

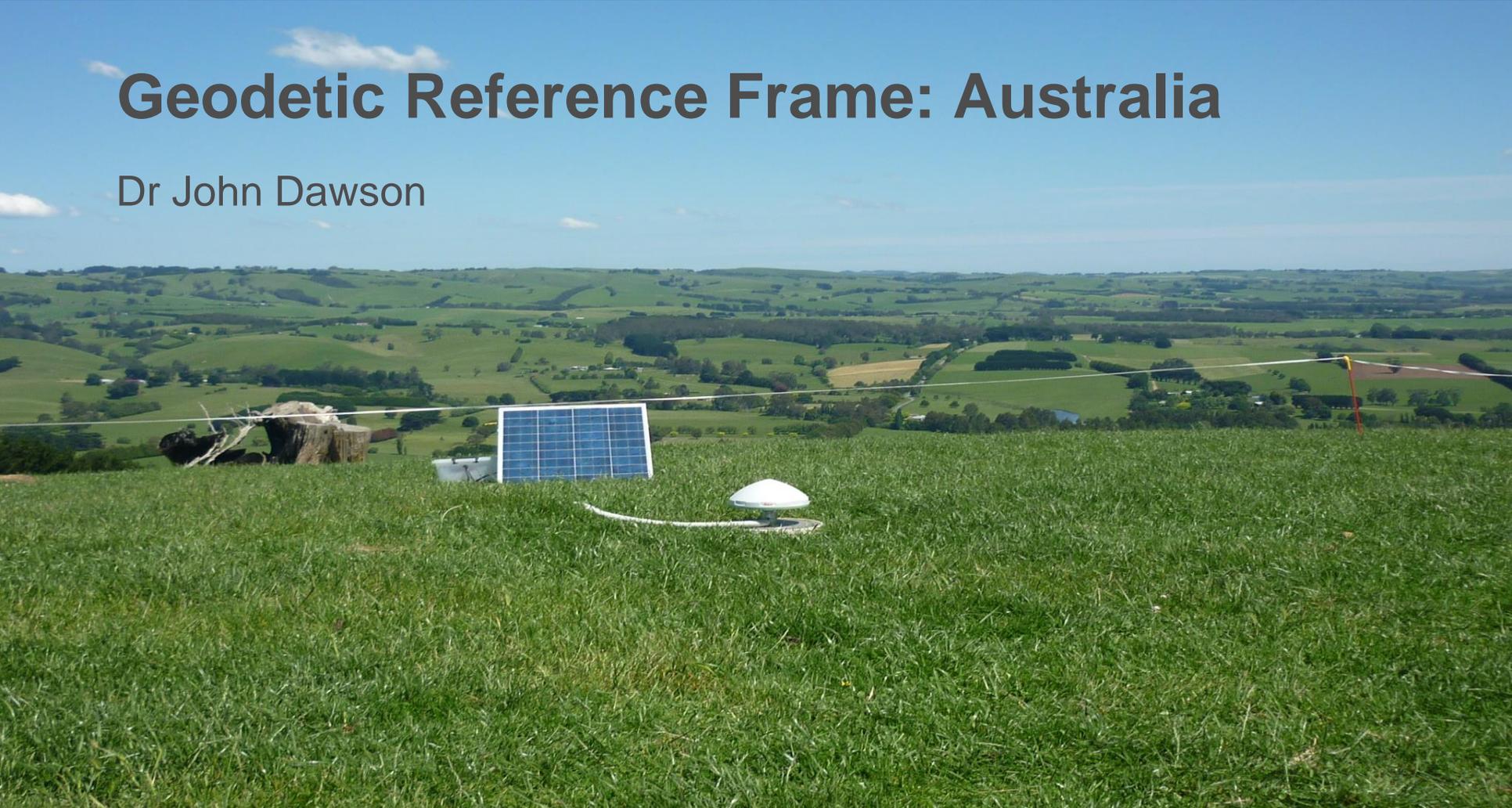


Australian Government  
Geoscience Australia



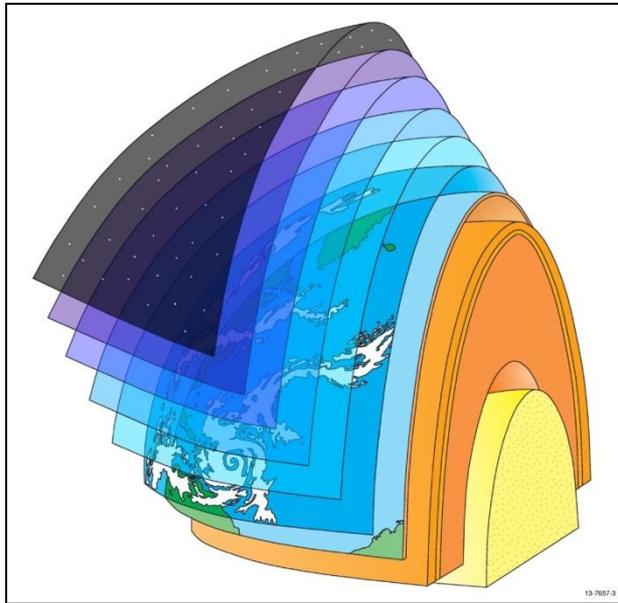
# Geodetic Reference Frame: Australia

Dr John Dawson

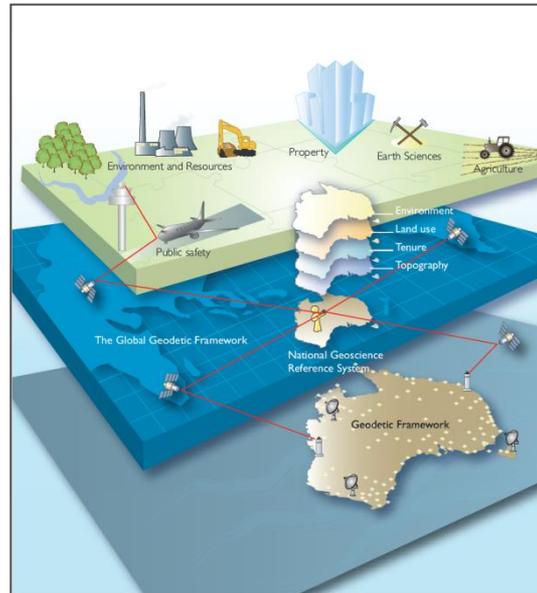


# Australian Geodetic Observing Program

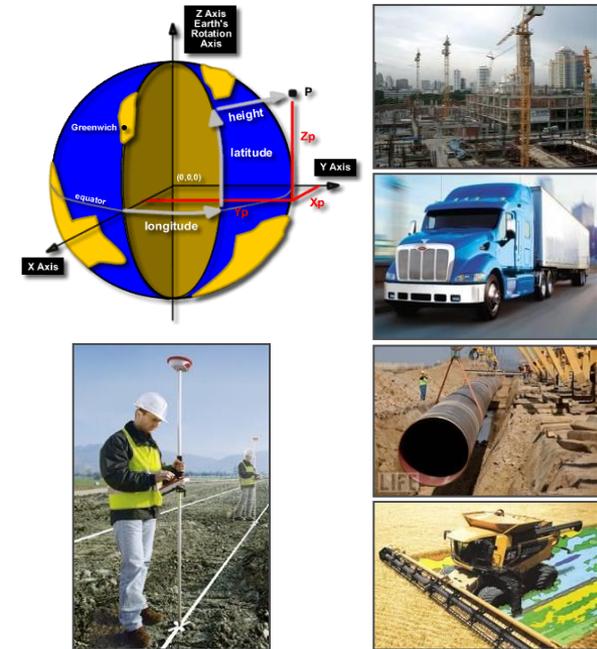
## Earth System Science



## Geodetic Infrastructure

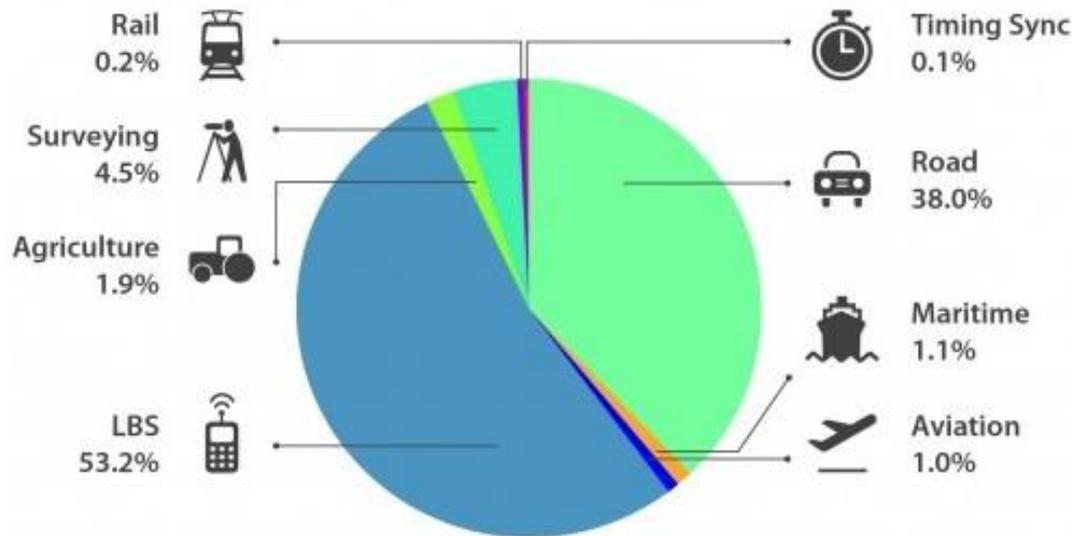


## Societal Applications



# Global Navigation Satellite Systems (GNSS)

## GNSS Market Report 2015



➤ 1 GNSS device per person on the planet by 2019

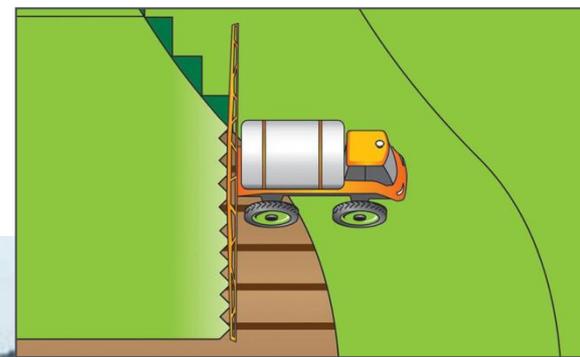
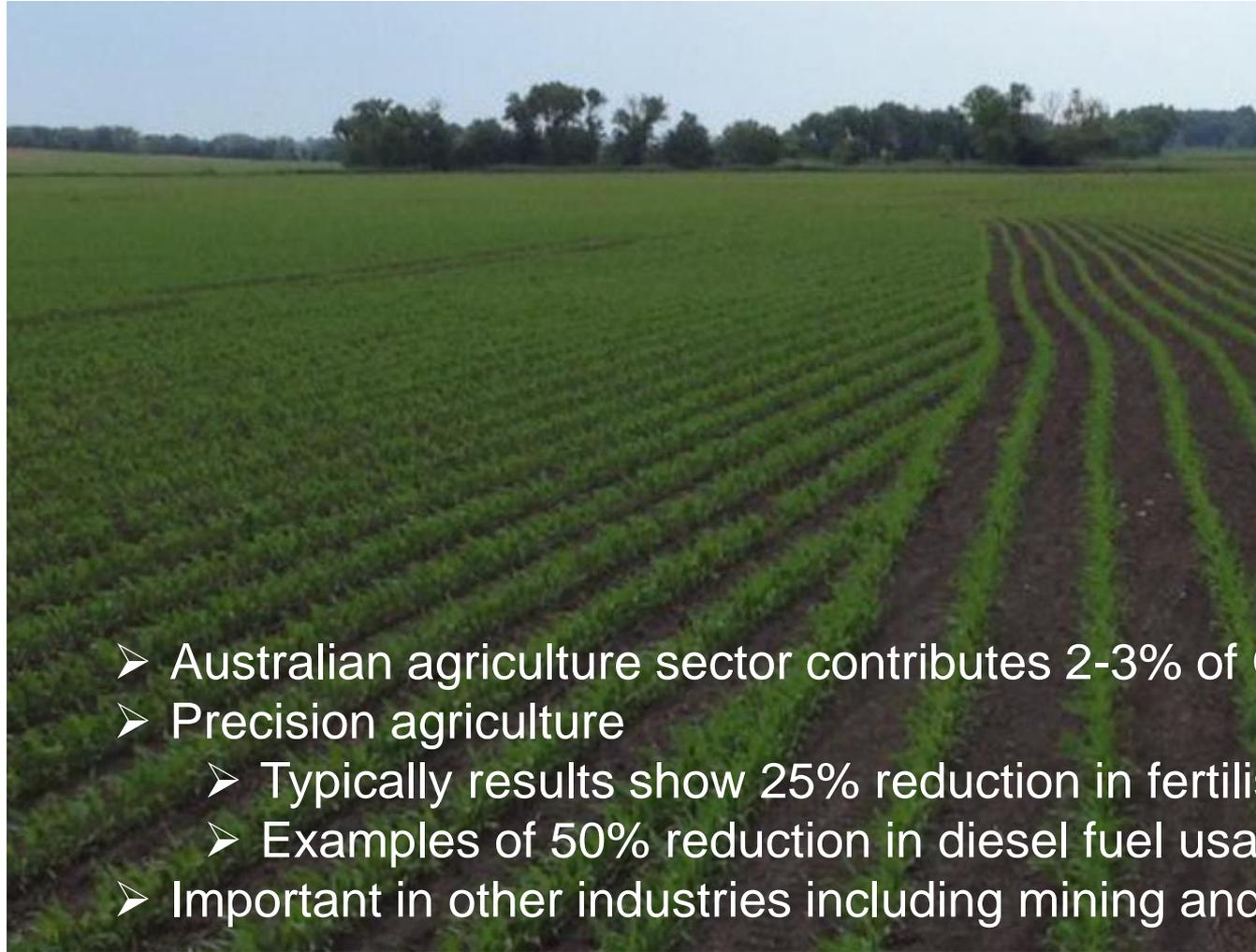
➤ App downloads that rely on positioning will reach 7.5 billion by 2019 (2.8b in 2014)

➤ High-end Multi GNSS smartphones will replace some specialised devices

Source: Cumulative Core Revenue (GNSS Chipsets) 2013 - 2023 (European GNSS Agency, 2015)

<http://www.gsa.europa.eu/market/market-report>

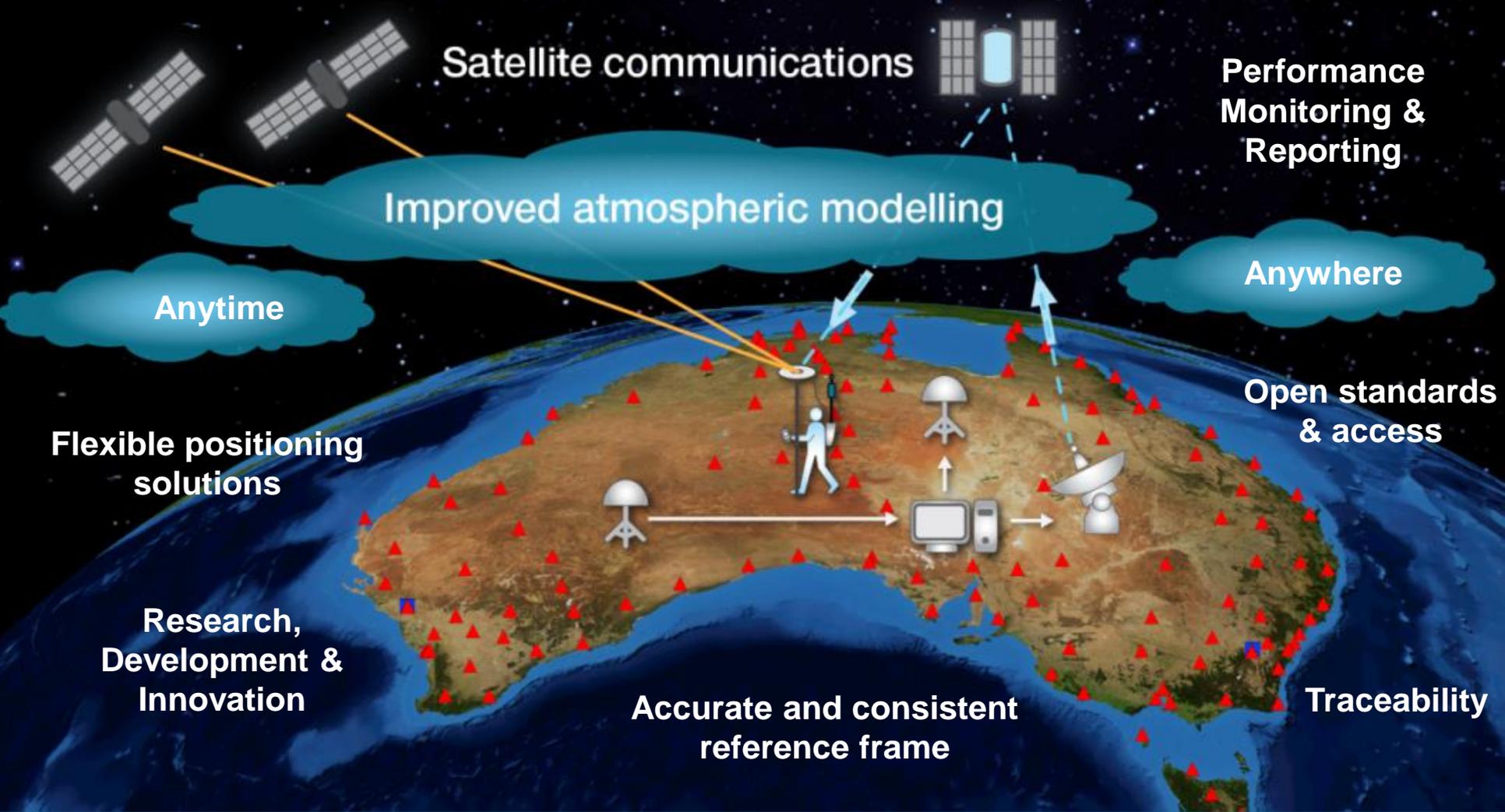
# Geodesy for Agriculture



- Australian agriculture sector contributes 2-3% of GDP
- Precision agriculture
  - Typically results show 25% reduction in fertiliser
  - Examples of 50% reduction in diesel fuel usage
- Important in other industries including mining and geospatial

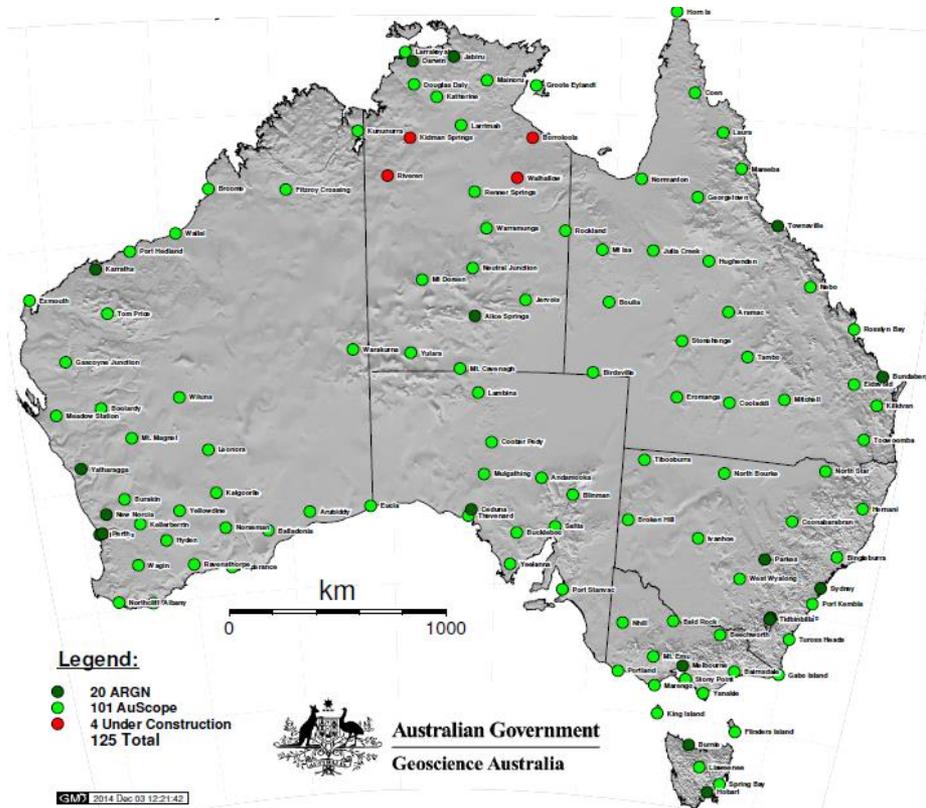
Images: Tim Neale, *Precision Agriculture*, 2015

# Australia's National Positioning Infrastructure

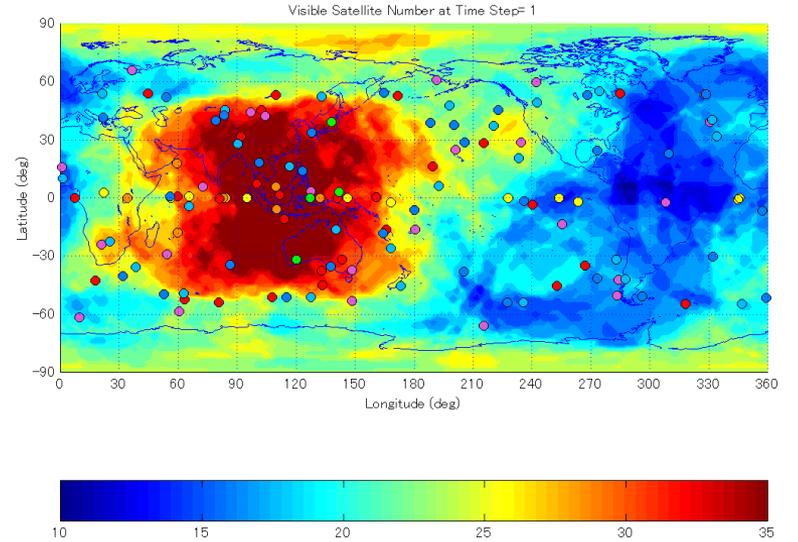


# GNSS

## ➤ New Australian GNSS network



## ➤ Australia in the GNSS 'hotspot'

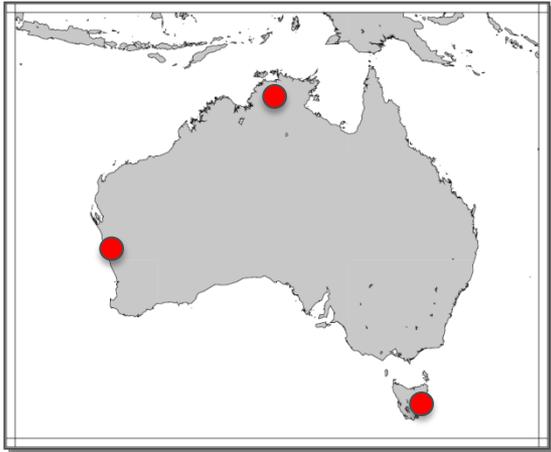


# VLBI and Satellite Laser Ranging (SLR)

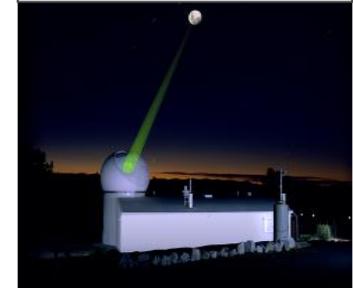
VLBI



VLBI Array



SLR



SLR



- VLBI: 140days/year
- VLBI: broadband receiver development
- SLR: two stations in the top 5 of ILRS network



**GNSS**

**Beidou**

**SLR**

**DORIS**

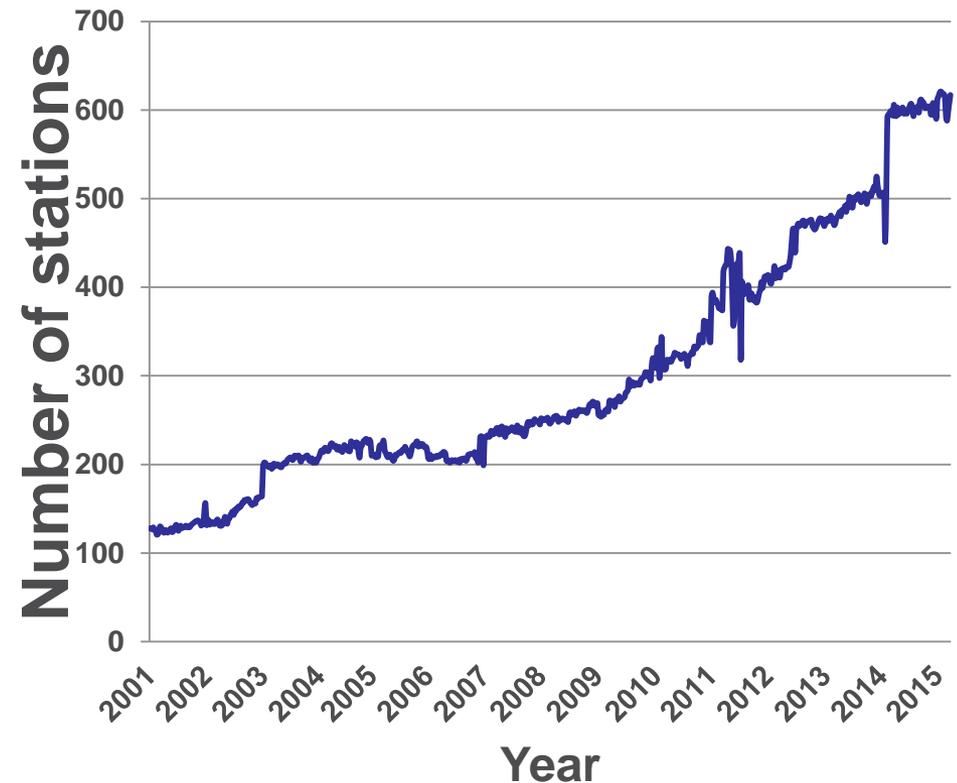
**VLBI**

**Gravity**

**Yarragadee Geodetic Observatory, Western Australia**

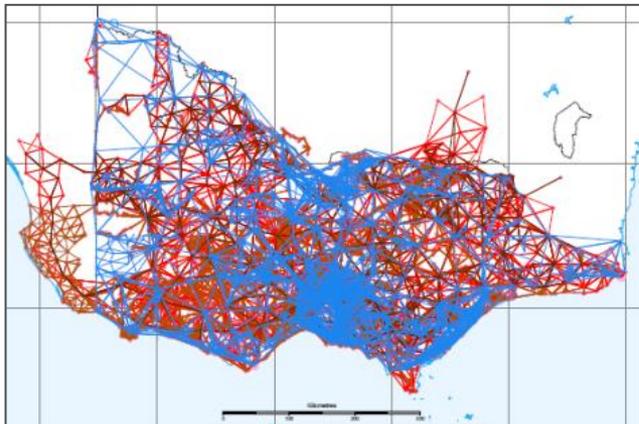
# Regional Contributions

- Asia Pacific Reference Frame (APREF)
- 600+ stations, 28 Countries, 4 analysis centres
- Geoscience Australia central bureau

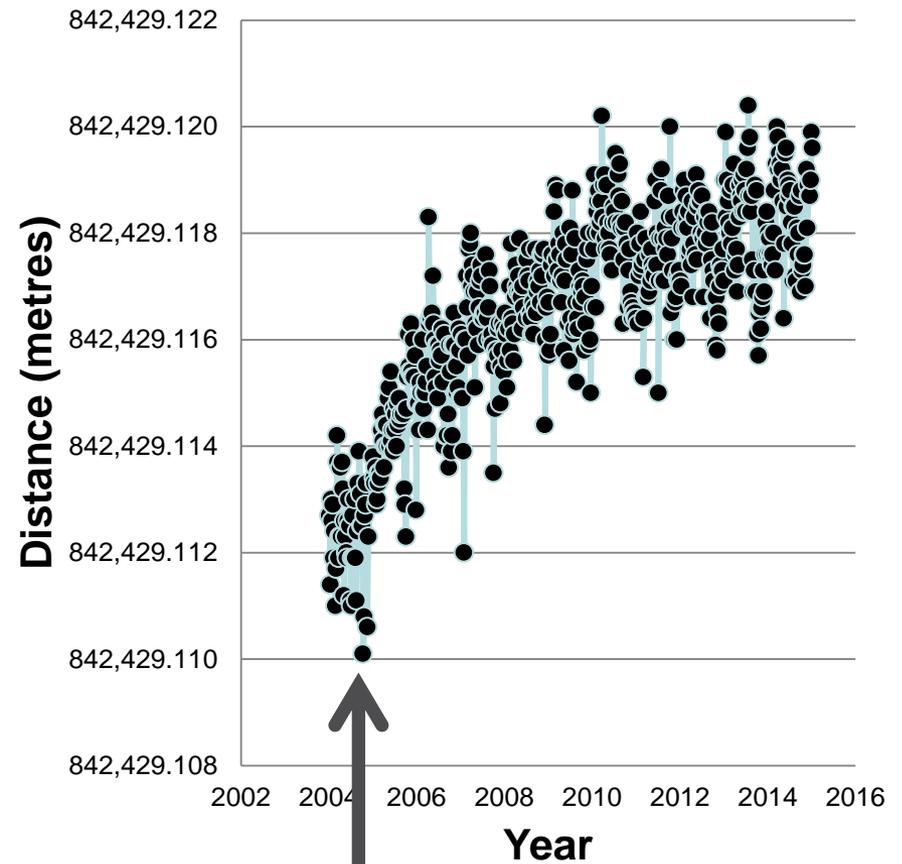


# New National Datum

- Modernisation of the Australian datum
- Improved alignment to ITRF
- New static datum from 1 January 2017 (GDA2020)
- ITRF based datum from 1 January 2020 (dynamic)



## Post-seismic Deformation Distance between Hobart (HOB2) and Canberra (STR1)

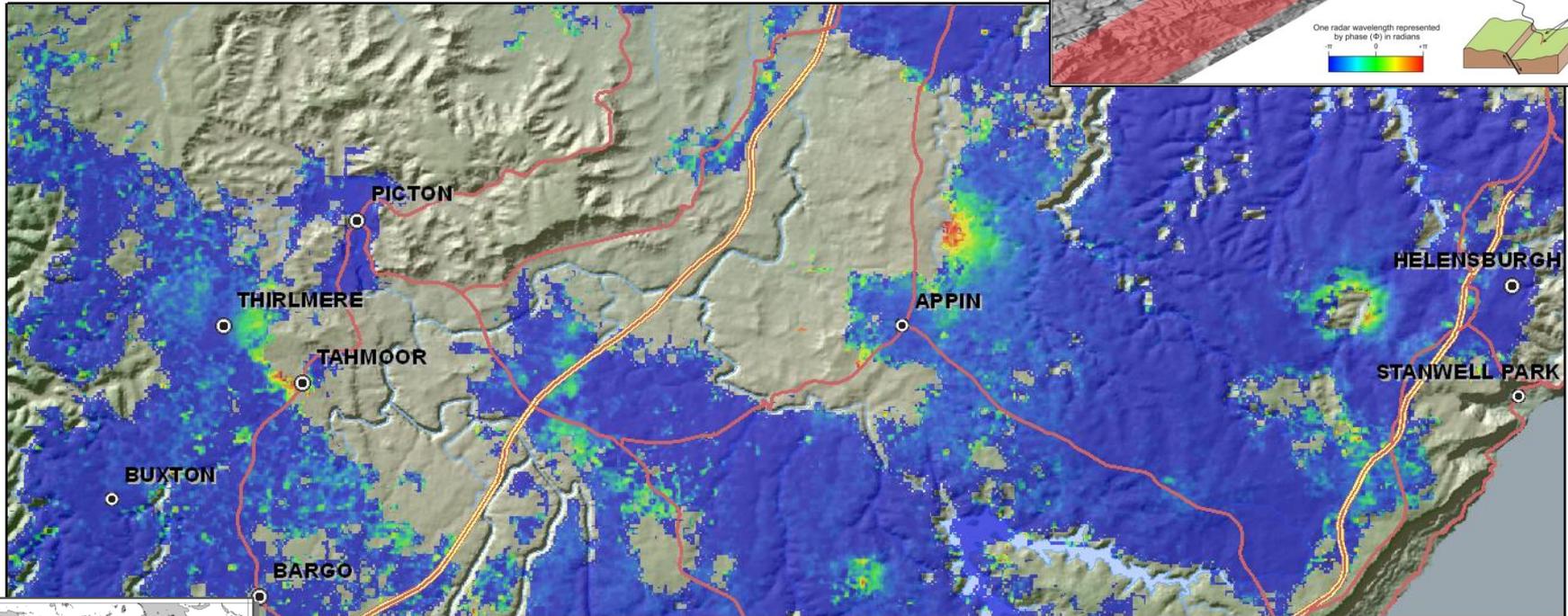
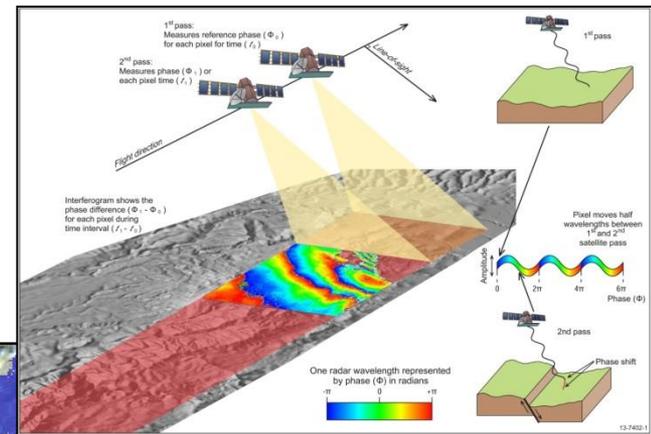


Macquarie Island earthquake

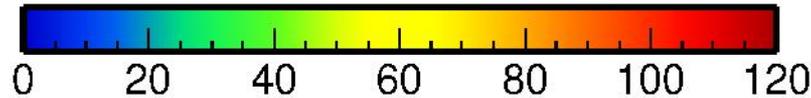
# Surface Deformation from InSAR

South Sydney basin, NSW

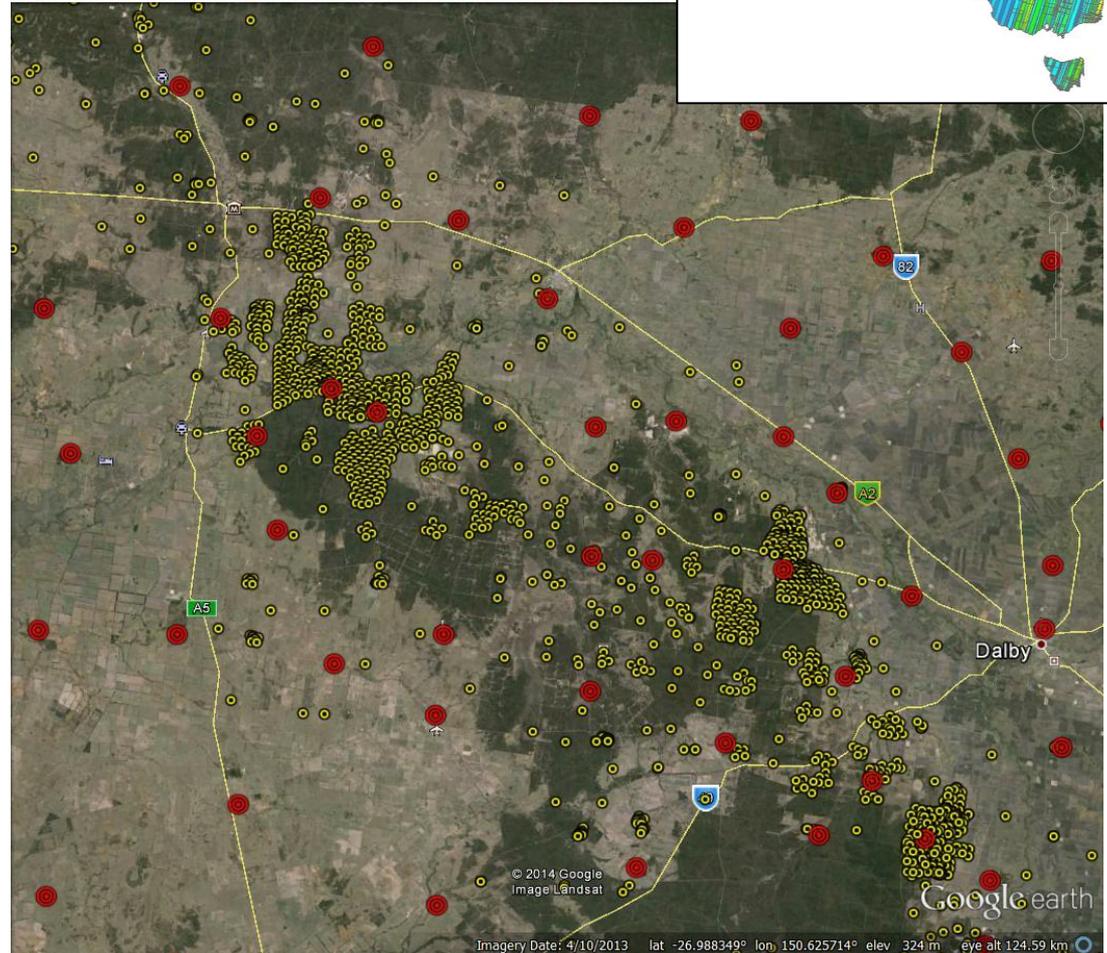
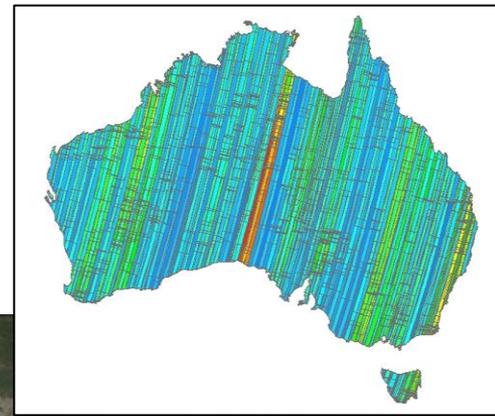
19-04-2010



Line of Sight Displacement (mm)



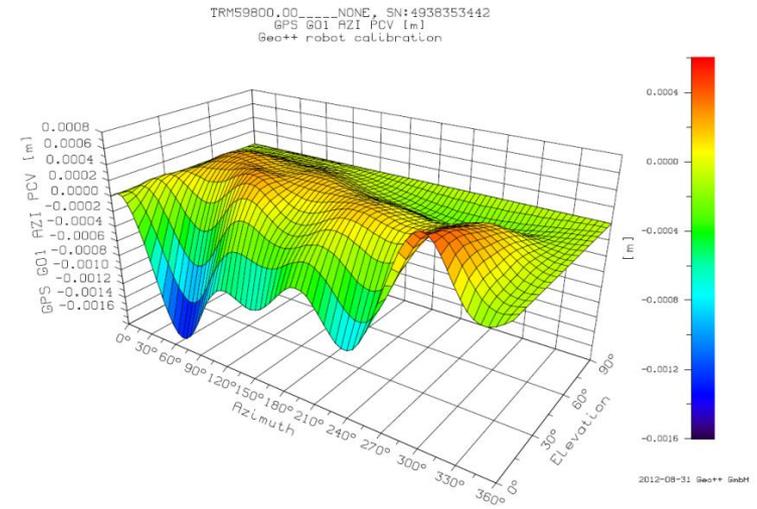
# Combining GNSS and InSAR



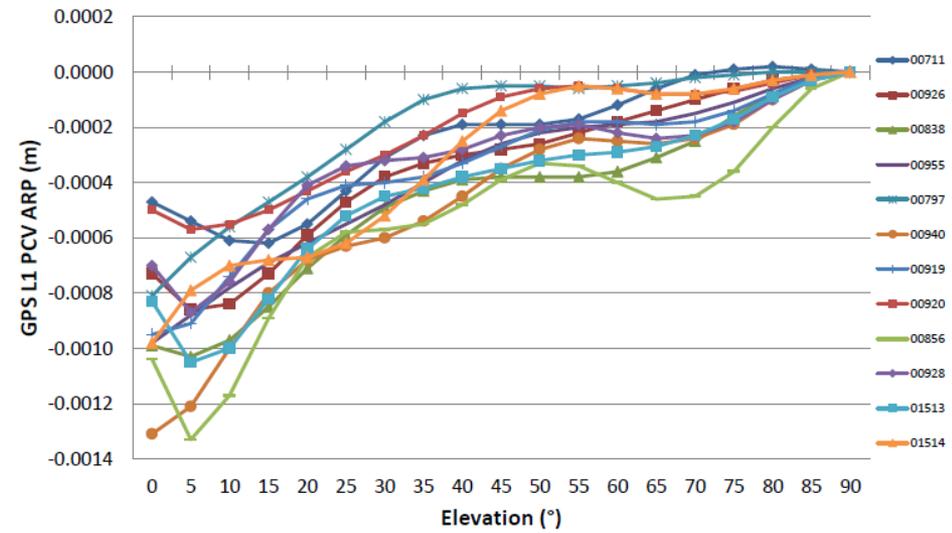
# GNSS Antenna Calibration



- Inter-comparisons completed w.r.t. Geo++ and Bonn anechoic chamber
- Repeatability of calibration within +/- 0.5mm for GPS L1 and +/- 1.0mm for GPS L2 w.r.t. GEO++ calibrations
- Extension to other GNSS underway



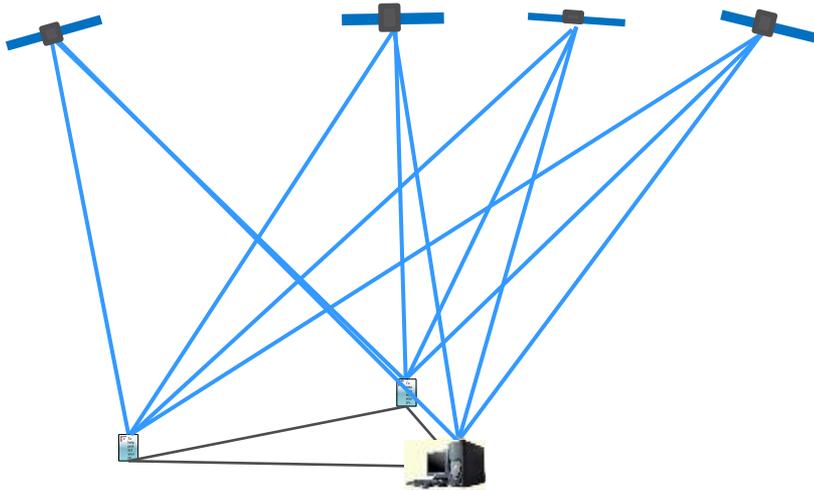
JAVRINGANT\_DM NONE difference from IGS type mean for GPS L1



Source: Riddell et al 2015

# Australian GNSS Software

- Analysis Centre Software Development underway
- Support GNSS integrity monitoring and other products
- Ambiguity resolved PPP (PPP-RTK)



- SV Orbits
- SV Clocks
- Un-calibrated Signal Delays (USDs)
- Inter System biases
- Troposphere
- Ionosphere
- Daily Earth Rotation Parameters
- Daily/Weekly Coordinates

# Final Comments

- GNSS antenna calibration capability developed
  - National InSAR deformation map to be derived
  - VLBI array will continue to operate at 140 days/year
  - New VLBI broadband receiver is being developed
  - New GNSS analysis software will ultimately contribute to IGS as an analysis centre
- 
- Significant investment in geodetic infrastructure in Australia recognising the importance of satellite positioning to both **science** and **industry**



**Australian Government**  
**Geoscience Australia**



# Geodetic Reference Frame: Australia

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