



SCAR Business and XXXII Delegates' Meeting
Portland, USA, 13-25 July 2012

Agenda Item: 5.3.4
Person Responsible: John Storey

Astronomy and Astrophysics from Antarctica

(AAA)

Executive Summary

Title: Astronomy and Astrophysics from Antarctica (AAA)

Authors: John Storey (Chief Officer) and the AAA Steering Committee

Introduction/ Background:

Broadly stated, the objectives of Astronomy & Astrophysics from Antarctica are to coordinate astronomical activities in Antarctica in a way that ensures the best possible outcomes from international investment in Antarctic astronomy, and maximizes the opportunities for productive interaction with other disciplines.

The SCAR AAA SRP Planning Group was proposed at the Hobart XXIX SCAR in 2006. Creation of the AAA SRP was approved at the Moscow XXX SCAR Delegates meeting in 2008. AAA held its first formal meeting as a Scientific Research Program in August 2010 in Buenos Aires, followed by a kick-off meeting in Sydney in June 2011.

Important Issues or Factors: At this stage, AAA is functioning well and is putting in place the structures and processes outlined in the implementation plan. There have been no significant problems.

Recommendations/Actions and Justification: No action required.

Expected Benefits/Outcomes: The AAA SRP will continue implement the structures and processes previously advised.

Partners: No formal partners, although the International Astronomical Union (IAU) is a Union Member of SCAR

Budget Implications: Continuing funding is requested at the approved level.

Astronomy & Astrophysics from Antarctica (AAA) Scientific Research Program

1. Rationale for the Programme

Astrophysical observations require minimum interference from the Earth's atmosphere: low thermal background, low absorption, and high angular resolution. The moderate "launch costs" for Antarctic plateau observatories make them an extremely attractive alternative to space.

Astronomy & Astrophysics from Antarctica aims to facilitate international astronomical programs in Antarctica. These programs are aimed at understanding the overarching ecological processes in the Universe, from the birth of stars and of planetary systems around other stars, to the return of heavy-element enriched materials to the interstellar medium, and the formation of new molecular clouds.

Astronomy & Astrophysics from Antarctica adds value by fostering international collaboration in order to permit goals to be achieved that are beyond those of single national programs.

2. Important Issues or Factors

i) Five Scientific Highlights

1. Data from the first wide-field optical telescope at Kunlun Station have been released by the Chinese Academy of Sciences, and are publicly available at <http://archive.bao.ac.cn/en/cstar>.
2. A new observatory has been established at Dome Fuji station by Japan, in collaboration with Australia.
3. A new observatory has been established at a previously unvisited location, Ridge A, by the USA in collaboration with Australia.
4. Millimetre-wave data from the South Pole Telescope have been released.
5. The first measurements of astronomical sky quality in the Canadian Arctic have been carried out.

ii) Progress against prior work plan, including metrics of performance

The AAA work plan was approved in 2010. The tasks, and the progress against each of them, are listed below:

1. Encourage quantitative assessments of the potential of each Antarctic plateau station to contribute to astronomy.

New Antarctic site testing has been carried out at the South Pole, Dome A, Dome C, Dome F and at a new site called Ridge A. In addition, site testing is underway in the Canadian High Arctic.
2. Through collaboration with atmospheric physicists, bring about advances in the understanding of Antarctic meteorology, as it applies to astronomical observations.

Boundary layer data obtained by astronomers at both Dome C and Dome A is currently being analysed with input from atmospheric scientists.
3. Facilitate improved coordination with atmospheric and ionospheric researchers.

This is being done through meetings, workshops, and collaborations on data processing.
4. Result in papers in peer-reviewed journals.

The publication rate of papers on Antarctic astronomy is rapidly increasing. No statistics are yet available, but such an analysis will be carried out by AAA over the next two years.

5. Help create properly archived data sets of site-testing data.

This is a major task, and is being undertaken by Working Group A (Site testing, validation and data archiving), chaired by Tony Travoignon (Caltech, USA). Discussions at the Taronga Zoo meeting of AAA in 2011 led to an agreed procedure by which a meta-database will be created by AAA, linking to the data archives themselves.

In addition, the all-important task of stimulating international cooperation on major new projects is being undertaken by Working Group D (Major new facilities), chaired by Peter Tuthill (Sydney University, Australia). A task force has been established for the first such project, a 2.4 metre class near-infrared telescope, called NIR@ANT.

3. Outputs/Deliverables

i) Publications

Selected publications describing each of the five highlights listed in 2.i) above are:

1. The First release of the CSTAR Point Source Catalog from Dome A, Antarctica.

Xu Zhou, Zhou Fan, Zhaoji Jiang, M.C.B. Ashley, Xiangqun Cui, Longlong Feng, Xuefei Gong, Jingyao Hu, C.A. Kulesa, J.S. Lawrence, Genrong Liu, D.M. Luong-Van, Jun Ma, A.M. Moore, Weijia Qin, Zhaohui Shang, J.W.V. Storey, Bo Sun, T. Travoignon, C.K. Walker, Jiali Wang, Lifan Wang, Jianghua Wu, Zhenyu Wu, Lirong Xia, Jun Yan, Ji Yang, Huigen Yang, Xiangyan Yuan, D. York, Zhanhai Zhang, Zhenxi Zhu, *Publ. Astron. Soc. Pacific*, **122**, (2010), 347 – 353.

2. Future plans for astronomy at Dome Fuji.

T. Ichikawa, *Highlights of Astronomy*, **15** (2010), 632 – 633

3. This is a very new achievement, and no publications are yet available. Results will be presented at the OSC meeting in Oregon. See: <http://mcba11.phys.unsw.edu.au/~plato-r/>.

4. The First Public Release of South Pole Telescope Data: Maps of a 95 deg² Field from 2008 Observations

K. K. Schaffer, T. M. Crawford, K. A. Aird, B. A. Benson, L. E. Bleem, J. E. Carlstrom, C. L. Chang, H. M. Cho, A. T. Crites¹, T. de Haan, M. A. Dobbs, E. M. George, N. W. Halverson, G. P. Holder, W. L. Holzapfel, S. Hoover¹, J. D. Hrubes, M. Joy, R. Keisler, L. Knox, A. T. Lee, E. M. Leitch, M. Lueker¹, D. Luong-Van, J. J. McMahon, J. Mehl, S. S. Meyer, J. J. Mohr, T. E. Montroy, S. Padin, T. Plagge, C. Pryke, C. L. Reichardt, J. E. Ruhl, E. Shirokoff, H. G. Spieler, B. Stalder, Z. Staniszewski, A. A. Stark, K. Story, K. Vanderlinde, J. D. Vieira, and R. Williamson, *The Astrophysical Journal*, **743**, (2011). id. 90

5. Astronomical Sky Quality Near Eureka, in the Canadian High Arctic

E. Steinbring, W. Ward and J.R. Drummond, *Publ. Astron. Soc. Pacific*, **124**, (2012), 185 – 194.

ii) Databases

- Astronomical data from the CSTAR telescope and the South Pole Telescope are now publicly available, as described above.
- A comprehensive archive of site testing data is being prepared by Working Group A of *Astronomy & Astrophysics from Antarctica*.

iii) Workshops and meetings

1. Astronomy and Astrophysics from Antarctica Kick-off Meeting

Some 51 people from eight countries attended this three-day meeting at Sydney's Taronga Zoo from 29 June – 1 July 2011. Twenty-six contributed talks were given, including site-testing reports from several Antarctic sites and from the Arctic, recent scientific results, and ambitious proposals for new research facilities.

For the final afternoon the meeting broke into the four Working Groups to discuss their implementation plans. The meeting concluded on a high note with plenary presentations by each of the WG convenors.

The most important task for AAA now is to add a site-testing data page to the AAA website. This page will link to the locations of all existing data, as a first step towards the creation of an enduring database. A presentation by Miles Jordan from the Australian Antarctic Division helped delegates to better understand SCAR's data policy and how astronomers can best contribute to, and benefit from, data preservation.

More information on this meeting can be found at <http://www.astronomy.scar.org/AAA2011/> .

2. Workshop Astro-Antarctica

This two-day workshop was held in Marseille, France, September 14 – 15, 2011. It explored the options for international collaboration on a 2.4 metre class near-infrared telescope, with participants from Australia, China, France and Italy.

More information on this meeting can be found at <http://marwww.in2p3.fr/~tao/PLT/> .

3. NIR@ANT meeting

This meeting, held in Beijing, China, from 7 – 9 November, 2011, created an international task force to carry forward the 2.4 metre class near-infrared telescope project – now called NIR@ANT.

More information on this meeting, and subsequent teleconferences, can be found at <http://www.astronomy.scar.org/NIRANT/index.html> .

iv) Education and Outreach

The main visibility of AAA is through the website <http://www.astronomy.scar.org> . AAA is also publicised at major international astronomical meetings, such as those of the international Astronomical Union, through posters and talks.

v) Data and Information activities

As described above, there are two component to this: making astronomical data publicly available, and creating suitably validated and archived sets of site testing data. Both these activities are ongoing.

4. Budgetary Implications

All expenditure so far has been for travel, most notably for the Taronga Zoo kick-off meeting in June 2011.

There are two main reasons for under-spend in the AAA budget.

1. So far, all work in setting up and maintaining the website [astronomy.scar.org](http://www.astronomy.scar.org) has been done free of charge by George Hatsidimitris at the University of New South Wales.
2. Some of the delegates to SCAR AAA meetings have had sufficient access to their own funds that the call on SCAR for travel funding has been less than expected. However, because of recent budgets cuts to many institutions (especially in Europe and the UK), we cannot rely on this in future.

For future years, we request a continuation of the current funding level. This will facilitate participation in annual AAA meetings. These will whenever possible be held in conjunction with the SCAR Open Science

Conference to minimise costs; however a separate meeting will be required in alternate years. Proposed locations for the 2013 meeting are currently under review.

5. Future Plans

The work plan for the next two years follows closely the original plan. We are now two years into the program. In the next two years, we expect to:

- Complete a web-based archive of site testing data from all sites, and have it fully publicly accessible,
- Have at least one major (>\$50m) new international astronomical facility approved for construction, with approval based in part on *Astronomy & Astrophysics from Antarctica* recommendations,
- Have a roadmap in place for future astronomical facilities.

Appendices

Members of the AAA SRP Steering Committee

Michael Andersen (Denmark)
 Philip Anderson (United Kingdom)
 Michael Burton (Australia)
 Xiangqun Cui (China)
 Lyu Abe¹ (France)
 Takashi Ichikawa (Japan)
 Albrecht Karle (USA)
 James Lloyd (USA)
 Silvia Masi (Italy)
 John Storey (Australia); Chief Officer
 Hongyan Zhou² (China)

¹ Replacing Nicolas Epchtein in 2010

² Replacing Lifan Wang in 2011

AAA Working Groups:

- **Working Group A: Site testing, validation and data archiving.**
 - Chair: Tony Travouillon, Vice-chair: Jon Lawrence
- **Working Group B: Arctic site testing.**
 - Chair: Eric Steinbring, Vice-chair: Michael Andersen
- **Working Group C: Science goals.**
 - Chair: Michael Burton, Vice-chair: Hans Zinnecker
- **Working Group D: Major new facilities.**
 - Chair: Peter Tuthill, Vice-chair: Xuefei Gong

Members of the NIR@ANT task force, led by Lifan Wang:

Michael Ashley (UNSW, Australia)
Michael Burton (UNSW, Australia)
Xiangqun Cui (NIAOT, China)
Nicolas Epchtein (University of Nice, France)
Jian Ge (University of Florida, USA)
Gil Moretto, (IPNL, France)
Jeremy Mould (Swinburne, Australia)
Carl Pennypacker (Berkeley, USA)
Jason Rhodes (JPL, USA)
John Storey (UNSW, Australia)
Nick Suntzeff (Texas A&M, USA)
Charling Tao (CPPM, France)
Andre Tilquin (CPPM, France)
Lifan Wang (PMO, China; Texas A&M, USA)
Don York (University of Chicago, USA)
Wei Zheng (John Hopkins University, USA)