

WARRSAT: A REGIONAL REMOTE SENSING CAPACITY BUILDING CENTRE

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ABSTRACT: We report on the establishment in Perth, Western Australia of a regional remote sensing education and training Centre. The IOC of UNESCO and Curtin University of Technology are collaborating in formation, development and promotion of the Centre. The thrust of the Centre is to support capacity building in remote sensing technologies in the Indian Ocean, Pacific Ocean and SE Asian regions. Implementation will be via collaborative initiatives with the international agencies and with local remote sensing centres. An overview of the Centre and some of the planned activities are outlined in this presentation.

1. INTRODUCTION

Under a recently negotiated arrangement, the Perth Regional Programme Office of the Intergovernmental Oceanographic Commission (IOC/UNESCO) and Curtin University of Technology have agreed that the West Australian Regional Remote Sensing Applications and Training (WARRSAT) Centre will be established in Perth, Western Australia (WA). WARRSAT will have the responsibility to develop and deliver satellite-based products and services, capacity building and training to benefit various user communities in the region.

The Centre will support a wide variety of users in the region. Agencies engaged in the marine industries, environmental protection, fisheries management, tourism and marine conservation will derive significant benefit.

The Centre will enable WA to export the expertise available in Perth with respect to remote sensing applications, creating new markets for products and education and capacity building in relevant areas. This will overlap into the computer and modelling fields with potential for offshore industry applications such as oceanographic instrument fabrication, communications, environmental monitoring, exploration and resource management.

2. SCOPE

The Centre's focus, in principle, will embrace the Indian Ocean rim, including Western Australia, Indonesia, Malaysia, India and Thailand; as well as the South Pacific Ocean. WARRSAT will collaborate through invitation with institutions and government agencies in the appropriate region to implement objectives in fields related to Earth observing satellites, research, operations, applications, training and education. Also, companies involved in providing services and products to user communities will be encouraged to participate. Specific products are envisaged to assist with applications in marine management including those dealing with climate variability, coasts, habitat preservation, fisheries, marine eco-tourism, the creation and sustainability of marine parks and reserves, multiple use environments and offshore resource operations.

Training and capacity building activities will focus on linking with IGOS and will provide services to address specific management issues of priority to local communities in identified regions. It will initiate pilot and demonstration projects and function also as a clearinghouse in the region for IGOS-based products.

A key role for WARRSAT will be the provision of expert staff for on-site interaction with users for training and implementation programs using remotely sensed products to meet individual user needs. This critical gap has prevented many potential users from fully utilising the available data stream and products. The objective is to ensure that the remote sensing products are designed for full integration into relevant management systems.

3. LOCATION

The Leeuwin Centre for Earth Sensing Technologies is proposed as the home for WARRSAT. Created by the Department of Commerce and Trade, the Leeuwin Centre's purpose is fostering industry-linked developments and education and training using remotely sensed products and information. The Leeuwin Centre has not fully attained its objective of delivering training and education largely because of insufficient staff and funding. Also, its mandate is not geographically defined as serving beyond the WA area. It is proposed that WARRSAT be the vehicle that develops that original vision of servicing WA's interests while also supporting the national and international goals of capacity building. The benefits of locating WARRSAT at the Leeuwin Centre are considerable with respect to collaborative opportunities, access to a wide range of scientific and technical expertise and the ability to capitalize on the existing infrastructure. WARRSAT will be separately managed and staffed to implement its focused set of objectives.

Of particular advantage in establishing WARRSAT in Perth is the existence of the Western Australian Satellite Technology and Applications Consortium (WASTAC). WASTAC was established in 1987, as a collaborative venture between CSIRO, Curtin University of Technology, the WA Government (via the Department of Land Administration) and the Bureau of Meteorology with the purpose of receiving and archiving satellite data. WASTAC itself is a legally constituted consortium with a charter to operate a satellite data reception facility and archive direct broadcast satellite data. WASTAC, as such, has no brief for research, applications or training. During 2001, WASTAC is establishing an X-band downlink capability that will provide reception from a range of new satellite sensors including MODIS Terra and Aqua.

4. CENTRE ESTABLISHMENT AND PROGRAM

The need for delivery of scientific and technical products and services in the marine area is well documented in general, but requires a more defined focus in the target regions to meet the specific needs of marine managers, industry, users and local communities. Throughout the target regions there is concern about improved marine management and its relationship to sustainable development. Coastal development and the increasing pressure for multiple use of coastal regions, are placing immense strain on the marine environment. Development of offshore resource industries calls for objective data and quantitative information often only from satellite measurements. Similarly, sustainable development of marine ecosystems requires information for protection and management of representative areas of the marine habitat, to ensure that biodiversity of the region is not compromised. Satellites provide excellent mapping data that has widespread, efficient and effective application in this area. The target regions, as a bonus, already are supported with the most expensive element of an observing system, namely the space-based sensors. Thus, a considerably small investment in WARRSAT will justify and demonstrate the large investment in the space-based system.

Initially, WARRSAT will focus on the ocean and coastal areas in the regions defined as Western Australian coastal waters, the Indian Ocean, and the South Pacific. It will develop products and services based on user needs defined in the region through surveys, workshops and interactions with potential users. Secondment of staff, both domestic and international, will be encouraged for the purpose of training both the Centre's staff and participants from the region. An active visitor program will be maintained with CEOS agencies to ensure regular infusion of scientific and technical ideas and to avoid duplication of effort. Training courses will also be held at institutions in the regions that may require assistance. By operating on a regional basis, sponsoring agencies will have a mechanism for delivering much needed capacity building in a systematic and cost-efficient way. An objective of this approach is to ensure that regional centres develop a capability to act independently in delivery of applications.

WARRSAT has initiated its first capacity building initiative. September 25-27, 2001 a short course is being held in Noumea, New Caledonia with sponsorship from IOC, IOCCG, IRD (Noumea) and Curtin University. Titled the "Workshop on Remote Sensing Resources for Marine Management", the intention in this initial meeting is to acquaint delegates with:

- accessing and integrating the extensive range of remotely sensed resources and associated geophysical products that are becoming available to users via the international agencies,
- understanding and interpreting these products,
- supporting the remote sensed component of the program with in situ and laboratory-based activities, and
- developing and implementing regional marine management programs that utilise such data sets.

In support of WARRSAT's capacity building programs, Curtin University of Technology, in association with the IOCCG, is developing a web site that will direct users to the available resources. Once development is completed this site will be available and accessible to all interested including delegates participating in WARRSAT Workshops. The web address is not yet released but it will be accessible in the near future via a link on Curtin's existing web site (see RSSRG 2001).

5. INTERNATIONAL AGENCY LINKS

WARRSATs links to international agencies will include working with IOC, IGOS, GOOS, GODAE and CEOS.

5.1 IOC

The work of the IOC, over the three decades since its inception, has focused on promoting marine scientific investigations and related ocean services, with a view to learning more about the nature and resources of the oceans. This has laid the foundation towards an expanded role of the IOC in meeting new challenges.

In meeting these challenges, the IOC now focuses on four major themes:

- develop, promote and facilitate international oceanographic research programmes to improve our understanding of critical global and regional ocean processes and their relationship to the sustainable development and stewardship of ocean resources;
- ensure effective planning, establishment and co-ordination of an operational global ocean observing system to provide the information needed for oceanic and atmospheric forecasting, for oceans and coastal zone management by coastal nations, and for global environmental change research;
- provide international leadership for education and training programmes and technical assistance essential for systematic observations of the global ocean and its coastal zone and related research; and
- ensure that ocean data and information obtained through research, observation and monitoring are efficiently handled and made widely available.

The IOC is composed of its Member States, an Assembly, an Executive Council and a Secretariat. The Secretariat is based in Paris, France. Additionally the IOC has a number of Subsidiary Bodies.

The IOC Perth Regional Programme Office (hereinafter referred to as the Office) will be a partner with WARRSAT in this initiative. It is charged with developing GOOS (Global Ocean Observing System) in the Indian, South Pacific and Southern Oceans. The Office will be the Centre's portal for engaging the IGOS (Integrated Global Observing Strategy) agencies. CEOS (Committee on Earth Observation Satellites) member agencies are viewed as potential sponsors of the Centre in terms of funding for activities and staff. The training and capacity building activities will be linked to the objectives of CEOS. A UN relationship will ensure that products and services are developed in accordance with IGOS standards, data policies, thematic approaches and other requirements. This will also facilitate use of the Centre's output in other global regions.

The IOC Perth Regional Programme Office will serve as an interface with the regional communities. It will assist in generating user requirements, developing awareness about WARRSAT services, implementing the Centre's work in compliance with the Global Ocean Observing System (GOOS) protocols and assisting in formulating training opportunities - particularly for Indian Ocean and South Pacific regions.

5.2 IGOS

IGOS has oceanographic, atmospheric and terrestrial components (GOOS, GCOS and GTOS, respectively). The IGOS Partnership is sponsored by the Committee on Earth Observation Satellites (CEOS), which includes the IOC, WMO, UNEP, FAO and the principal national space agencies. The research components, related to the observing systems, are represented by the International Council of Scientific Unions (ICSU), the International Geosphere-

Biosphere Programme (IGBP), the World Climate Research Programme (WCRP) and the International Group of Funding Agencies for Global Climate Change (IGFA).

5.3 GOOS

Initially, the Centre will focus on marine applications, training and capacity building, as defined within the Global Ocean Observing System (GOOS). GOOS is responsible for implementation of the Oceans Theme of IGOS. The Centre's activities will align with the objectives identified in the IGOS (2001) "Ocean Theme" paper. Once established, the Centre will expand to provide terrestrial and atmospheric products and services, as these major systems are physically and biologically linked. However, climate applications will be addressed from the beginning because of the strong ocean/climate connection.

GOOS has a number of technical committees that, when facilitated by the Office, will be able to assist in defining appropriate products and services. These committees operate under GOOS and are composed of experts in the fields of oceanography, numerical modelling, data management and so on. They will assist by identifying suitable products, standardising products for wider usage and interpretation of data. They work continuously in pursuit of expanding the utility of GOOS worldwide.

5.4 GODAE

GOOS's premier project is the Global Ocean Data Assimilation Experiment (GODAE) that will be fully operational in 2005. Central to the success of GODAE is the integration of space-based, sea surface temperature data with in situ subsurface temperature data that will be obtained from a global network of profiling floats within the ARGO (2001) project. A significant benefit from the establishment of WARRSAT will be the demonstration of the utility of GODAE data.

5.5 CEOS

CEOS has recently established a Working Group on education (WGEdu). The CEOS Education Working Group coordinates capacity building through its members in the area of satellite remote sensing. This group operates through regional nodes, which could include WARRSAT. Close collaboration with the WG on Education will generate opportunities for international collaboration. Collaboration with the space agencies and knowledge of their technical requirements for understanding and using the data is important. Their personnel will be encouraged to visit the Centre for purposes of staff training and serving as resource people for the Centre's activities in the regions.

The Ocean Biology Project initiated by CEOS and coordinated by the International Ocean Colour Co-ordinating Group (IOCCG) aims to implement a strategy for understanding ocean biogeochemical and ecosystem processes by combining long-term ocean colour and other remote sensing data with in situ measurements. This is an emerging capacity building field.

6. PILOT PROJECTS

It is intended that, in addition to delivering training courses and workshops, WARRSAT will initiate a number of pilot projects, either domestically or in the regions that will be pivotal to achieving successful regional impact. Examples of such activities have been developed for illustrative purposes (see Appendix 1).

7. CONCLUSION

WARRSAT will achieve both local and regional benefits in the application of remotely sensed information to understand and manage physical and biological marine environments. Education, training and regional capacity building goals will be accomplished through (i) the conduct of specialist workshops, (ii) the provision of demonstration and pilot projects and (iii) the advancement of techniques for product development. The WARRSAT proposal results from the synergy of remote sensing expertise in WA, the IOC Office and international linkages, government and industrial interests and requirements.

8. REFERENCES

ARGO (2001) ARGO, part of the integrated global observation strategy. <http://www.argo.ucsd.edu/>

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IGOS (2001) An Ocean Theme for the IGOS Partnership - A Final Report from the Ocean Theme Team.
<http://ioc.unesco.org/igospartners/igoshome.htm>

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APPENDIX 1

WARRSAT PROJECTS: PILOT PROJECTS AND CAPACITY BUILDING ACTIVITIES

The following list is indicative of the types of activities to be undertaken by WARRSAT. The program includes projects that might best be described as Pilot Projects[#] and Demonstration Projects* as well as activities that will focus more on Regional Capacity Building through training. For many of the projects described there presently are existing and well advanced activities in progress. The experience gained and the outcomes of these ongoing activities are candidates for regional application through exchange of expertise and technology transfer. Regional capacity building would normally be developed through the conduct of training workshops, visiting fellowships, specialist meetings and possibly field training activities. International capacity building workshops that focus on accessing, interpreting and applying remotely sensed data will be conducted using the services of national and international experts. The demonstration and pilot projects will illustrate operational programs that use remotely sensed data. Visitors on exchange programs will be able to participate in these projects that will emphasise time the science and the applications. These workshops and projects will be sponsored by several international agencies including, for example, SCOR, IOCCG, CEOS WGEdu.

Examples of proposed WARRSAT projects are listed below. Further details are available from the authors.

EXAMPLES OF WARRSAT PROJECTS:

1. Marine Ecosystem Monitoring and Management for Long Term Sustainability
2. Fisheries Management - Rock Lobster Industry
3. Fisheries Management - Remotely Sensing Oceanic Primary Productivity
4. In Situ Validation of Satellite Products
5. Satellite Oceanography: Offshore Industry Support
6. Coastal Management in Multiple Use Environments
7. Satellite Oceanography and Meteorology: Support for GOOS
8. New Technologies: Developing High Accuracy Sea Surface Temperatures from an Advanced Geostationary Satellite - GIFTS
9. Cloud Physics and Regional GOOS
10. Coral Reef Monitoring and Management
11. Carbon Cycle
12. Hazardous Algal Blooms Detection Program
13. In-Situ Coastal Waters Monitoring and Management Program
14. Education and Training Programs in Satellite Data Products and their Applications

* Demonstration Projects

The term is used here to reference activities that have been implemented and are either in progress or have been completed recently. In the latter case, the project design, implementation and outcomes would have been documented previously and would be available for study and possibly modification for implementation elsewhere.

Pilot Projects

If a specific requirement arose as a result of a WARRSAT Workshop or linked capacity building field program it might be identified as a Pilot Project and investigated further. For example, planning and investigate a solution to an identified management problem (eg using remote sensing to monitor over time a set of water quality indicators in a region of interest).