Report on the 2016 Antarctic Near-shore and Terrestrial Observing System (ANTOS) Action Group Workshop

Date: Sunday, 21 August 2016, 12:00-16:00
Location: Renaissance Hotel Kuala Lumpur – Function Room 4

Workshop organisers:
Craig Cary (University of Waikato, New Zealand)
Vonda Cummings (NIWA, New Zealand)

Notes:
Eric Sokol (University of Colorado, USA)

Executive summary

The Antarctic Near-shore and Terrestrial Observation System (ANTOS) is a SCAR Action Group that was created in August 2014 to coordinate a biologically focused, international effort to collect data necessary to assess environmental and biological variability and change in terrestrial and near-shore habitats across the Antarctic continent. Long-term goals of ANTOS include the establishment of technical guidelines for an internationally-coordinated installation of sensor networks, and standards for long-term data collection, storage, and sharing among national programs. The ANTOS Action Group hosted a workshop at the 2016 SCAR Open Science Conference (OSC) in Kuala Lumpur, Malaysia on 21 August, 2016 that was attended by 50 researchers representing 16 countries (Argentina, Australia, Belgium, Brazil, Canada, Chile, Czech Republic, France, Germany, Italy, Japan, Korea, New Zealand, Sweden, United Kingdom, and USA). The purpose of the workshop was to report to the international research community on progress toward the action group goals and to discuss the next steps toward implementing ANTOS as a long-term program.

At this workshop, ANTOS committee members reported on progress and deliverables from previous workshops that will direct the design and implementation of ANTOS, and attendees at the workshop discussed program “next steps”. Progress to date includes: (1) a preliminary version of a database management schema and user interface (UI) that will be the backbone of an ANTOS website. This has been developed by Soon Gyu Hong from the Korean Polar Research Institute (KOPRI). The website and database will provide a portal for data management and sharing among the international research community; (2) Action group committee members, led by Byron Adams (Brigham Young University, United States) have designed an online survey to poll the international community to designate suitable, high-priority sites that should be included in the ANTOS network; (3) Action group members have reviewed technical aspects of site instrumentation (e.g., sensor networks, telemetry, remote data transfer) and have drafted technical guidelines for standards for a 3-tier system to guide investment in ANTOS site infrastructure by national programs; (4) Peter Convey (British Antarctic Survey, BAS) presented results from a BAS supported workshop to create an Atlas of Ice-Free Areas of Antarctica to identify prospective terrestrial ice-free sites that should be prioritized to be included in the ANTOS network. The ANTOS action group has successfully identified a need for international collaboration to measure and understand continent-wide, long-term trends in Antarctic biology and environmental parameters, and has begun to design a framework for a coordinated international effort to address these issues. As such, the ANTOS action group is

seeking to gain designation as a SCAR expert group by early 2017. As ANTOS shifts to an expert group, next steps include a cost-benefit analysis of SCAR investment in ANTOS, conducting the survey to identify candidate ANTOS sites, implementing the database design and user interface to create an ANTOS data portal website, developing a working relationship with COMNAP to communicate why it is necessary national programs invest in such an effort, and develop mock-up examples of the three investment tiers to facilitate this communication with national funding agencies and research programmes.

Background, what is ANTOS?

The Antarctic Near-shore and Terrestrial Observation System (ANTOS) is a SCAR action group that was established at a workshop at the 2014 SCAR Open Science Conference to coordinate a cross-continent and cross-national collaborative effort to guide the installation of infrastructure and management of data that will be necessary to gain a broad-scale baseline understanding of terrestrial and near-shore Antarctic ecosystems, and to monitor how their response in a changing climate. Long-term goals (***Terms of Reference***) of ANTOS are to (1) establish an observation network to address key scientific questions, (2) establish technical guidelines—implemented as a three-tiered approach to facilitate and encourage buy-in and involvement across nationally programs with different levels of resourcing—so observations are comparable across sites, (3) identify and prioritize critical locations to include in the observation network, (4) provide information to assist evidence-based conservation decisions and policy in Antarctica and the sub-Antarctic (see the 2015 ANTOS Workshop Report).

Summary of activities

(1) **The ANTOS tiered measurement system**: Preliminary guidelines for a 3-tiered system (i.e., recommendations for three possible levels of resource investment at an observation site) were developed at a previous workshop (August 2015), for the measurement of physical habitat properties, biological colonization processes, biodiversity, spatial distribution of biota, ecosystem function, and genetic/genomic diversity in both terrestrial and marine habitats. Each site would consist of a hardware installation coupled with a local and/or regional biological and environmental assessment, mapping, and monitoring schedule, depending on the tier (investment) level. Multiple tiers allow for different levels of investment across national program. This flexibility is anticipated to encourage greater participation from national programs that may be resource-limited. Detailed guidelines can be found in the ANTOS: Report on 2015 International Workshop: http://www.scar.org/scar_media/documents/science/antos/2015-ANTOS-Workshop-Report.pdf)

(2) **Database management**: KOPRI has led the design of a database management schema and web-portal to manage data that will be collected across the ANTOS network. The database is being designed with the anticipation that raw data will be relayed from data loggers at field installations via satellite to a database server, but also with the acknowledgement that data will likely need to be physically retrieved from some data loggers. Both original data and derived data products will be backed up at multiple physical locations. A web-based user interface (UI) is being designed, by which researchers will be able to manage data streams, and which will also provide a platform for data sharing. KOPRI and the ANTOS community will make use of current, widely used metadata standards (such as EML) as they develop the database.

(3) **Survey launch**: The ANTOS committee, led by Byron Adams and Emmanuelle Sultan, designed a web-based survey that will be used to poll the international research community about where infrastructure currently exists to collect long-term ecological and environmental data, where long term data are already being collected, and where investment is most needed to collect such data. The ANTOS action group will solicit participation in the survey from across the international Antarctic research community.

Atlas of Ice Free Areas of Antarctica (AIFAA)

The British Antarctic Survey (BAS) hosted a small workshop in Cambridge, UK with the goal of gathering and curating summary information about named, ice-free, terrestrial features in

Antarctica. The anticipated product (expected in 12-18 months), which will be an open access document, will provide insight about terrestrial areas that should prioritized as prospective ANTOS sites. In a similar effort, Aleks Terrauds will soon be publishing a similar product describing the attributes of Antarctic Conservation Bio-Regions (ACBRs).

Relationship with the Council of Managers of National Antarctic Programs (COMNAP)

One of the missions of COMNAP is to promote environmental stewardship and conservation among national Antarctic programs. To this end, if ANTOS is successfully implemented, it will package outcomes of raw science and summarize patterns and trends in a way that COMNAP can implement in policy decisions. For ANTOS to be successful, it will require significant buy-in from the national programs that are members of COMNAP. Thus, an important function of ANTOS will be the development of a document that successfully communicates to COMNAP how ANTOS will provide a framework for international collaboration that will promote a more efficient use of national program resources toward the goal of a comprehensive understanding of Antarctic ecosystems. The workshop identified two types of deliverables that could facilitate this communication: (1) a proposal to the COMNAP Executive Committee to gain the support of COMNAP members, and (2) a prototype mock-up installation to present to COMNAP member programs. If ANTOS gains COMNAP endorsement, then the community can organize a system in which researchers can approach their national funding agencies with proposals for the justification of installing a tier-1, -2, or -3 system at a desired location, and the funding agency can make an informed decision about where spend resources on ANTOS sites.

Morphing ANTOS into an "Expert Group"

As an expert group, ANTOS will seek to expand membership and produce the deliverables that were designed under the action group. The proposed duration of the expert group will be 6-8 years, beginning in 2017. Expanded membership will include increasing the involvement of early and mid-career researchers and under-represented countries. The budget requested will be $10,000/yr for the duration of the expert group. Deliverables and ***terms of reference*** will include:

(1) The active solicitation of membership from developing countries.
(2) Conducting a survey to identify potential high priority ANTOS sites. The survey has already been designed by the action group (questions presented and discussed at this workshop).
(3) Developing a formal paper of site recommendations based on data collected from the survey described above.
(4) Developing a proposal with endorsement from COMNAP.
(5) Developing a document of proposal guidelines for researchers seeking support from their national programs to install an ANTOS site.
(6) Developing a website that implements the database management program that is being designed by KPRI.
(7) Scheduling a workshop for the SCAR Biology meeting in Belgium 2017 to promote cross-discipline collaboration.
(8) Ensuring the expert group has representatives from other relevant SCAR groups (e.g. ANTPAS, Arctic network, remote sensing, APECS).

Appendix 1. Workshop Agenda

1. Welcome, introductions, workshop aims;
2. Brief description of ANTOS;
3. Summary of activities over the past 2 years;
4. Survey launch;
5. Morphing ANTOS into an 'Expert Group';
6. Next steps – to complete Action Group needs for SCAR
7. Next steps – as an Expert Group:
    a. Community input
    b. Identify priority ANTOS locations
    c. Develop technical guidelines for the Tier systems
    d. Involvement of COMNAP
    e. Collaboration/linkages with other programmes and initiatives
    f. Involvement of developing countries
    g. Funding
    h. Developing the website and logo;
8. Review of ANTOS chairs and committee;
9. Other business?

Appendix 2. ANTOS 2016 KL workshop attendees.

Last	First	Institution	Country
Schloss	Irene	Inst. Antartico Argentina	Argentina
Ruberto	Lucas	Inst. Antartico Argentina	Argentina
Ashcroft	Mick	U. of Wollongong	Australia
King	Diana	U. of Wollongong	Australia
Robinson	Sharon	U. of Wollongong	Australia
Post	Alix	Geoscience Australia	Australia
Carson	Chris	Geoscience Australia	Australia
Terauds	Aleks	AAD	Australia
Fenton	Gwen	AAD	Australia
McIvor	Ewan	AAD	Australia
Smith	Jodie	Geoscience Australia	Australia
Briche	Pip	SOOS	Australia
Annice	Wilmotte	U. Liege	Belgium
Elias-Piera	Francyne	FURG	Brazil
Ferreyre	Gustavo	University Quebec	Canada
Casonova	Angelica	UCT	Chile
Bartak	Milos	Masaryk University	Czech Republic
Saucede	Thomas	U. Burgundy	France
Sultan	Emmanuelle	Museum National d' Historie Meleuelle	France
Abele	Doris	Biosciences Awi	Germany
Schiaparelli	Stefano	Unige of MNA	Italy
Onofri	Silvano	U. Tuscia	Italy
Imura	Satoshi	NIPR	Japan
Tsujimoto	Megumu	MPR	Japan
Chulshin	Hyoung	KOPRI	Korea
Ahn	In-Young	KOPRI	Korea
Kim	Sanghee	KOPRI	Korea
Lee	Hongkum	KOPRI	Korea
Hong	Soon Gyu	KOPRI	Korea
Lohrer	Drew	NIWA	New Zealand
Joy	Kurt	U. Canterbury	New Zealand
McDonald	Ian	U. Waikato	New Zealand
Storey	Bryan	U. Canterbury	New Zealand
Morgan	Fraser	Landcare Research	New Zealand
Almond	Peter	Lincoln University	New Zealand
Shanhun	Fiona	AntNZ	New Zealand
Marshall	Craig	University of Otago	New Zealand
Axelsson	Michael	Sweden Polar	Sweden
Pearce	David	Northumbria/BAS	UK
Hughes	Kevin	BAS	UK

Waller	Cath	University of Hull	UK
Griffith	Huw	BAS	UK
Lyons	Berry	Ohio State	USA
Wall	Diana	Colorado State	USA
Yu	Zicheng	Lehigh Univ.	USA
Adams	Byron	BYU	USA
Sokol	Eric	INSTAAR, U. Colorado	USA
Cummings	Vonda	NIWA	New Zealand
Cary	Craig	Univ. of Waikato	New Zealand
Lee	Charles	Univ. of Waikato	New Zealand