Southern African Space Geodesy:- Towards Developing a Strategic Direction

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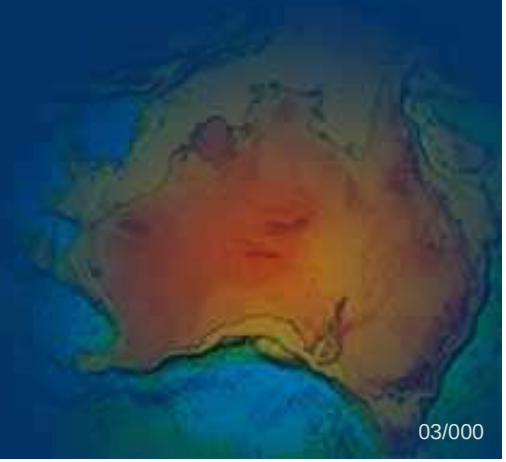
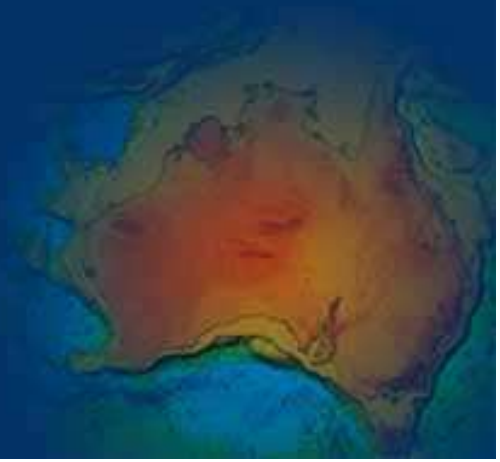


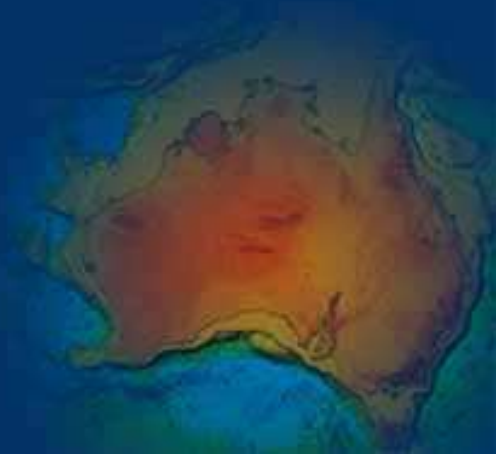
Overview

1. Vision and Goals – what do we want to achieve?
2. Priorities for strategic positioning
3. Priorities through projects
4. Roadmap
5. Outcomes and consequences



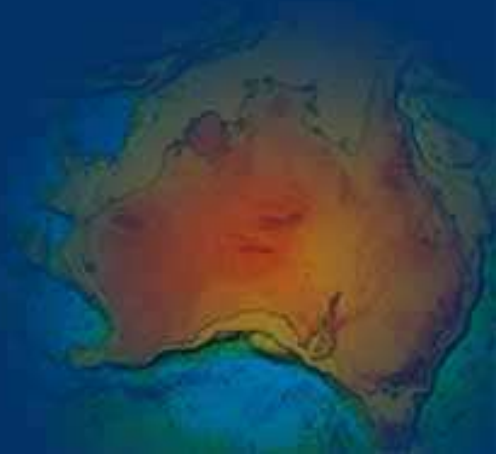
Vision – What do we want to achieve?

- The first point of call in the Southern Hemisphere for all global and regional space geodetic activity.
- The first choice Southern Hemisphere partner for the international space (geodesy) agencies such as NASA, ESA, JAXA, GSI, GRGS, CNES, and others.
- Reliable and Capable



Vision – What do we want to achieve?

- Participate, Influence and Contribute at the global leadership level of the discipline and the International structures and services (IAG, GGOS, ILRS, IGS, others)
- Achieve self-sufficiency and self-reliance for both science, research and development and infrastructure
- Competitive

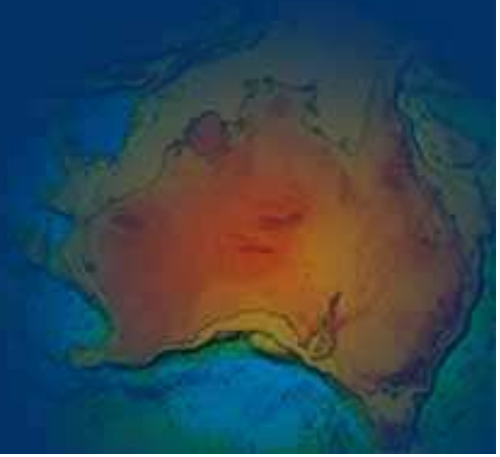


Priorities for Strategic Positioning (for this Vision)

- In addition to establishing an observatory infrastructure for data –
  - Priority to develop an analysis capability and skills for science and infrastructure products – progress beyond an observation platform
  - "In-house" use of all the data (global data sets)
  - Engineering for developing "cutting edge" observing systems and payloads – such as SLR and VLBI systems and components

Priorities

- Priority 1:
  - Develop an analysis capability for all space geodetic data types for contributing to the International Services and “internal” research and development (global change) and national infrastructure:
    - SLR and LLR
    - GNSS
    - VLBI
    - DORIS
    - Satellite Altimetry

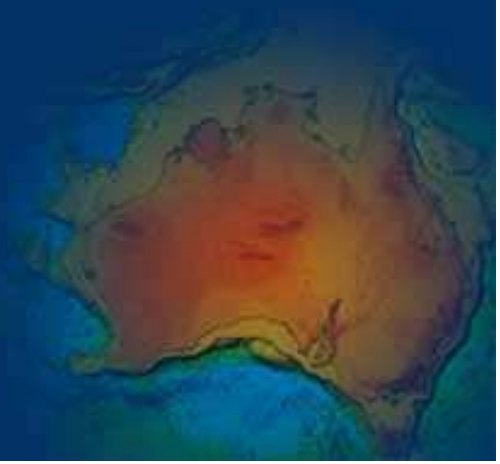


Priorities through Projects

1. Terrestrial and Celestial Reference Frames
   - SLR for the ITRF definition – origin, scale and core network and EOPs
   - VLBI for the ICRF definition, ITRF scale and core network and EOPs
   - GNSS, DORIS for densification of the ITRF and regional geodetic networks
   - Note: need for co-location

Priorities through Projects

2. Satellite Orbit Determination
   - SLR, GPS and DORIS for satellite orbit determination for all space based applications
   - Altimetry
   - Gravity Field
   - Positioning and Navigation
   - Orbit Analysis

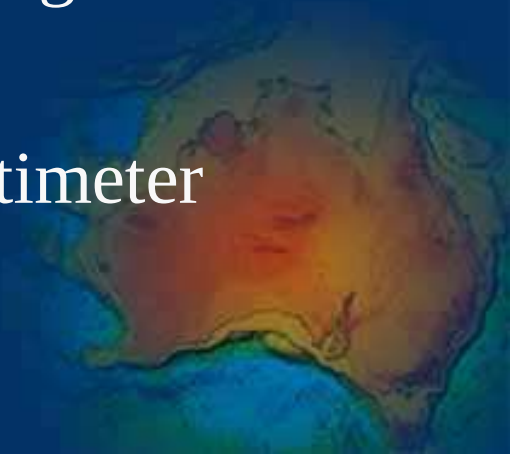


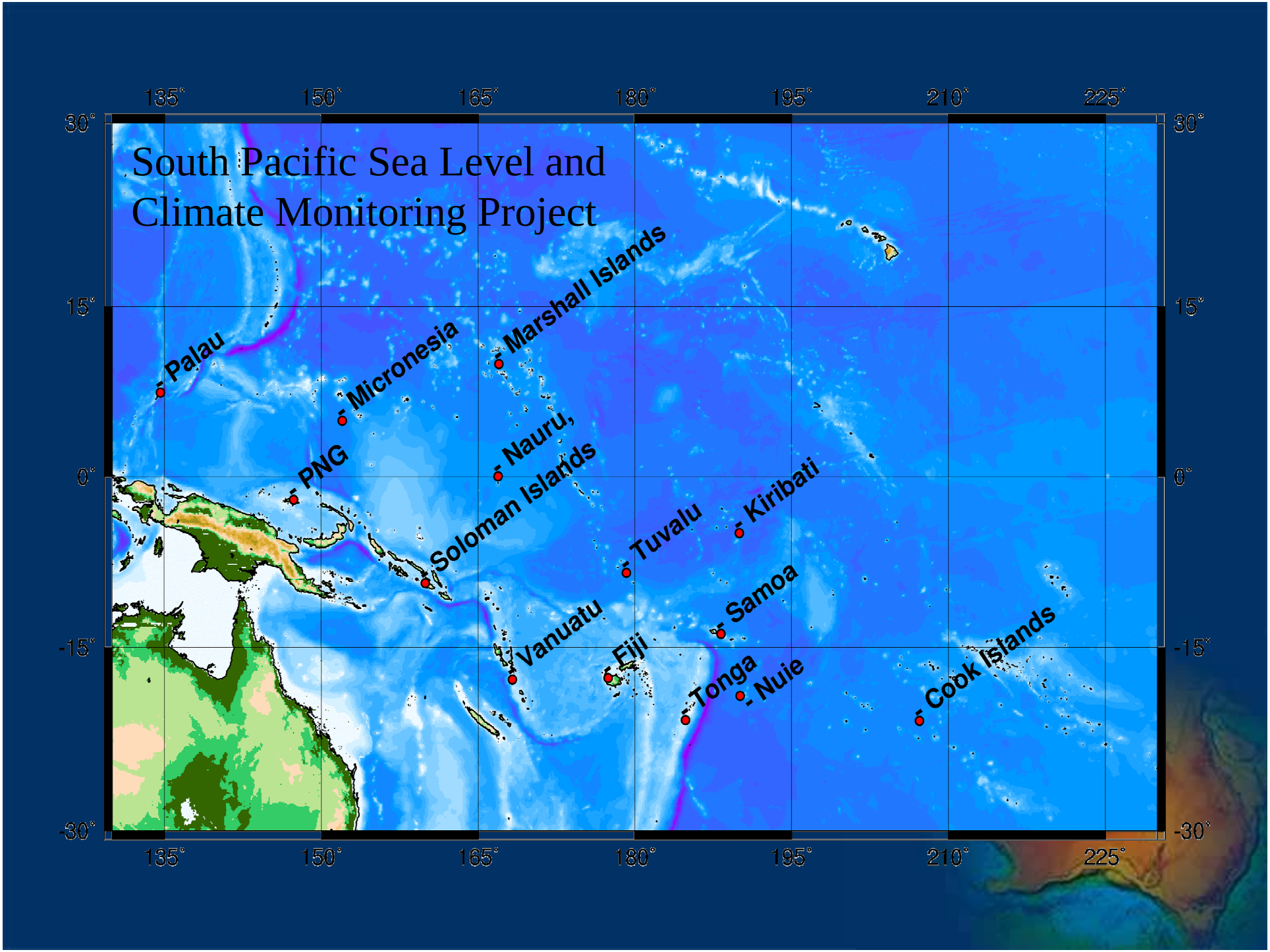
Priorities through Projects

3. Global Gravity Field Determination
   - SLR, GPS, DORIS tracking LEO satellites (+ Grace, Champ, GOCE) for estimating the SH coefficients of the Earth's gravity field
   - Monitor changes in the Earth's gravity field – water storage, mass transport
   - Improved global geiod
   - Satellite Altimetry – marine geoid

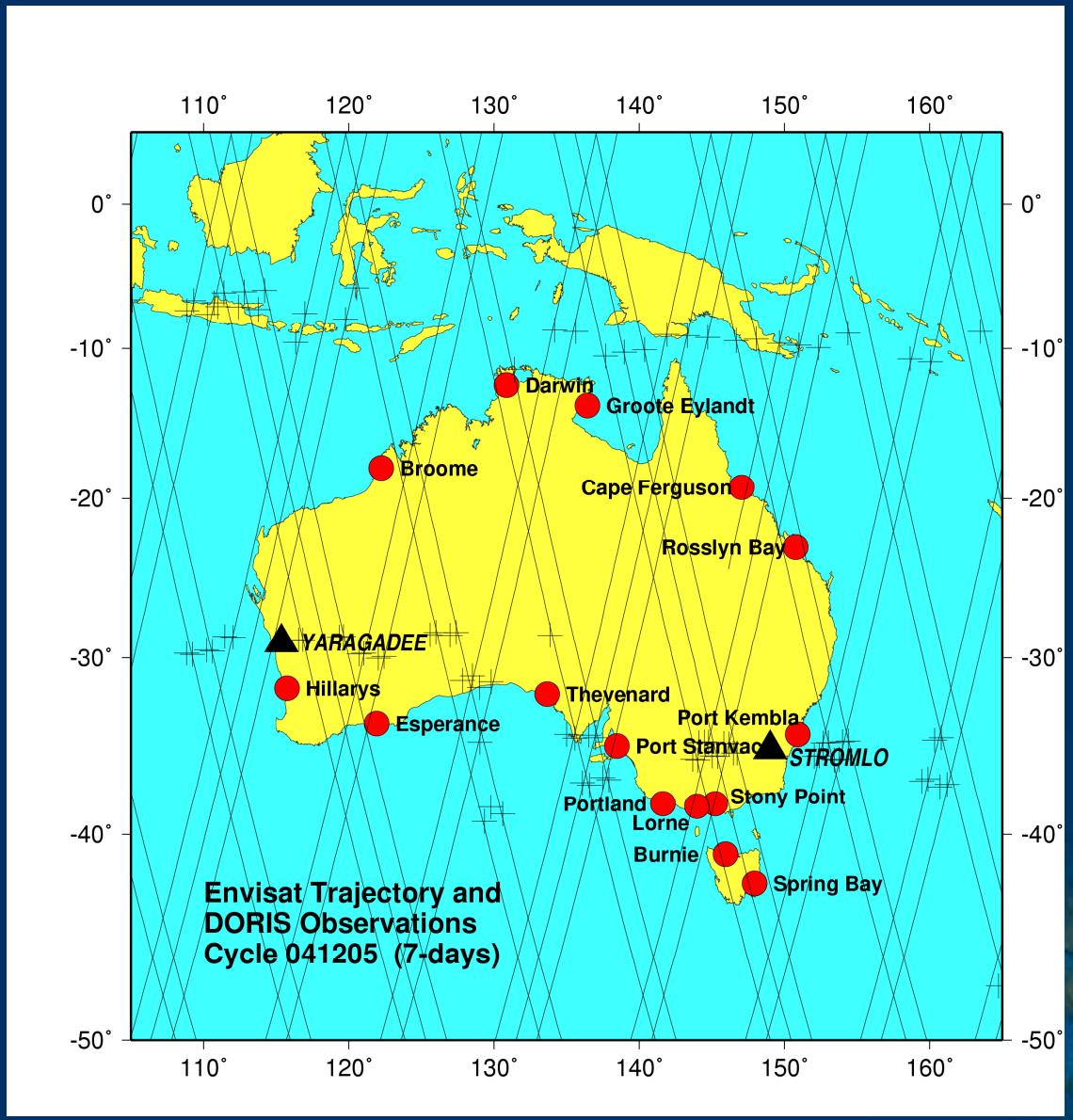
Priorities through Projects

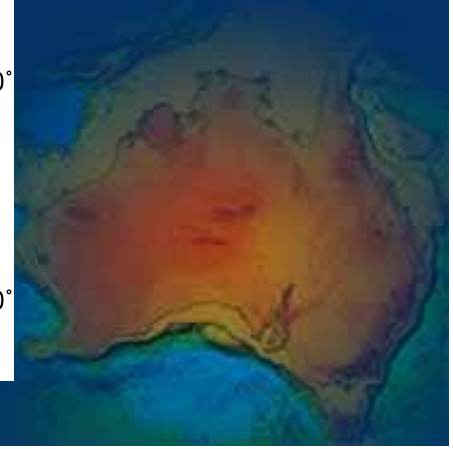
- Absolute Sea Level Monitoring and Climate Change
  - Geodetic Fixing of Tide Gauge Benchmarks
    - GPS at tide gauges
    - Consistent Global Geocentric TRF
    - Monitoring vertical motion at tide gauges
  - Satellite Altimeter Calibration
    - Determine the bias and drift in the altimeter measurements



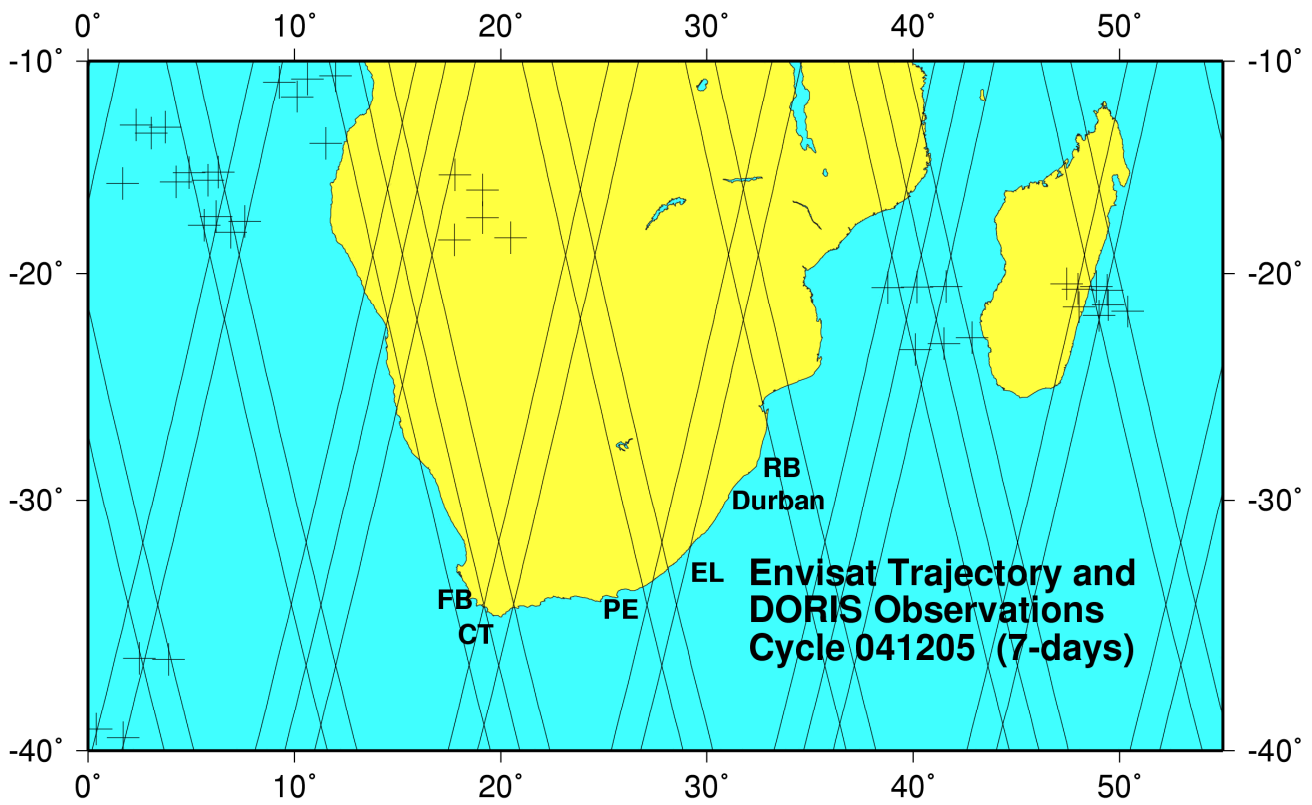

South Pacific Sea Level and
Climate Monitoring Project
135˚
150˚
165˚
180˚
195˚
210˚
225˚
30˚
15˚
0˚
-15˚
-30˚
Palau
Micronesia
Marshall Islands
PNG
Nauru,
Soloman Islands
Kiribati
Tuvalu
Samoa
Vanuatu
Fiji
Tonga
Nuie
Cook Islands

Satellite Altimeter Calibration



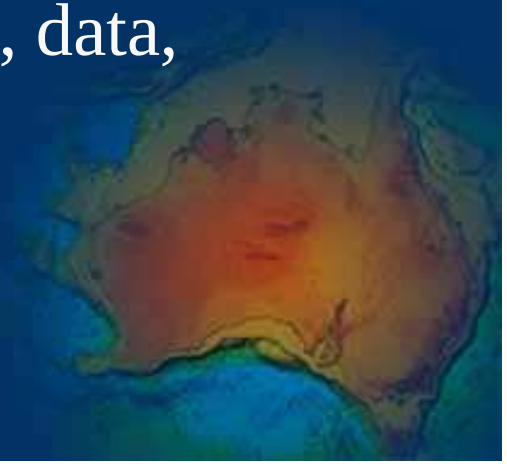


Satellite Altimeter Calibration



Roadmap

1. Develop an analysis capability as a high priority
    1. Obtain from partners (NASA, GRGS) or purchase satellite orbit determination and geodetic parameter estimation software and VLBI processing software
    2. Train “in-house” clearly understanding the satellite geodesy and VLBI concepts, data, ancillary inputs, etc.



Roadmap

3. Replicate analysis products as required by the ILRS, IDS, IVS and IGS Analysis Working Groups and for benchmarking and quality assurance – establish a confidence in the quality
4. Visit partner agencies for refinement of the analysis capability
5. Apply for formal contribution to the AWGs -- establishes a capability and confidence to undertake research.

Roadmap

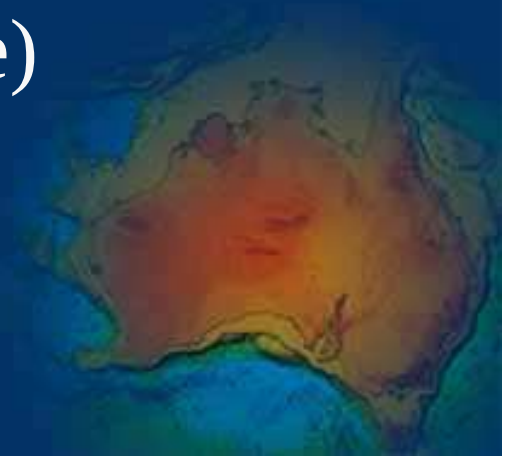
- Education and Training at Universities
  - Provide software tools to universities
  - Use for teaching and research at the graduate level
  - Develop research capabilities, ideas and directions
  - Become self-sufficient as a community.

Outcomes and Consequences

- Progress from a data gatherer / data platform for “external” advanced science and research programs to a provider of knowledge
- Acquired and increasing knowledge and skills will provide the foundation for fundamental reseach and infrastructure development – “in-house”
- Close the gap with the “traditional providers” knowledge – e.g. be able to replicate the NASA Space Geodesy, GRS, or others as a measure of achievement -- strengthen international partnerships

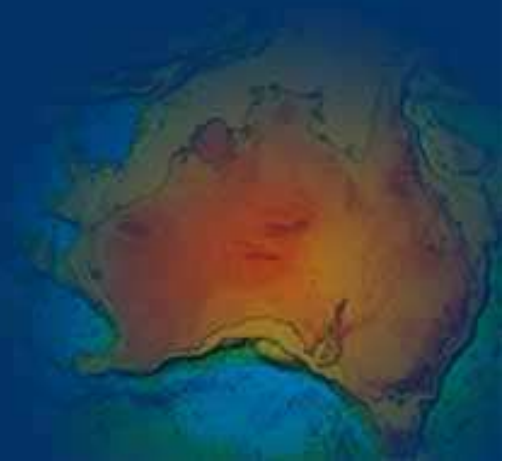
Outcomes and Consequences

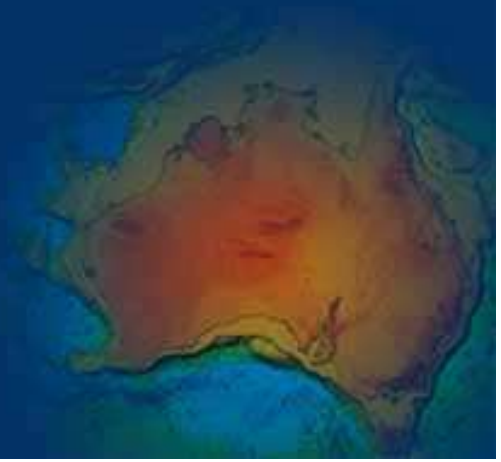
- Basis for leadership – opportunity to input and influence global programs – relevance to Africa – from a position of strength
- Geodetic products (e.g. Satellite Orbit Determination) for any other space based Earth Observation program (Geomagnetism, Oceanography, fundamental science)



Outcomes and Consequences

- Extend, Enhance, Strengthen, Modernise, university under-graduate and graduate studies in Engineering and Geodesy
- Relatively In-expensive





Satellite Altimeter Calibration