

**Call for Proposals under the IMOS (EIF) Five Year Strategy:
Enhancement or extension of IMOS – July 2009 to June 2013**

Facility Project Plan template

Proposals should be submitted by 30 October 2009 to:

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Background:

This template has been provided to allow Facility and Sub-Facility Leaders, and other interested parties to prepare a Facility Project Plan following a call for proposals announced on 18 September 2009, with a closing date of 30 October 2009.

Prior to completing this template, please read the IMOS Five Year Strategy (the 'Strategy'), and Detailed Guidelines for Proposal Development (the 'Guidelines') – see the IMOS website at: <http://imos.org.au/eif.html>.

The Facility Project Plan must be in the following template and contain the information set out below:

Overview:

Proposed Infrastructure Investment:	An Australian contribution to the global Argo Array
IMOS Facility:	Argo Australia
Operating Institution:	CSIRO Marine and Atmospheric Research
Facility Leader (for this Proposal):	Susan Wijffels, Centre for Australian Weather and Climate Research, CSIRO Marine Laboratories, Hobart Tas 7000 Susan.Wijffels@csiro.au 03 6232 5450 0438 022 223
Other(s) key people involved:	Ann Thresher (same affiliation as above)
Collaborating Institutions:	Bureau of Meteorology Antarctic Climate and Ecosystem Cooperative Research Centre

Please attach:

- Letter from senior person in Operating Institution, confirming that the proposed infrastructure can be developed and operated within that institution
- Resume of Facility Leader
- Letters received from Collaborating Institutions, detailing their support to the Proposal, and indicative level of co-investment

Nature of Investment:

Implementation Strategy:

1. Summary

The Argo array is the dominant *in situ* data stream allowing real-time monitoring of the seasonal broadscale structure of the global ocean down to 2000m (www.argo.net). Over the last decade, Argo represents the largest improvement in the *in situ* global ocean observation system. The IMOS Argo Australia facility comprises a national contribution to this vital international infrastructure. A significant Australian contribution to Argo is critical to ensure good Southern Hemisphere coverage through direct contributions, influence via Argo leadership and through partnering to assist/encourage deployments in the oceans around Australia.

Argo data are critical to many national and international research and operational activities which assess climate variability and climate change, and for ocean forecasting systems. The list of research projects and publications dependent on this data stream is long and growing.

With the help of EIF and NCRIS funding, along with support from our partners, we propose to sustain and modestly build the Argo Australia program, deploying floats to attain sustain target density in Australian waters by replacing those that are ageing, and to get more value out of the infrastructure through technology improvements.

2. Objectives

- i. In outlining the objectives of the Facility please refer to the IMOS Five Year Strategy, and in particular the Strategic Priorities on
 1. Providing a national backbone for observing boundary currents
 2. Continuing to build institutional strengths into national capability
 3. Exploring the potential for whole-of-system approaches
 4. Driving down the cost per observation

The primary objectives of this facility is to

- a) **sustain** an array of Argo floats in the region around Australia of around 220 – 240 active floats performing the Argo core mission (one float every 3° x 3° on a 10 day cycle, drifting at 1000m depth, profiling to 2000m in the open ice-free regions of the ocean)
- b) **extract more value** from the float platforms by transitioning 50% of the fleet to Iridium-equipped floats to deliver data of higher vertical resolution, and through a programming modification, extract more near-surface temperature information to assist the international Group for High Resolution SST (GHRSSST) in improving global SST products.
- c) **assist** Argo partner nations deploy more floats in the Southern Hemisphere through investment in deployment opportunities in our region
- d) **enhance** the Argo core array by partnering with the ACE-CRC to extend Argo sampling under the seasonal ice zone in the Australian Antarctic sector

3. List of major activities

The facility will provide a real-time and delayed-mode ocean profile data stream from an array of > 220 active profiling Argo floats from the oceans around Australia. This comprises Australia's contribution to the international Argo program (www.argo.net).

We will purchase, prepare and arrange deployments for Argo floats which return 2000db profiles of temperature and salinity every 10 days as they drift in the ocean. Deployments will be arranged largely from Ships-of-Opportunity (both research and commercial). Volunteer deployers will be trained and deployment oversight maintained.

In addition, we will coordinate with our international and national partners to ensure that gaps in the under-resourced Southern Hemisphere Argo array are filled, creating deployment opportunities in gaps if necessary. We will continue to be actively involved in international Argo leadership in both the science and data system steering teams to ensure the focus of Argo remains on *global* coverage.

We will process the data in real-time (within 24 hours of the profile) and delayed-mode (after 6 months to allow us to assess any drifts in the sensor readings), according to Argo and emll data standards and formats. Real-time data are available via both the Global Telecommunications System (GTS) and the internet (Argo Global Data Assembly Centres and emll's Oceans' Portal) within 24 hours of collection. Delayed-mode data are to be distributed within 1 year of collection and a detailed data report provided online. We will continue to work with international partners, such as Indian, in improving their Argo data streams, for the benefit of the global and national research community.

The technical performance of the array will be monitored for problems in float performance so that manufacturing or programming errors are quickly identified. In such cases, the global Argo community and the manufacturer will be notified, and deployments halted until the problem has been resolved.

We will explore and implement an extension under the seasonal sea-ice in the Australian region and deploy floats which resolve the temperature structure above 5m to assist the GHRSSST project resolve very near-surface temperature structures.

4. List of major equipment to be purchased / developed

Around 60-65 Argo floats will be purchased from Teledyne Webb Research Corporation. Each float will be thoroughly technically checked at CMAR, equipped with lithium battery packs, prepared for shipping and deployed as soon as practical (largely from ships-of-opportunity).

Access, pricing regimes:

1. How will data access be provided?

Data access is open and provided through the IMOS Oceans Portal as well as through the two international GDACs. Access is virtually immediate with data delivery to the GDACs as soon as a profile is processed. Data is also inserted onto the GTS where it is available to meteorological and operational agencies in real-time.

2. How will data and products be managed?

Data management is overseen by the Scientist in Charge of Operations (SCO) who is a member of the international Argo Data Management Team. Initial processing is carried out in 2 stages with mirroring of the first stage at both CMAR and BOM who process the incoming real-time data in parallel, delivering (identical) data to the GDACs and the GTS. This provides a failsafe backup in case of problems at one site (e.g. power outage in Hobart).

Delayed mode data processing is carried out by the experts at CMAR approximately 6 months to 1 year after the original profile is delivered. This allows time for any sensor drift to manifest itself clearly so corrections can be calculated and applied. Scientific oversight

is provided by Susan Wijffels with assistance from expert user scientists such as Steve Rintoul, Helen Phillips and others. This scientific oversight comprises an 'in-kind' contribution to IMOS. Comprehensive documentation on delayed-mode data decisions are made available via the CMAR Argo website. Technical and scientific feedback on data quality from users via the international Argo data system and nationally are quickly responded to by the data management team.

3. What are the dependencies on external / other facilities (national and international)?

We assume that internationally Argo will continue to be successful, and that our major regional partners, the USA, Japan and Korea, will maintain deployments to ensure 100% design coverage is achieved. If international support reduces (unlikely at this point), the IMOS proposal still ensures 50% coverage around Australia. Argo Australia plans to address issues in partners accessing deployment opportunities in remote regions of the South Indian and Pacific Oceans, by directly co-investing in leasing small ship time.

We have also assumed that the ACE CRC will purchase some floats into the future, though the final numbers are uncertain, and that BoM will contribute about 8 floats per year.

4. Collaborative structures for allocation of priorities

Argo continues to operate with a small national committee of contributing agencies (CMAR, BoM, RAN) and users which meets annually to guide the operations and deployment plans and monitor performance. The key precepts are to ensure uniform global coverage, meet Argo and emll data requirements and extract more value out of the array. Enhancements or modification of the Argo core mission proposed internationally will also be debated by the national Argo Committee, in concert with the IMOS Office (via the ongoing APBs).

Governance

- Performance indicators
 - A total of up to 60 floats are ordered, delivered, prepared and deployed each year.
 - Data is processed and delivered to the Global data repositories and the GTS within 24 hours of availability. From there, it is picked up and served by the IMOS Oceans Portal.
 - Data is processed through Delayed mode QC as it becomes available (6 months to 1 year after original profile date).
- Describe key risks and risk management strategies

Risk Analysis Summary

Description of the Risk	Rating of Likelihood (highly/likely /unlikely)	Rating of Adverse impact Minor/Significant/ catastrophic)	Gross Rating of the Risk (High/Significant/ Moderate/Low)	Proposed treatment of Risk
Batch manufacturing problems in floats causing large numbers of failures	unlikely	significant	low	Monitor the array's engineering performance closely for early identification; Carry out any mission or hardware changes in small batches before introducing them to larger parts of the array; maintain close contacts with overseas Argo groups to ensure quick alerts on float problems
Adverse exchange rate variations affecting float acquisition and communications costs	likely	significant	significant	Budget at the low end of the exchange rate envelop or work with NCRIS to manage this risk over the entire portfolio; reduce float acquisition
Failure or degradation of satellite communications system	unlikely	catastrophic	low	For floats using Service Argos, maintain relatively long surface times to ensure all data packets are transferred even in a degraded system; ramp up use of Iridium to spread the risk

Description of the Risk	Rating of Likelihood (highly/likely /unlikely)	Rating of Adverse impact Minor/Significant/ catastrophic)	Gross Rating of the Risk (High/Significant/ Moderate/Low	Proposed treatment of Risk
Loss of funding by partner agencies	unlikely	significant	moderate	Even if all our partner agencies lose funding (BOM, Scripps, ACE CRC), we will still have a significant (though lower) float coverage in our area of interest for several years, sufficient time to ramp up additional funding if required.

- For existing Facilities, respond to any issues raised in the 2008 IMOS Review

The main concern raised in the review was:

“IMOS Office to keep aware of ACCSP and ACECRC developments and their implications for the Argo program, and ensure the IMOS priorities continue to be addressed in any new versions of these programs”

The ACE-CRC was refunded, but with a 20% funding reduction and only for 4 more years. Significant ongoing float acquisition via the CRC will still continue. Support for DMQC activities is reduced.

Support via the Australian Climate Change Science Program (Department of Climate Change and CSIRO Wealth from Oceans’ Flagship) remains dependent on annual funding process. Competition for ACCSP \$s is high, with the program essentially flat-funded for nearly a decade. ACCSP also is the core source of support for the ACCESS modelling project. The Argo facility can only attempt to argue for ongoing ACCSP support via demonstration of the essential nature of Argo for climate change detection and research.

Budget: Please complete the spreadsheet provided, and detail here any further information you have available on the background to the Budget:

- EIF Funds
 - Extension of existing Facility
 - Expansion of existing Facility / New Facility
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- Co-investments – source and nature

See budget spread sheet:

ACE-CRC – float acquisition and scientific oversight of Southern Ocean DMQC (Rintoul)

ACCSP – cash salary support for Argo technical team

CMAR capital – acquisition of 10 floats per year.

BoM capital – acquisition of ~ 8 floats per year (\$200k)

BoM in kind – staff time to oversee the Argo real-time data stream.

- Staffing details

Staffing will be covered by a combination of IMOS NCRIS/EIF and ACCSP/CSIRO funding, for a total of 7 staff (Susan Wijffels, Project leader; Ann Thresher, Scientist in Charge of Operations; Vito Dirita, Argo Engineer; Bob Weldon, Argo lead technician; Alan Poole, Argo technician; Jeff Dunn and Esmee Van Wijk, Delayed mode QC operators).

- Description of proposed new infrastructure for Nodes – please complete the Table on the next page, referring to Attachment 1 to the Guidelines for further information

TABLE: Observations required by the Nodes in relation to this Facility

Facility	Observations required by the Node			
	NCRIS Funded (already allocated to Jun11) (see Appendix 1 of the Guidelines)	EIF first \$8M funded (already allocated to Jun10) (see Appendix 1 of the Guidelines)	Extension of existing facility infrastructure out to 2013.	Enhancements of existing Facilities / new infrastructure required 2010-2013
Bluewater & Climate	60 Argo floats prepared and deployed per year	Enhance deployments in Southern Ocean and under the seasonal ice zone. Enhance deployments in northern Australia and some deployments with oxygen sensors.	~ 65 Argo floats prepared and deployed per year. Improve vertical resolution near surface on some floats, deploy ice-capable floats in the seasonal ice zone, ensure international deployments via ship-leases (where needed).	
WAIMOS				
GBROOS				
NSW-IMOS				
SAIMOS				
Other <enter name>				