A world of knowledge

Matthew Brace hears about the next big step for geoscience information sharing

Had a look at Google Earth lately? Maybe you marvelled at the truly global nature of the system - the fact that you can find detailed geographical information about pretty much anywhere on the planet.

Such a system is soon to be available for geoscience information for the Australian research community, and for the resources and spatial industries. The desire for a truly interoperable system for sharing, storing and displaying a wide array of geoscientific information has been great and it has led to the development of a world first from Australia.

AuScope is an infrastructure system combining research infrastructure and applied science infrastructure of great benefit to industry, government, research organisation and the wider community. It is intended to be a seamless, broadly accessible and fully integrated blend of technology, data and knowledge that will transform the practice of geoscience and its outcomes.

The ultimate aim of AuScope is to provide an infrastructure to enable the geoscience (both research and applied) community to contribute effectively to optimising the wealth, safety and security of the Australian community over the next century and beyond.

According to AuScope's Chairman, Dr Mike Etheridge (right), "to find and assess the additional major mineral deposits buried under the regolith in Australia will require a substantially improved image of the subsurface and a predictive understanding of the factors that determine where large mineral systems localise. AuScope will provide the research infrastructure that will underpin both these components".

Building the infrastructure

The AuScope team realised that merely acquiring infrastructure and making it accessible is not enough. The key is to harness, organise and provide ready access to the data, information and knowledge.

AuScope's vision is to create an "infrastructure circle" of new data acquisition and processing, which will be accessible via an interoperable and universally accessible data grid.

This is incorporated into a broadly accessible inversion, simulation and data mining toolkit. New knowledge is captured and made widely available via a common Earth Model with research, industry, education and policy portals.

The result is expected to be a wealth of enhanced research opportunities and outcomes, commercial applications, improved policy design and community education, which will lead to the next generation of data acquisition and modelling processes, and the solving of existing and future issues.

Dr Etheridge said the system "is designed to put Australia at the forefront of geoscience research and applications for a generation, and thereby to enhance Australia's wealth through improved and sustainable discovery, development and management of its minerals, energy and groundwater assets".

"It will also provide a step-change in our ability to spatially map Australia's location and internal deformation, in particular enhancing our ability to contribute to natural hazard prediction and management in our own country as well as for our immediate neighbours.

MICHAEL AMENDOLIA

"Further, AuScope will contribute significantly to all aspects of Australia's environmental monitoring and management, and provide a platform for innovative commercial developments in the spatial, minerals, energy and water industries," said Dr Etheridge

Capabilities

AuScope includes a range of infrastructure components [Figure 1] that will help us to understand the evolution and structure of our continent. It comprises subsurface earth imaging, earth composition and age measuring, a Virtual Core Library (led by CSIRO in collaboration with State agencies), a National Geospatial Reference Framework, the AuScope Simulator, and a cyberspace infrastructure known as AuScope Grid.

All these elements of the AuScope infrastructure system are designed to work towards building, refining and the continuing enrichment of a live, online, four-dimensional Earth Model for the Australian continent. The vision is for the Earth Model not only to serve the needs of geoscience specialists but to be as accessible, informative, user-friendly and attractive to non-specialists as Google Earth has become.

Changing culture

One of the architects of AuScope is CEM's Principal Software Engineer, Dr Robert Woodcock, who said the system was a way not just to change technical information sharing but also alter the way we think.

"AuScope is intending to change our culture and the way we interact," he said. "It is adopting and developing many of the technologies coming out of the SEEGrid community in order to achieve the interoperability goal required by its systems view.

"The social change is probably the most challenging aspect rather than the technology. Most researchers and research organisations are not used to considering what happens to their data or service once it leaves their office. AuScope will challenge us all to consider what others might do with the information and services we have.

"For example, when geochemists do their analyses and publish their results into a journal that's effectively the end of their job. Meanwhile geophysicists or numerical analyst may be writing a system and are in desperate need of that information. AuScope will provide the infrastructure to bridge the gap between the two and will encourage both parties think differently about how to interact across many scientific and industry disciplines," said Dr Woodcock.

This system's wide-view approach has led to cooperative activities such as the geotransects programme where multiple types of data are acquired for the same region simultaneously. Seismic data acquisition is accompanied by sample collection for geochemical characterisation and isotopic dating. This assists geoscience research by allowing new types of analysis to be performed on the combined data types.

The scientific benefits of the AuScope infrastructure reach beyond the exploration and mining industries. In particular, the National Geospatial Reference Framework will result in substantial improvements to spatial location accuracy and precision across much of the continent. This has important implications for a wide range of scientific and commercial applications, including in agriculture, transport, environmental monitoring and climate change research.

model, beginning with the Research Science Portal, which will be constructed under the NCRIS program.

LINK

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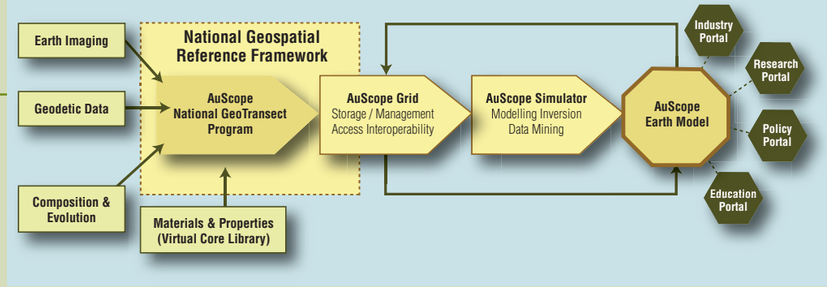
AuScope for Beginners



National GeoTransects Program and National Geospatial Reference Framework are the main data acquisition infrastructure development programs whose data will provide the main contribution to broader research and applications communities.

Earth Imaging enables researchers to build an increasingly clear and rich picture of the subsurface. The Virtual Core Library progressively builds a high-resolution image of earth materials and properties for the upper 1-2km of the Australian continent. Earth Composition and Evolution offers improved access and a national data management and delivery infrastructure to understand better the geological formation of the Australian continent.

AuScope Geospatial Framework provides the high-resolution spatial platform for all of the other earth observations and enabling the next generation of research in geodesy, short-term continental deformation, seismic hazard analysis and the monitoring of environment-induced change.

AuScope Grid comprises distributed data storage hardware, high bandwidth network links, data management protocols, middleware and software, and will take advantage of existing developments in SEEGrid, the APAC Grid Project and EarthBytes.

AuScope Simulator is a toolkit of simulation, modelling, inversion and data mining tools, underpinned by parameters provided through "Earth Composition and Evolution". It enables researchers and applied geoscientists to understand how Australia and its minerals, energy and groundwater assets evolved, and how better to predict, explore for, inventory and manage these assets.

AuScope Earth Model is the evolving and ultimate knowledge infrastructure component of AuScope. The core will be a progressively enriched 3D model of the subsurface composition, structure and resource asset inventory of the Australian continent. This will include the modern evolution of the state of the continent.

The evolutionary history of the continent over its 4 billion year life will be added as a series of times slices to build a 4D model. A key to access to the AuScope Earth Model will be the development of a series of web portals for input into and intelligent output from the model, beginning with the Research Science Portal, which will be constructed under the NCRIS program.