

Dr Stuart Minchin, Chief of Environmental Geoscience Division, Geoscience Australia

Accounting for a dynamic planet: GNSS, precise positioning and dynamic datums

Abstract:

Access to accurate positioning is better than it used to be, there has also been a decrease in the time taken to acquire positional data – it is now almost real-time. There is also an ever-growing number of positioning systems, known as GNSS.

Australia sits in an overlapping area of many positioning systems, meaning that 35 positioning sets are available at any one time. The Satellite-Based Augmentation System (SBAS) has existed for a number of years, but coverage is lacking in the Southern Hemisphere. The Australian Government is funding a trial project in which covers Australia, New Zealand and parts of South Asia, the aim is to develop very good positional accuracy without having to set up base stations. This can be used in many sectors such as agriculture, marine, and autonomous vehicles.

GPS specifications currently provide accuracies of around 5 meters, this will be reduced to under 5 cm when the third phase of SBAS comes online. This will create problems as Australia is currently shifting 7 cm a year due to tectonic movements, the Australian Government is using dynamic datums to account for this.

Notes to support the presentation:

- There are opportunities in front of us for positioning, and forcing us down the route of dynamic datum.
- Issue is access to accurate positioning, however is better than it used to be. This includes the time needed to acquire accurate positioning. Now close to real time. The number of positioning applications are increasing.
- Importantly we are used to GPS. GNSS is giving the ability to exploit multiple positioning services.
- Australia sits in the 'hot zone' of many GNSS systems. All GPS networks cover over Australia. The map shows all the systems which cover Australia. At any one time, 35 positioning satellites are available. The USA has only GPS.
- There has been a lot of work on the benefits for users.
- By 2019, there is expected to be a GNSS unit for every person on earth.
- There will be a time when mobile positioning is as accurate as high-resolution positioning systems.
- Australia benefits by being able to provide a correctional system. This can be radio or internet, but tested through SBAS.
- Satellite-Based Augmentation System (SBAS) has existed for a number of years, but coverage for the Southern Hemisphere is lacking.
- There needs to be more capability to cross-reference as they won't be able to import technology.
- Government has funded SBAS trial for the region, covering Australia, New Zealand and South Asia. This will allow corrections to be sent out to anyone. There is significant investment. There are many opportunities that are active today.
- With SBAS you'll get very good positioning without having to set up base stations. This has many advantages:

- Agriculture is huge in Australia. The use of self-driving tractors is growing, this leads to accurate seeding and best use of fertilisers and watering.
- Ports can use the positioning services to accurately self-dock ships. Each 10cm of water under the keel of a ship can add tens of millions of dollars of inputs.
- Cars and autonomous system. The ability to position accurately within the lane will enhance intelligence transport.
- Safety of life systems in integrated as it can be determined but the quality of the signal.
- Emergency services are also another use of accurate positioning.
- GPS specifications, typically have 5m accuracy. SBAS 1 will improve to 1-1.5 accuracy; SBAS 2 to under 1m accuracy; SBAS 3 to sub-5cm anywhere in the country.
- Opportunities and challenges. By moving to a dynamic data node. The entire continent moves by 7cm each year. If you use sub-5cm accuracy, positional accuracy needs to be matched with continental drift.