR • Temperature • Conductivity/salinity • pCO_2/pH	• Water column assessment (CTD profiler) • Coded, real time monitoring array • Depth resolved • PAR • Due point • Precipitation/snow fall • Active layer (soil moisture and temp – 10cm intervals) • Wireless capability for local slave sensor arrays
Colonisation	Settlement (ARMS, INTERACT)	Time-lapse (ICELAPSE)	Plankton/larval dispersal
Diversity	Permanent transects, imagery	Time-lapse (ICELAPSE) ARMS	Broad scale • ROV • Vessel towed systems
Distribution	Permanent transects, imagery	ARMS, drop camera, ROV etc,	Broad scale • AUV/detailed 3D mapping
Function	NA	Time-lapse (ICELAPSE) Fecundity Sediment quality	Entire food web (isotopes) Tagging (growth) Ecophysiology Chamber flux, eddy correlation (nutrients, O_2) Gene expression, contaminants Experiments
Genetic/genomic	NA	Barcode campaign	Population markers

2.5 Cyber/data management

Critical to the success of ANTOS will be the management and accessibility of the data generated. We are very fortunate that KOPRI, under the guidance of Dr Soon Gyu Hong, has agreed to design and host an open-source ANTOS database. This is currently in the early stages of development but a provisional design was presented to the workshop attendees for comment. It was recognized that other analogous databases exist for the Antarctic arena and that we should make all efforts to integrate and cross reference our data where ever possible. The workshop attendees agreed that the comparative and predictive power of the ANTOS data comes from having all of the data accessible in one virtual location. To achieve this admirable objective an ANTOS *database advisory committee* has been established to ensure that the disciplinary data requirements and the needed statistics are considered at all phases of database design and implementation. This committee is comprised of: Soon Gyu Hong (chair), Stefano Schiaparelli/Drew Lohrer (Italy/NZ; marine), Craig Cary/Charlie Lee (both NZ; terrestrial), Fraser Morgan (NZ; database design), and Adrian McDonald (NZ; statistics).

3 Post-workshop activities

During the wrap-up session at the end of the workshop the attendees formulated a list of action items specifically for the Action Group that would need to be addressed prior to the next SCAR Open Science Meeting in Malaysia, 2016.

- Write a short report on ANTOS for EXCOM, 2015 (Completed);
- Conduct an international survey of existing long term data sets, to evaluate appropriate locations;
- Develop the ANTOS webpage and design an ANTOS logo;
- Write an Information Paper to be submitted through SCATS into the CEP;
- Develop a concept paper or proposal to suggest that ANTOS morph into a SCAR Expert or Task group (before EXCOM 2016).

4 Summary

ANTOS Workshop Outputs and Recommendations:

Aim: To track and attribute environmental variability and change at biologically relevant scales.

- Tiered measurement system addressing six themes, key parameters for terrestrial (including fresh water) and nearshore environments.
- Evaluate existence and content of current long-term data sets to help identify suitable areas for node placement.
- Site selection should consider: biodiversity, existing information, transition zones, terrestrial nearshore links, gradients; could also incorporate formal analysis of potentially useful site locations using GIS.
- Develop a formal paper summarising site recommendations and justifications.
- Proposal should emphasise 'flexibility' of measurement and site recommendations so that all National Programmes can participate.
- The report will include summaries targeting the Antarctic community, policy makers, and operators/logistics.
- Propose COMNAP pushes availability of spatial/temporal satellite imagery through a Data Cube approach (more of it, easier access), to help deliver Horizon Scan objectives.
- ANTOS database advisory committee has been established (see Section 2.5); will initiate discussion with AntiBiv group and other major Antarctic databases managers.
- Produce report for SSGs and National Programmes on ANTOS (with workshop input).
- Workshop attendees unanimously supported the possibility of ANTOS morphing into a SCAR Expert Group. To that end, a proposal will be submitted to SCAR prior to EXCOM 2016.

5 Acknowledgements
We thank the workshop's funders: NZARI (principal funder), AntEco, and SCAR, who made this event possible. Thanks also to the various home institutions of the workshop participants (especially University of Waikato and NIWA) for their support. Particular thanks go to the participants of the evening internet sessions.

6 Glossary of abbreviations and terms

AntEco:	State of the Antarctic Ecosystem, a SCAR biology programme
AnT-ERA:	Antarctic Thresholds – Ecosystem Resilience and Adaptation, a SCAR biology programme
ANTOS:	Antarctic Near-shore and Terrestrial Observing Systems, a SCAR Action Group
ATS:	Antarctic Treaty System
ARMS:	Autonomous Reef Monitoring Structure
CEP:	Committee for Environmental Protection (of the Antarctic Treaty System)
EXCOM:	Executive Committee (of SCAR)
ICELAPSE:	Analysis of Antarctic benthos dynamics by using non-destructive monitoring devices and permanent stations (PNRA 2013 / AZ1.16) (Italian initiative)
INTERACT:	International Network for Tracking Ecological Responses in Antarctic Coastal Time-series (NZ initiative)
LSG:	Life Sciences Group (of SCAR)
NIWA:	National Institute of Water and Atmospheric Research, New Zealand
NZARI:	New Zealand Antarctic Research Institute
SCAR:	Scientific Committee on Antarctic Research
SCATS	Standing Committee on the Antarctic Treaty System (a SCAR committee)
SOOS:	Southern Ocean Observing Systems
SSG:	Scientific Steering Group
TON:	Terrestrial Observation Network (for the McMurdo Dry Valleys)

7 References

Kennicutt, II M.C., Chown, S.L., Cassano, J.J., Liggett, D., Massom, R., Peck, L.S., et al. (2014a) Six priorities for Antarctic science. *Nature,* 512: 23-5.

Kennicutt, II M.C., Chown, S.L., Cassano, J.J., Liggett, D., Peck, L.S., Massom, R., et al. (2014b) A roadmap for Antarctic and Southern Ocean science for the next two decades and beyond. *Antarctic Science.* Doi:10.1017/ S0954102014000674.

Appendix A Workshop participants

List of researchers involved in the August 2015 workshop.

Name	Country	Institution
Craig Cary (Chair)	New Zealand	University of Waikato
Vonda Cummings (co-chair)	New Zealand	National Institute of Water and Atmospheric Research
Byron Adams	USA	Brigham Young University
Dana Bergstrom	Australia	Australian Antarctic Division
Angelica Casanova-Katny	Chile	Independent
Peter Convey	UK	British Antarctic Survey
Soon Gyu Hong	Korea	KOPRI
Ian Hawes	New Zealand	Gateway Antarctica, University of Canterbury
Drew Lohrer	New Zealand	National Institute of Water and Atmospheric Research
Sanghee Kim	Korea	KOPRI
Charles Lee	New Zealand	University of Waikato
Ian McDonald	New Zealand	University of Waikato
Adrian McDonald	New Zealand	University of Canterbury
Fraser Morgan	New Zealand	Landcare Research
Nicole Stahlmann	New Zealand	New Zealand Antarctic Research Institute
Stefano Schiaparelli	Italy	University of Genoa
Megumu Tsujimoto	Japan	National Institute of Polar Research
Georgia Wakerley	New Zealand	University of Waikato
Gary Wilson	New Zealand	New Zealand Antarctic Research Institute
Emmanuelle Sultan*	France	Muséum National d'Histoire Naturelle
Satoshi Imura*	Japan	National Institute of Polar Research
Annick Wilmotte*	Belgium	University of Liège
Michael Axelsson*	Sweden	University of Gothenburg
Jean-Pierre Feral*	France	IMBE
Michael Ashcroft*	Australia	University of Wollongong

* participation in the evening internet session(s) only

Appendix B 2015 ANTOS Workshop - Final Agenda

Antarctic Near-Shore and Terrestrial Observation System

Workshop Agenda

August 18-19th, 2015
University of Waikato
Faculty of Science and Engineering
FG 2.01

ANTOS aims to establish an integrated, coordinated transcontinental and trans-regional surveillance system to track environmental variability and change at biologically relevant scales. This valuable information will be used to provide a more complete understanding of changes occurring in the Antarctic region. This workshop will work towards a clear vision for the implementation of ANTOS and a resource analysis, and the findings will be summarised in a report.

Day 1 (Tuesday August 18th)

0830-0900 Welcome, introductions and workshop objectives

- ANTOS philosophy – adaptable and future proof
- Thinking outside your discipline and national programme

0900-0930 Implementation of ANTOS

- Revisiting the aims of, and need for ANTOS
- What questions will ANTOS address – long and short term?
- Where does ANTOS fit within SCAR?
- How does ANTOS address Horizon Scan priorities?
- How should ANTOS be configured?
- How do we best define and validate proxies?
- Essential to have real-time and future benefits
- In 100 years, where will we be?

0930-1200 Short Talks (10-15 min each)

- Byron Adams –TON directives and outcomes
- Stefano Schiaparelli – ICELAPSE; Near coastal monitoring in Terra Nova Bay
- Drew Lohrer/Vonda Cummings - INTERACT
- Ian Hawes – underwater vehicles
- Louise Neuman (via GoTo, 1130am) - SOOS development and near coastal linkages

1000-1030 Tea/coffee break

1200 –1300 Lunch

1300-1500 Breakout Groups – nearshore Marine and Terrestrial

- Primary questions to be addressed – now and in the future
- Parameters to measure/detect and frequency – what do we need to measure and monitor in order to detect change?
- Scales and gradients
- Adaptability of the system
- Marine and Terrestrial system linkages

1500-1530 *Tea/coffee break*

1530-1700 Breakout group reporting

- Discussion of synergies, overlaps and agreed priorities

1700-1715 Wrap-up

1815-2100 *Dinner*

2100-2200 Teleconference reporting of Day 1

Day 2 (Wednesday August 19th)

0830-0845 Introduction of Day 2 objectives
Comments from overseas telecom

0845-1000 Technology (Craig Cary and Charlie Lee)

- Ocean observatory system
- Neon program
- Adrian McDonald – Snow Web
- Developing a universal interface
- Future proofing the system

General Discussion

1000-1030 *Tea/coffee break*

1030-1200 Preliminary resource analysis

- What are our resource needs?
- Likely return on investment?
- Discussion of assets & liabilities
  Taking this forward - community review

1200 – 1300 *Lunch*

1300-1500 Development of the ANTOS 'system'

- Geographic extent – critical coverage to capture questions
- Define essential qualities of ANTOS node locations
- Required local and regional scaling
- Specific locations that meet these requirements
- Data management (Soon Gyu Hong – KOPRI)

1500-1530 *Tea/coffee break*

1530-1700 Recommendations and Implementation plan

- Agree on the major recommendations from this workshop
- National programme buy-in.
- Coordination across national programmes
- ANTOS web page
- Next steps

1700-1715 Wrap-up

1830-2100 *Dinner*

2100-2200 Teleconference reporting of Day 2