International Partnership
Space Programme

UK SPACE AGENCY

Case Study

Collaborative SAR Solutions for Australia

Project lead

CATAPULT Satellite Applications

Prepared by

STAR HUB

Collaborative SAR Solutions for Australia

Overview

Synthetic Aperture Radar (SAR) data presents a huge opportunity for environmental mapping applications due to the measurements it can make and because, unlike optical Earth Observation (EO) data, SAR is unaffected by cloud cover or lack of sunlight. However, making the most effective use of SAR data for specific applications is still a challenge, requiring large-scale processing, analysis and interpretation.

The UK is very advanced in this field and therefore opportunities exist for international collaborations to develop capacity and capability in other countries, and then to work together with them on collaborative ventures, both in that nation and further afield.

Funding from the UK Space Agency's International Partnership Space Programme (IPSP) has allowed the Satellite Applications Catapult to work with partners in Australia to develop a sustainable, collaborative programme based initially around the use of SAR data which it is hoped will lay foundations for future opportunities in the wider Asia-Pacific region. In parallel, the partners have been working on a high performance, multi-dimensional database – a 'data cube' – for SAR data. They are also showcasing the potential of collaboration and of SAR technology through three projects in the agriculture, forestry and water sectors.

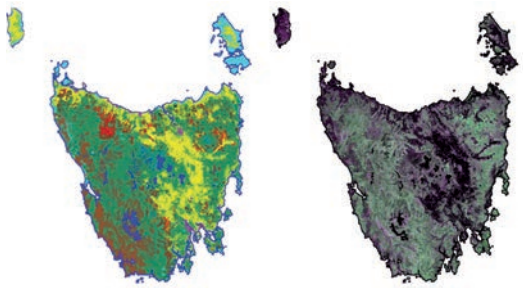
Partners

- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Geoscience Australia (GA)
- Cooperative Research Centre for Spatial Information (CRCSI)

Challenge

Historically, Australia and most countries in the Asia-Pacific region have lacked the large-scale SAR processing and analysis capability required to fully benefit from newly launched operational SAR satellites such as Sentinel-1, part of the Copernicus programme. What capability there is in Australia is largely held within State Governments.

However, Australia has a high level of scientific capability and an excellent record for global outreach and partnerships. In addition to this its geographical location allows it to act as a gateway to the Asia-Pacific region where potential SAR applications and markets are numerous, creating a significant opportunity to establish formal partnerships with Australian partners within a defined framework.



ALOS-1 PALSAR-1 satellite images of Tasmania provide a valuable asset for forest monitoring including (left) vegetation land cover map and (right) mosaic; both 2010

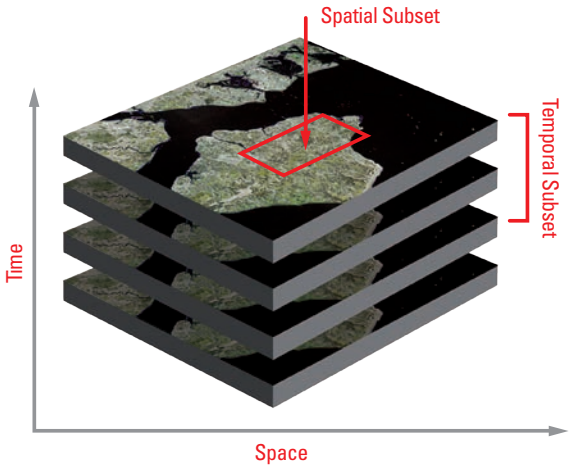
Credit: JAXA Kyoto & Carbon (K&C) Initiative

Solution

The Catapult is developing a collaborative framework with three leading Australian science and innovation groups: the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Geoscience Australia (GA) and the Cooperative Research Centre for Spatial Information (CRCSI). Together they will promote and showcase the opportunities afforded by SAR data to governments and businesses, particularly in the natural resources, environmental and agricultural sectors, in order to stimulate those markets.

The technical solution the Catapult is developing has been aptly termed the 'SARCube'. The SARCube applies the concept of a 'data cube' to a large collection and ongoing stream of SAR data from Sentinel-1. The concept was developed in collaboration with the Australian research community to build upon their experience gained creating an optical data cube that stores Landsat data acquired over the past 30 years.

In a data cube the data is stored and managed as a multi-dimensional array, enabling any geographical point to be visualised as a time series of information about that particular location. The benefits of managing and displaying data in that way are that data can be explored to see changes in any aspect – such as land cover, water surface area or agriculture. Over time these layers can be compared and analysed to provide information to support decision making.



A data cube comprises a multi-dimensional array of values which can been analysed to highlight change over time at a given location

©Copernicus data (2015)/ESA. Image © Satellite Applications Catapult Ltd, 2015

Any technical solution needs to be demonstrated to prove it works, and so three demonstration projects were identified, covering agriculture (sugarcane and wheat), forestry monitoring (land cover) and water resource monitoring.

The development work on the way that SARcube processes and ingests (takes in) SAR data for the three showcase projects will be complete by the end of May.

IPSP benefits

Thanks to funding from IPSP, this programme demonstrates that collaborative cross-border partnerships can be highly complementary and lead to the acceleration of both service development – in this case a SARcube – and delivery to the market, and allow market access to both partners that may otherwise be difficult to accomplish.

Outcomes & Future

All partners are keen to continue with further collaboration; the extent of which will be determined by future funding. The relationships developed already allow UK SMEs to be put in touch with potential partners in Australia and vice versa, and many other opportunities have been identified.

continued overleaf

The SARcube solution developed through the project will be a powerful way for users to access and interrogate SAR data, although it requires further work to create a truly user-friendly interface: this work was not within the scope of the original IPSP project but the Catapult is producing mock-ups to demonstrate how such interfaces could appear for different applications. Then, for each new application it will need to be adapted to ingest relevant datasets in the most appropriate and efficient way. The Catapult is looking forward to taking both aspects forward as soon as possible.

For the individual demonstrator projects, existing datasets have been used to prove the benefits of the collaborative programme. They have also shown the capabilities of the latest radar satellite sensors, the usefulness of incorporating Analysis Ready Data (ARD) into a specific service and the overall potential of a service based on a high performance computing infrastructure. The results of engagement with stakeholders in the projects is being fed back into the build of the SARcube.

Catapult's IPSP INSIGHT

Working with partners in different time zones causes time delays in communications and can result in project tracking issues, both of which need to be planned for from the start in order to keep a project focussed and on target, especially when the project has a limited lifespan. In addition, try to build in a review period at the start of any project to ensure that the scope matches the true requirements and capabilities of all the partners involved.

IPSP
The International Partnership Space Programme was a two year, £32 million pilot programme established and led by the UK Space Agency. The aim of the programme was to open opportunities for the UK space sector to share expertise in real-world satellite technology and services overseas and develop international partnerships for mutual benefit. The objectives for this programme were to show the benefits that UK satellite or space technology can provide above and beyond terrestrial solutions; these were provided in terms of societal or economic benefits, for countries that currently do not have these capabilities or wish to develop them further. The aims were for the UK to learn from partnerships with these countries and to establish the UK as the partner of choice with these countries once they are in a position to acquire or enhance their own space or satellite infrastructure.

UK Space Agency
The UK Space Agency is an executive agency of the Department for Business, Innovation and Skills (BIS) and lies at the heart of UK efforts to exploit and benefit from investment in space technologies and satellite applications. The Agency was created on 1 April 2011, and for the first time integrated UK civil space policy and the majority of programme funding from across Government, the Research Councils and Innovate UK (formerly known as the Technology Strategy Board).

To view profiles of IPSP partners and learn more about satellite applications in emerging markets visit: **starhub.sa-catapult.co.uk**