Application for Associate Membership of The Committee on Earth Observation Satellites

Purpose

This paper presents Geoscience Australia's credentials to become an Associate Member of the Committee on Earth Observation Satellites (CEOS).

The paper provides an overview of Geoscience Australia (GA), its National Earth Observation Program and its Earth observation from space (EOS) capabilities. The paper then discusses the agency's national leadership role in relation to EOS activities, and its engagement in the international EOS community. The paper then summarises the agency's historical contribution to CEOS, and how it proposes to leverage its capability to make a meaningful and sustainable contribution to CEOS into the future.

GA's eligibility for Associate Membership of CEOS is underpinned by the Australian Government's formal recognition of the agency as one of the two national operational EOS agencies[1], and the fact that GA undertakes "significant ground segment activity that supports CEOS objectives"[2]. Further detail on this activity is provided below.

About Geoscience Australia

GA is Australia's national geoscience agency, and is part of the Australian Government's industry portfolio. GA's work is focused on addressing Australian Government priorities, including development of the nation's mineral and energy resources, management of the nation's marine estate and community safety.

In addition to its EOS program, the agency operates an international network of magnetic, infrasound, hydro-acoustic and geodetic observatories, including two Satellite Laser Ranging facilities. The agency also has responsibility for the nation's geospatial reference frame and provides access to a repository of over 5 Petabytes of geological, geophysical, geochemical, remote sensing and other geospatial data.

GA has an annual budget of approximately AUD $200 million and employs approximately 730 staff. Almost all of the agency's staff are based in the national capital, Canberra, but the agency operates across the country and the region.

[1] Including The Bureau of Meteorology, and with the CSIRO as the recognised lead research agency.

[2] Source: ttp://www.ceos.org/index.php?option=com_content&view=category&layout=blog&id=25&Itemid=73

National Earth Observations from Space Program

GA has been involved in EOS activities since the Australian Landsat Station became operational in 1979.

In the 2013-14 financial year, the agency will invest approximately $7 million and employ 40 staff in its core EOS program. This investment supports key activities including:

- Ground segment operations, including ground stations and calibration sites.
- Acquisition and distribution of public-good data to underpin innovation and productivity.
- Operation of a wild-fire monitoring system to support rapid emergency response.
- Creation of pre-competitive information to encourage resources industry investment.
- Flood mapping to support disaster recovery.
- Surface water mapping to support hazard mitigation.
- Forest monitoring to support reporting against international agreements.
- Monitoring of changes in land-cover to support environmental management.
- Coordination of government procurement of commercial imagery.

This investment also supports new science, including into challenges faced both locally and internationally. For example, the agency invests in research into how EOS data can be calibrated to enhance exploitation of the long-term EO data record, and how it can be used to support environmental management and disaster response.

Earth Observation from Space Capability

The agency's EOS capability includes the significant expertise of its people, its physical infrastructure and its substantial data holdings.

Expertise

GA employs remote sensing scientists specialising in EOS. GA's staff have developed extensive scientific expertise in key areas, including calibration/validation, continent-scale land cover monitoring, and use of EOS data to support response to natural disasters. Since 2008, GA's EO staff have published over 40 internationally peer-reviewed scientific papers on methods and applications associated with the use of EOS data.

GA also employs engineers specialising in EOS and calibration/validation instrumentation. GA also employs specialists in management of very large EO time-series datasets, and development of algorithms to harness that data for a range of applications.

Physical Infrastructure

GA operates a significant ground station in Alice Springs, central Australia, and is negotiating with another Australian Government agency to commence operation of a significant ground station in Darwin, northern Australia. These ground stations support downlinking of X band across continental Australia, Australia's maritime jurisdiction, parts of the South Pacific and South-East Asia, and parts of the Southern Ocean.

This coverage positions GA to support the international community to tackle challenges in the growing Oceania and South-East Asia regions, as well as providing access to data about geographies necessary for whole-Earth science. These ground stations are routinely maintained and have a demonstrated record of reliable performance.

Geoscience Australia maintains a network of data transmission, processing and distribution facilities that enable national and international access to EOS data and products and is currently working to deploy a series of radar corner reflectors to support calibration of SAR instruments. GA also hosts a robotic facility for calibration of geodetic antennas.

Australia's geographic location means GA's ground segment can act as an alternative site or backup to northern hemisphere ground segments, and its proximity to the rapidly growing Asian region is also advantageous.

Data

GA manages over 2 Petabytes of EOS data, spanning a 30-year period. GA provides this data publicly under a Creative Commons licence whenever possible, making it a significant asset for the international scientific community.

The agency has invested heavily in improving the accessibility of its data holdings to the Australian and international communities, including through initiatives to unlock its archive of Landsat data and to enhance its processing system to ensure newly acquired data is processed on-receipt rather than weeks or months later. GA has also assisted other CEOS agencies such as the USGS and ESA with their efforts on the global consolidation of EO data by repatriation of Landsat and ERS data acquired by Australian ground stations. The agency is now harnessing big data technologies to develop a data cube that will enhance access to its data holdings for users wishing to use High Performance Computing.

National Leadership Role

The Australian Government's *Satellite Utilisation Policy* recognises the Commonwealth Scientific and Industrial Research Organisation (CSIRO) as the nation's lead EOS research agency, and Geoscience Australia as one of the nation's two lead operational EOS agencies. GA's recognised focus on operational use of EOS will enable it to add a valuable end-user perspective to the work of CEOS.

GA is now driving a range of national EOS initiatives, including establishing a national capability for the use of public-good and commercial EOS data for disaster response. GA will be the point of contact for Australian activation of the *International Charter on Space and Major Disasters*, under the new universal access provision. This recognition of GA's national role positions the agency to ensure Australia's engagement with international fora such as CEOS is targeted and coordinated.

International Engagement

GA has been an active contributor in the international EOS community for many decades. Australia is a member of the Group on Earth Observations, and has long-running bilateral relationships with agencies such as the United States Geological Survey and the Japan Aerospace Exploration Agency. GA provides one of four international representatives on the Landsat Science Team.

GA also contributes its data and science to the broader international community under permissive licenses, provides calibration and validation data to support international missions, and collaborates on science projects. In addition, GA is heavily engaged with neighbouring countries, including developing their ability to leverage EOS.

Although Australia has a long history of international engagement, the Australian Government's recently released *Satellite Utilisation Policy* explicitly recognises the need for the nation to increase its international contribution into the future. The policy recognises the need for GA to continue to develop further bi-lateral relationships and increase its contribution to broader multi-lateral fora such as CEOS. The policy also identifies the need for GA to explore options for co-contribution to space segment activity.

Historical Contribution to CEOS

GA and its predecessors have been involved with CEOS activities since the 1990s. GA officers have been attendees at several CEOS Plenaries, and have actively participated in meetings coordinated by CEOS. GA officers have also contributed their time and expertise to a range of CEOS working groups and related projects, including:

- Attendance at CEOS Plenaries and CEOS Working Group Plenaries to present GA work relevant to these forums.
- Participation in the CEOS Strategic Implementation Team and Space Data Coordination Group meetings in support of the GFOI initiative.
- Participation at the CEOS Working Group on Calibration and Validation meetings since 2011.
- Participation in SAR Sub-Group meetings of the CEOS WGCV since 2006.
- Participation in the CEOS Ad Hoc Working Group on GEOGLAM.
- Participation in international joint campaigns for calibration and validation.

Future Contribution to CEOS

GA is well positioned to support the goals of CEOS:

- The location of the agency's facilities and area of operation, including in the south Pacific, positions it to support the goal to **close observational gaps**.
- The agency's policy of making data and products freely available through standards-based mechanisms supports the goal of **improving Data Democracy**.
- The agency's role as an Australia lead agency for operational uses of EOS positions it to provide a national perspective to CEOS, as well as adding a valuable end-user perspective to the work of CEOS. This enables the agency to support **responsiveness to global Earth observation needs**.
- The agency's experience in acquiring marine data and operating ground-based geophysical observatory networks position it to support the CEOS and GEO goal of **integrating Earth observations**.

The agency's niche expertise in key areas such as continental-scale land cover monitoring, management of national long-term EO data records and calibration/validation positions it to offer a valuable contribution to a range of CEOS activities, including in relation to geographies similar to those of Australia such as developing countries in southern Africa.

GA proposes to support the work of CEOS in the following ways:

- Provide in-kind support to the Australian Chairmanship and Troika Period of CEOS.
- Provide in-kind support for targeted projects/activities in the Data Democracy, Calibration/Validation and Information Management working groups.
- Work with Australian Government agencies to encourage support for CEOS objectives and activities.
- Participate in key CEOS meetings and teleconferences to advance the CEOS objectives.
- Continue to participate in relevant CEOS Working Groups where GA is able to make effective contributions.

These contributions are proposed on the basis that they align to CEOS goals, and align to the agency's priorities and unique capabilities. Although GA understands participation in CEOS is on a voluntary basis, this alignment positions GA to make a meaningful and sustainable contribution into the long-term.

In anticipation of being accepted as Associate Member of CEOS, GA would like to nominate Dr Adam Lewis, Group Leader, National Earth Observation, as the Principal, and Medhavy Thankappan, Section Leader, Earth Observation Science, as the Contact.