ICSM
INTERGOVERNMENTAL COMMITTEE ON SURVEYING & MAPPING

Next Generation Australian Datum

Permanent Committee on Geodesy, ICSM

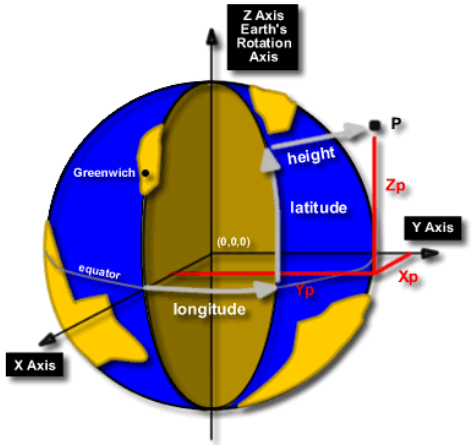
Presentation: Next Generation Australian Datum

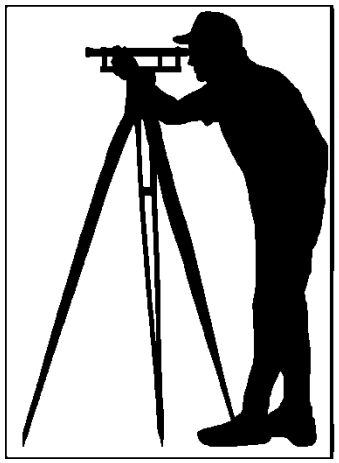
The future of the geospatial sector

The Geocentric Datum of Australia 1994 (GDA94)

Progress towards datum modernisation

The Changing World of Geospatial





Precise coordinates for and by the masses (no monopoly for surveyors anymore)

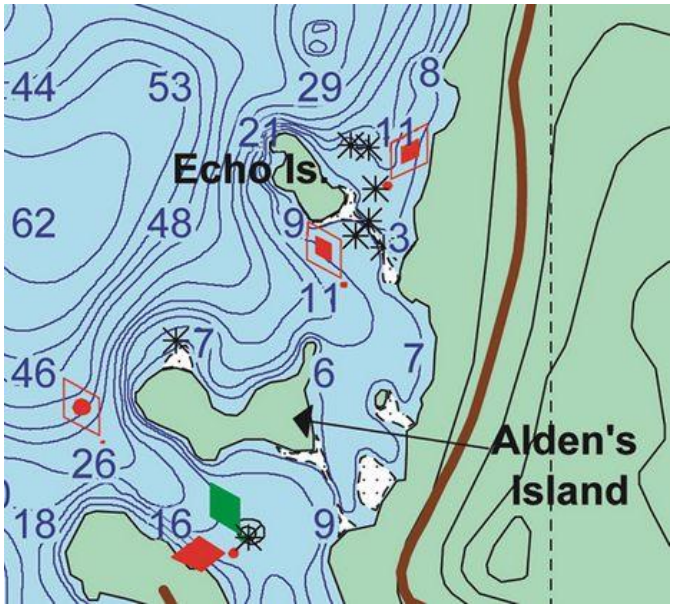
The Changing World of Geospatial

Cheaper geodetic receivers

The Changing World of Geospatial

Fewer Surveyors

The Changing World of Geospatial



Big data

Data poor

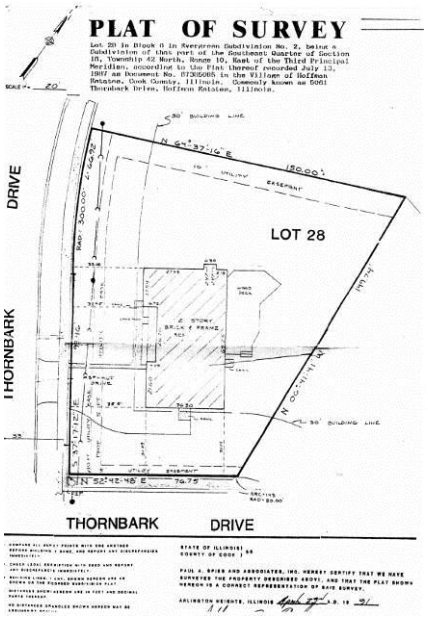
Data rich

The Changing World of Geospatial

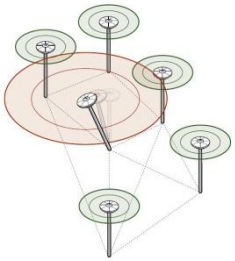
Precision positioning will contribute 2.1% of Australia's GDP by 2030

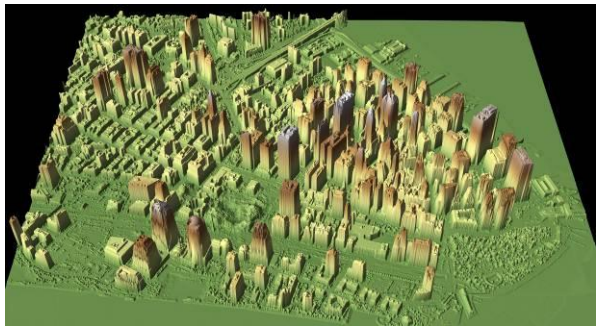
Automated mines, driverless cars, UAVs

The Changing World of Geospatial



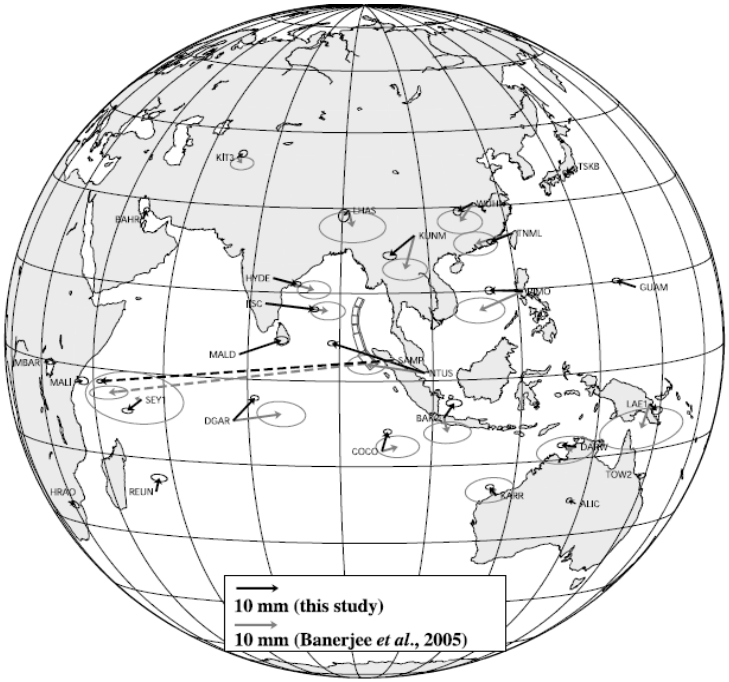
Expectation of seamless interconnection in 3D





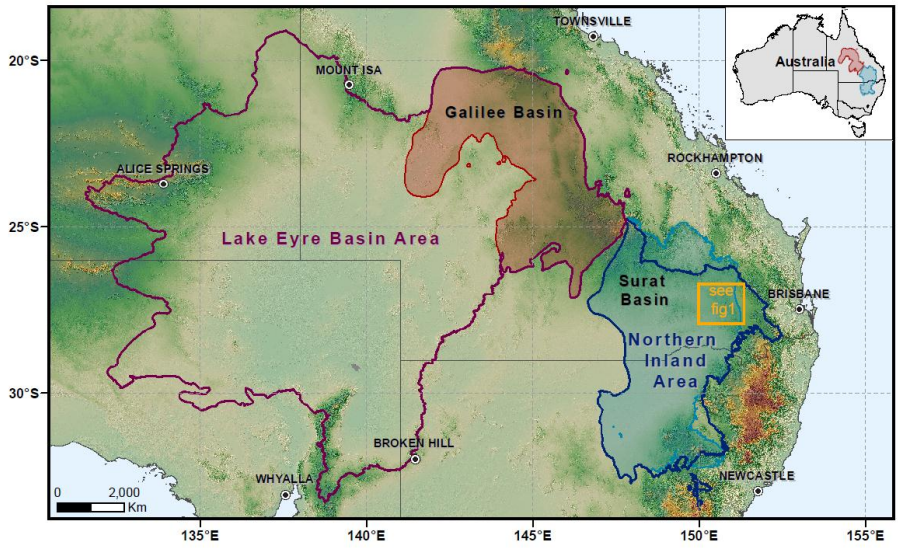
The Changing World of Geospatial

Recognising that the Earth is dynamic



From: Kreemer et al 2006

The Changing World of Geospatial



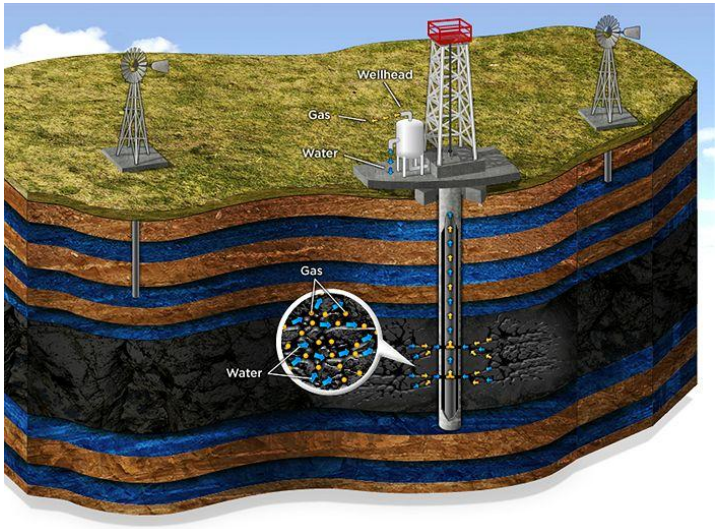
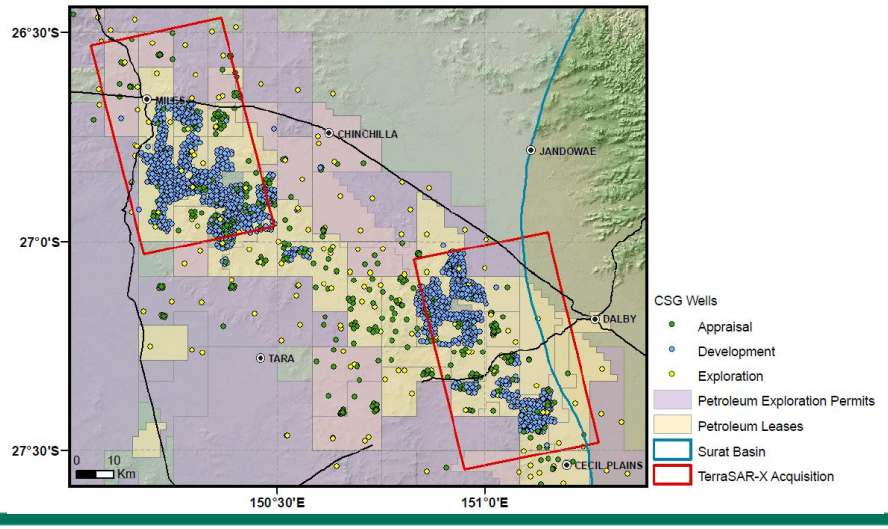
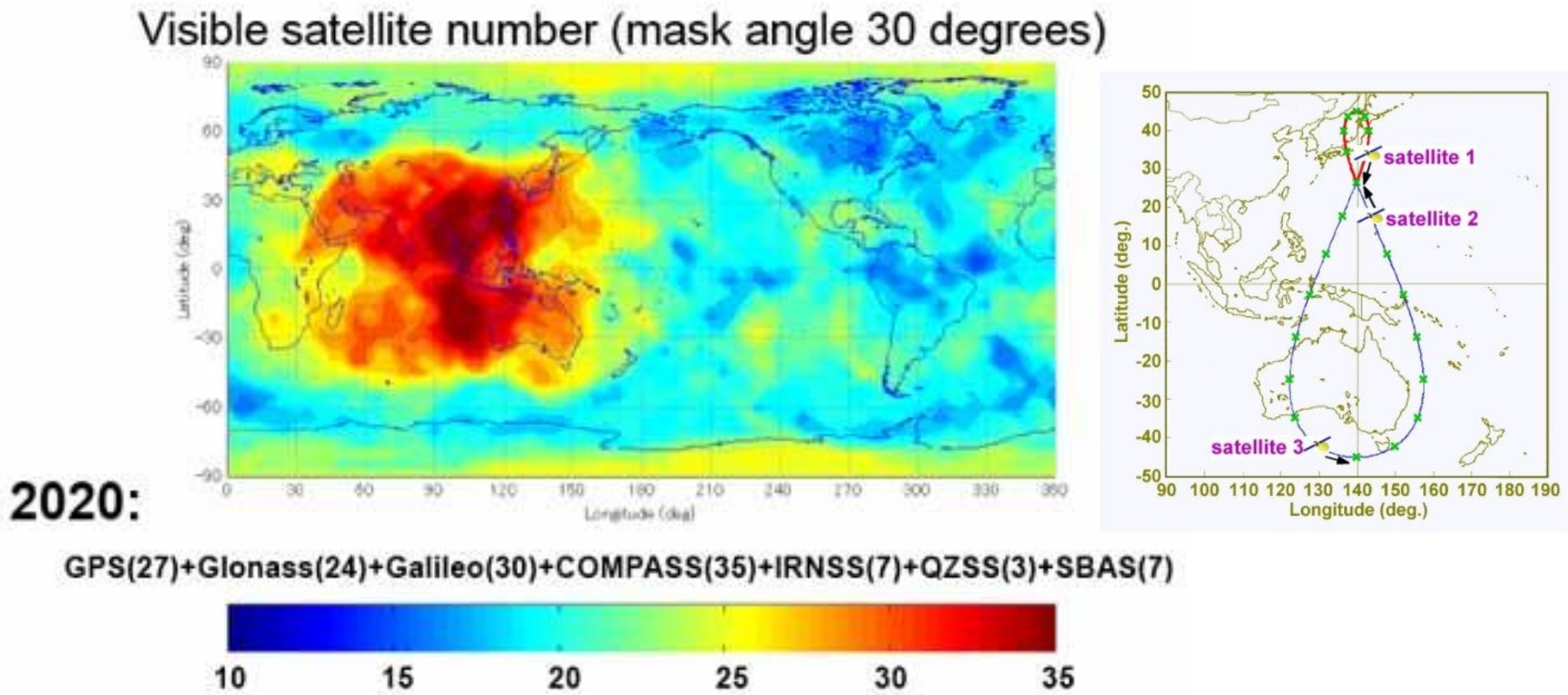


Fig 1: InSAR Capability Study - TerraSAR-X Data Acquisition Areas



The Changing World of Geospatial

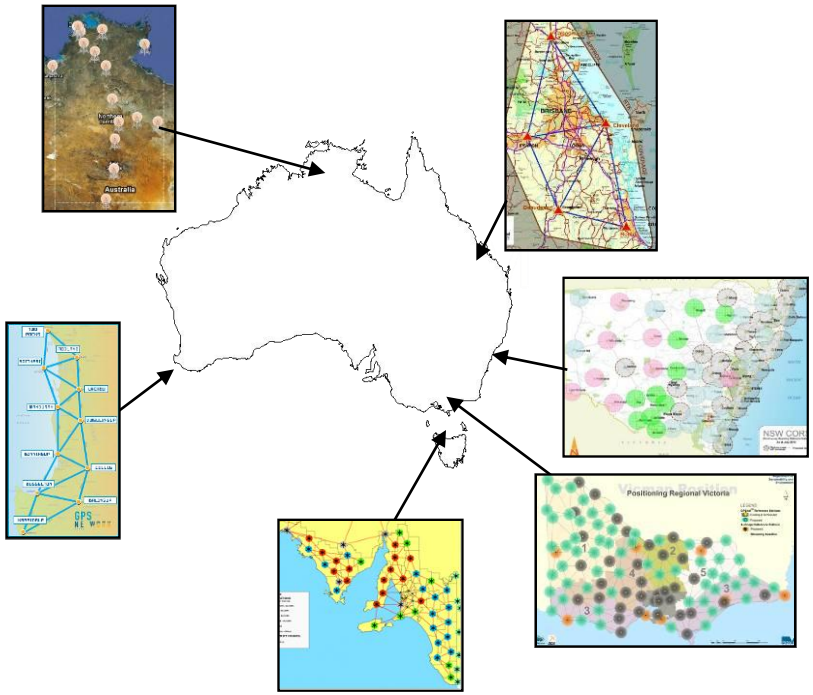


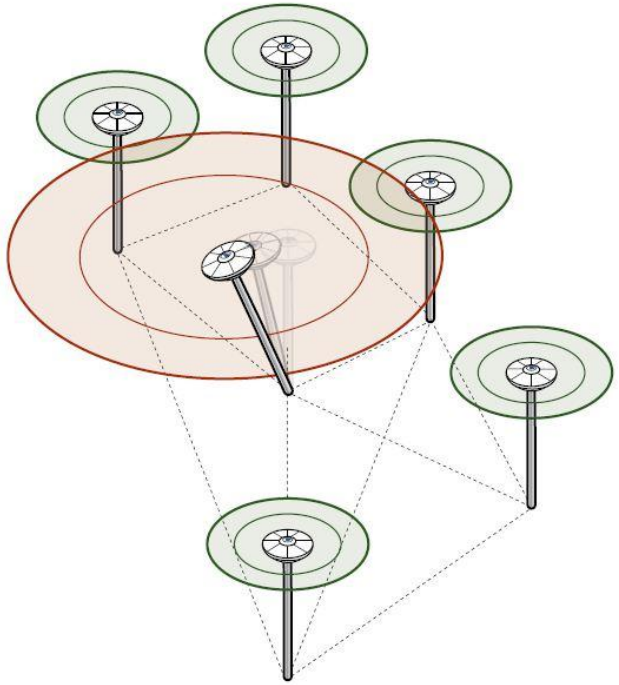
The Changing World of Geospatial

National Positioning Infrastructure (NPI)

→ Importance recognised by government

→ Objective: '*instantaneous, reliable and fit-for-purpose positioning and time services anywhere and anytime across the Australian landscape and its maritime jurisdictions.*'





The Changing World of Geospatial

The International Terrestrial Reference Frame (ITRF) is the international standard for coordinates

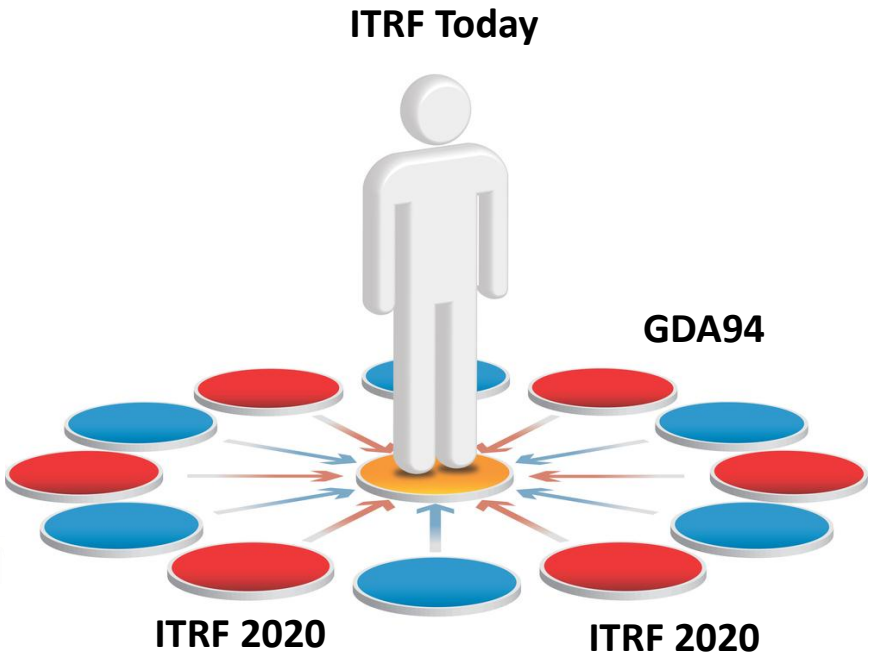
GNSS (GPS, Galileo, Compass, …) will inherently work in the **ITRF**

Precise positioning service providers will inherently work in the **ITRF**

High resolution satellite imagery will inherently work in the **ITRF**

LiDAR will inherently be collected with respect the **ITRF**

The Changing World of Geospatial

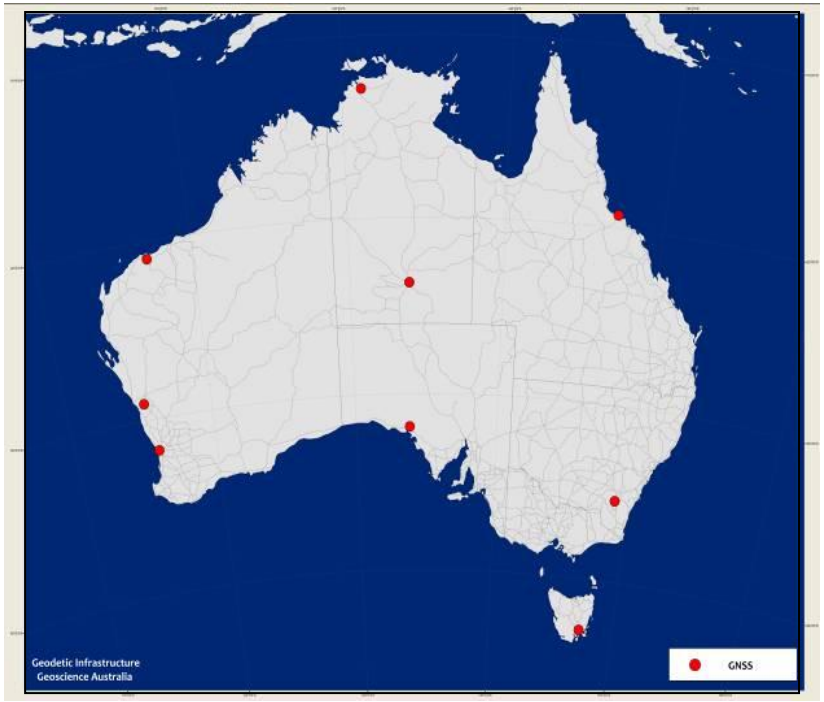


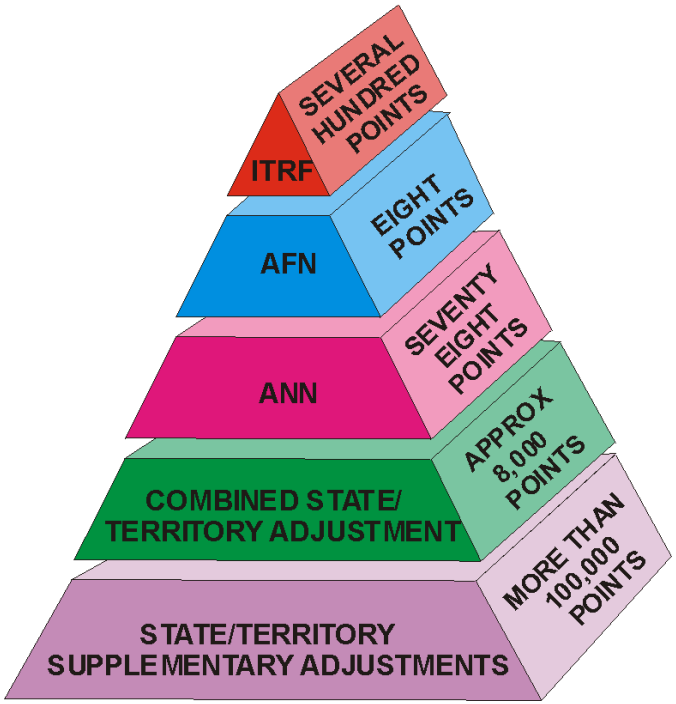
User-centric view of datum

→ why can't you provide your data in my datum!

Geocentric Datum of Australia 1994 (GDA94)

Geocentric Datum of Australia, 1994
Gazetted Static Coordinate System

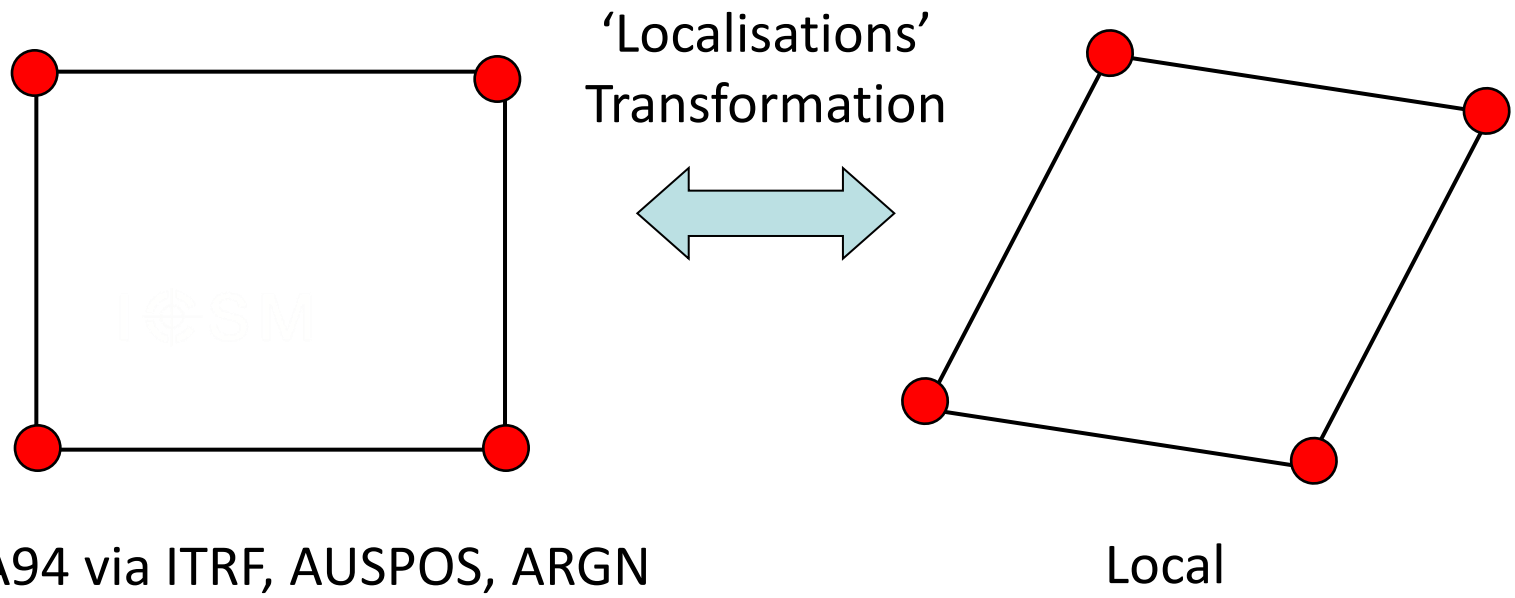




GDA94: problems, issues, complications

Large local distortions

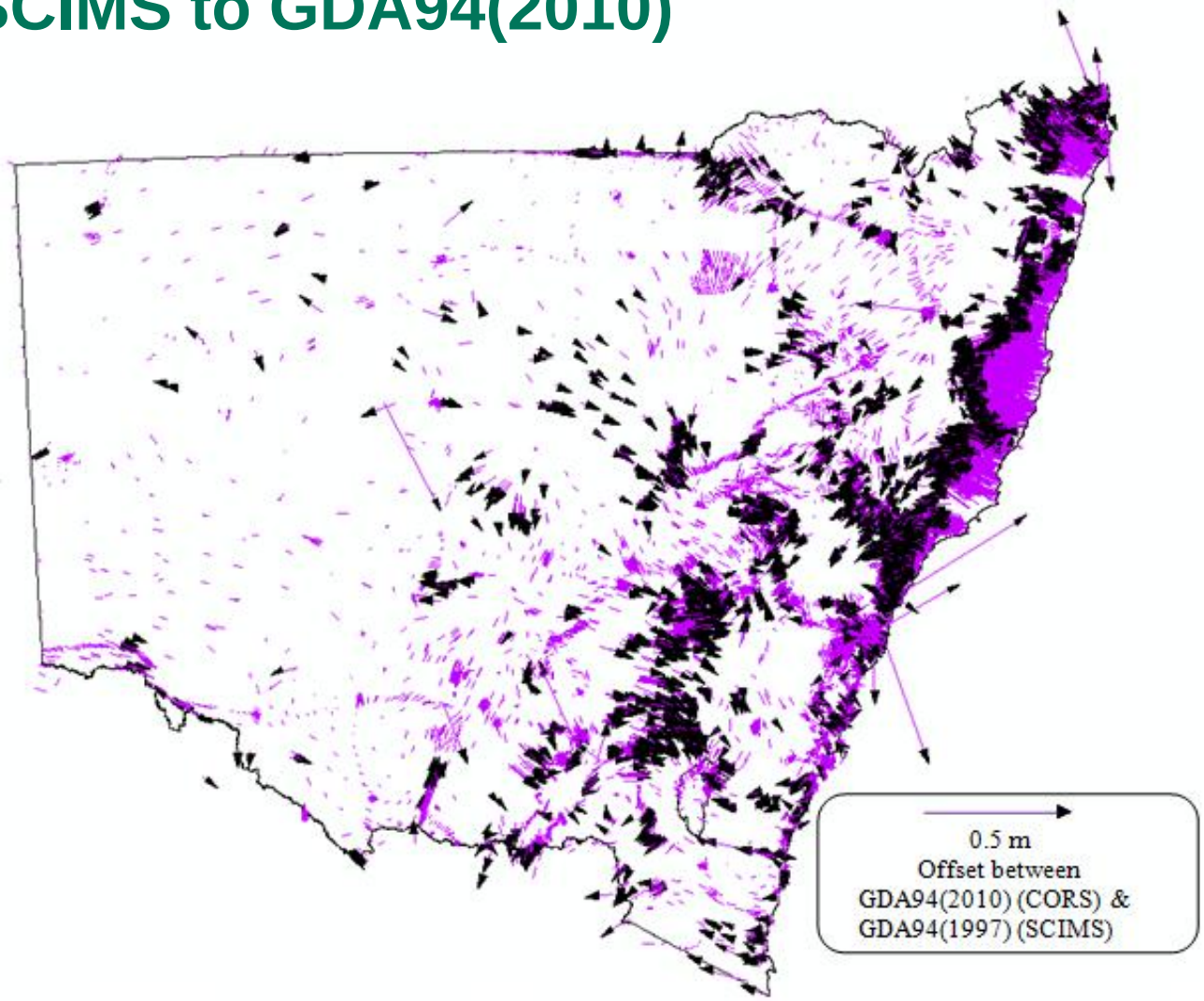
→ 30 cm in horizontal differences in parts



GDA94 via ITRF, AUSPOS, ARGN

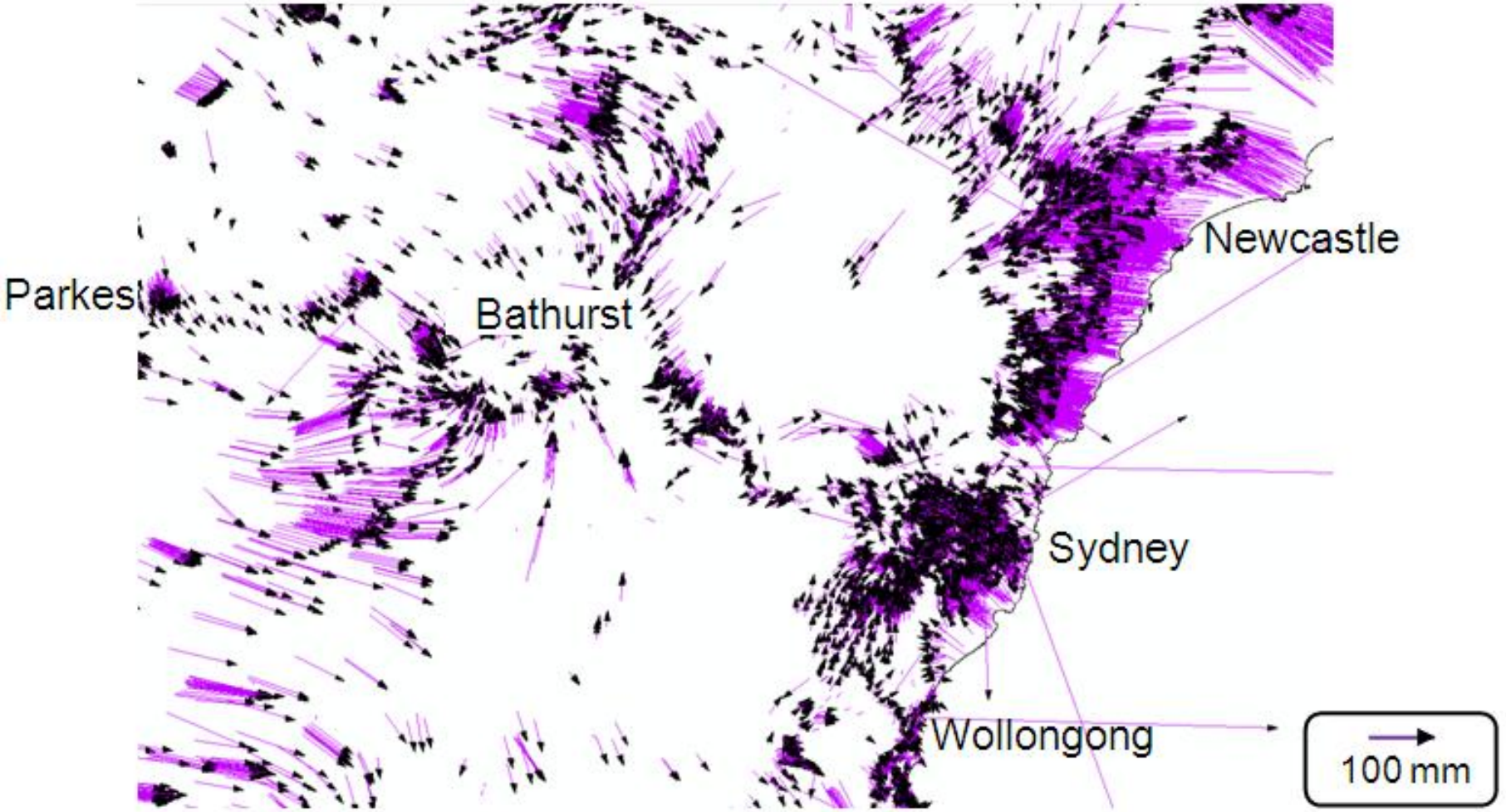
Local

NSW SCIMS to GDA94(2010)



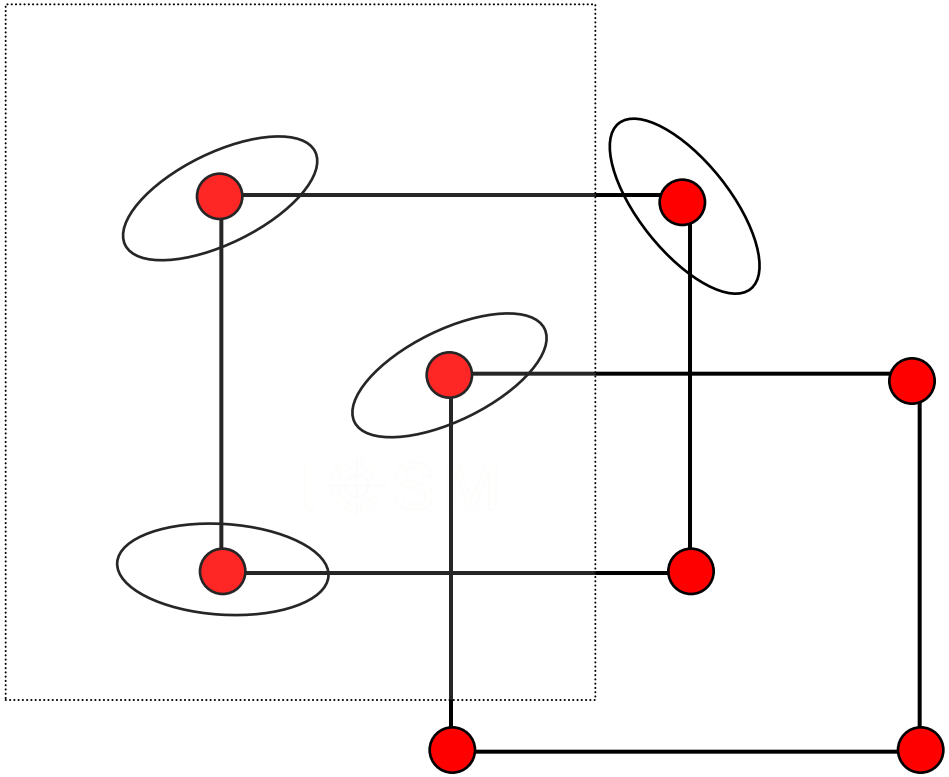
Source: Joel Haasdyk and Tony Watson, LPI NSW, APAS Conference 2013

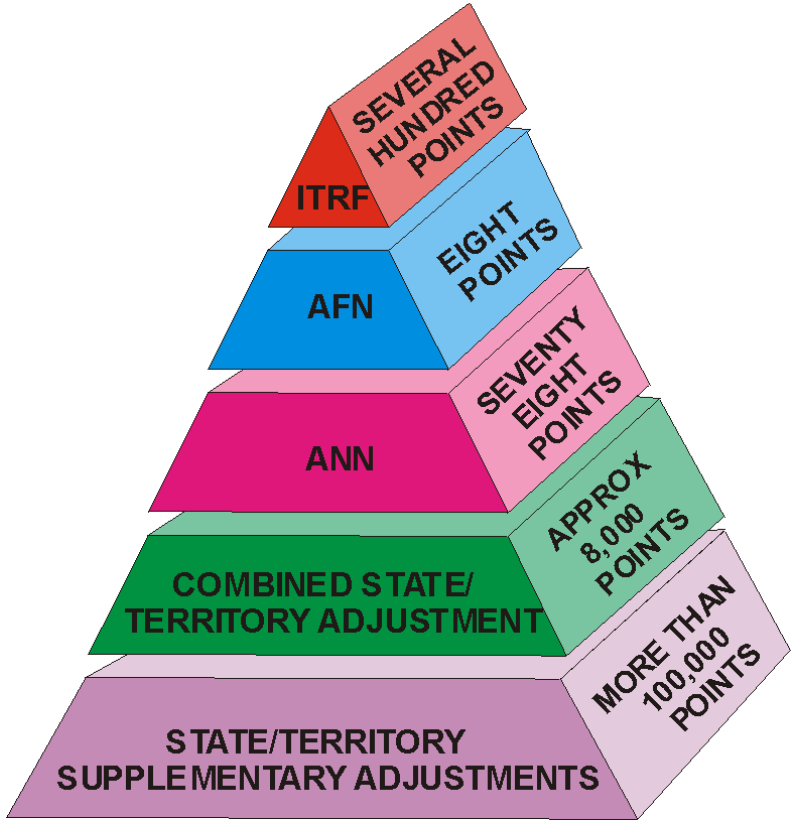
NSW SCIMS to GDA94(2010)



GDA94: problems, issues, complications

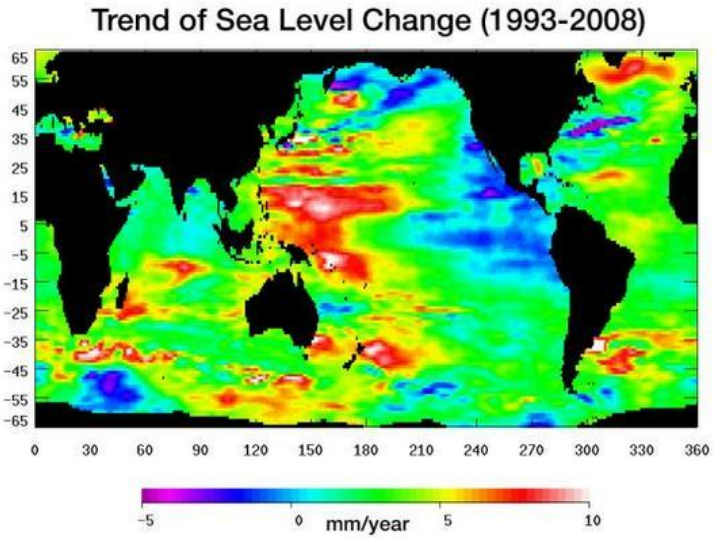
Relative uncertainty not always able to be determined

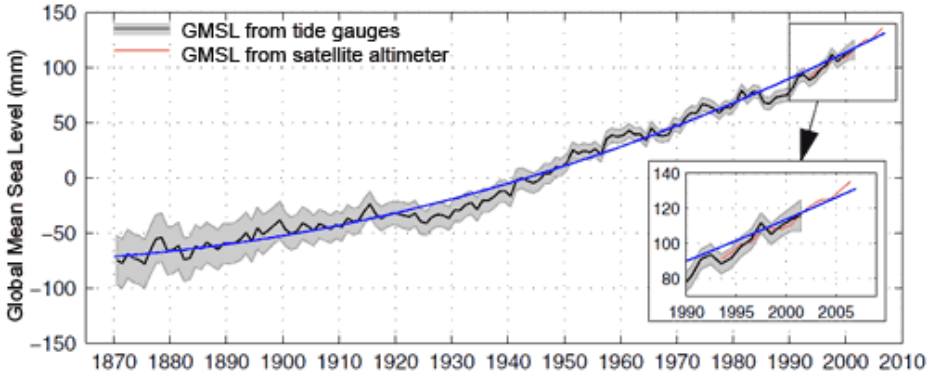




GDA94: problems, issues, complications

GDA94 unable to support science and national policy response



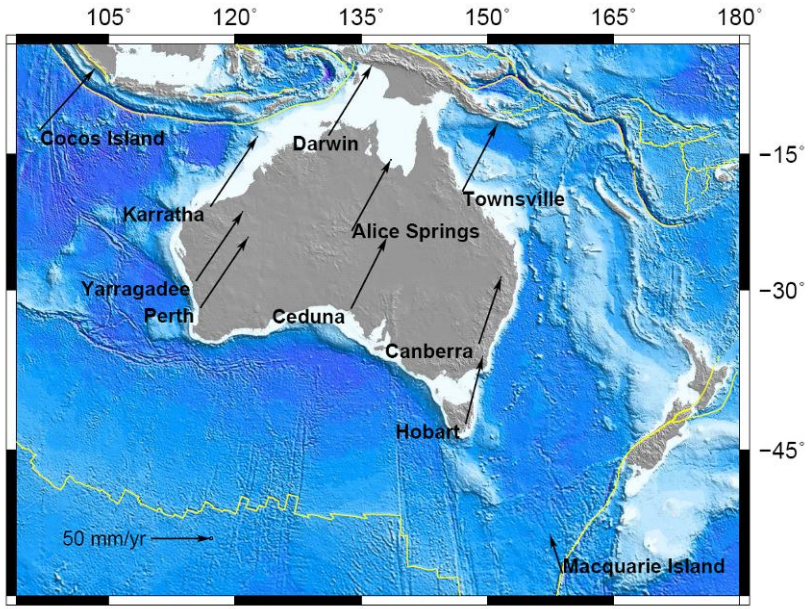


GDA94: problems, issues, complications

Absolute difference between GDA94 and ITRF will exceed 1.8 metres by 2020

→ pseudorange-based positioning services will have an uncertainty of 6 cm (PU 95%, open sky)

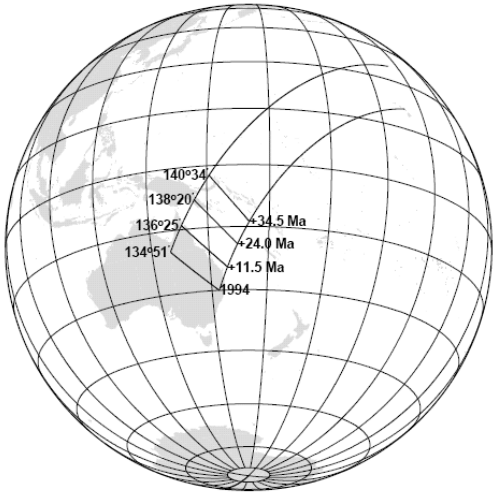
~ 70 mm/year tectonics

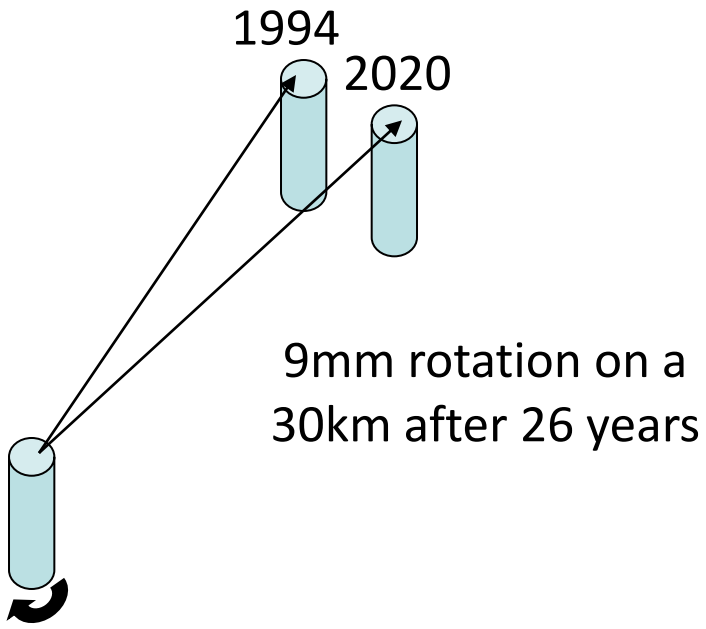


Geocentric Datum of Australia – referenced at 1994

GDA94: problems, issues, complications

Rotation of the Australian Plate has become significant for survey applications



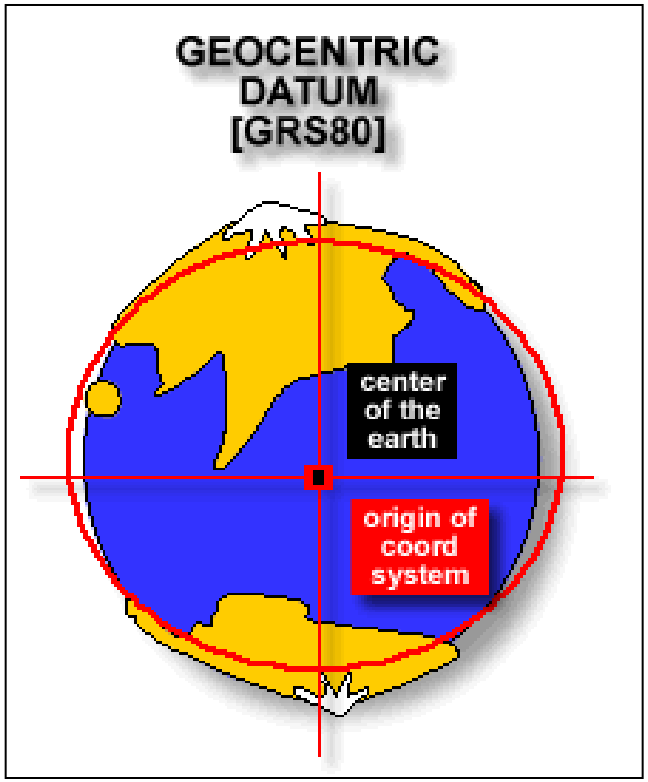


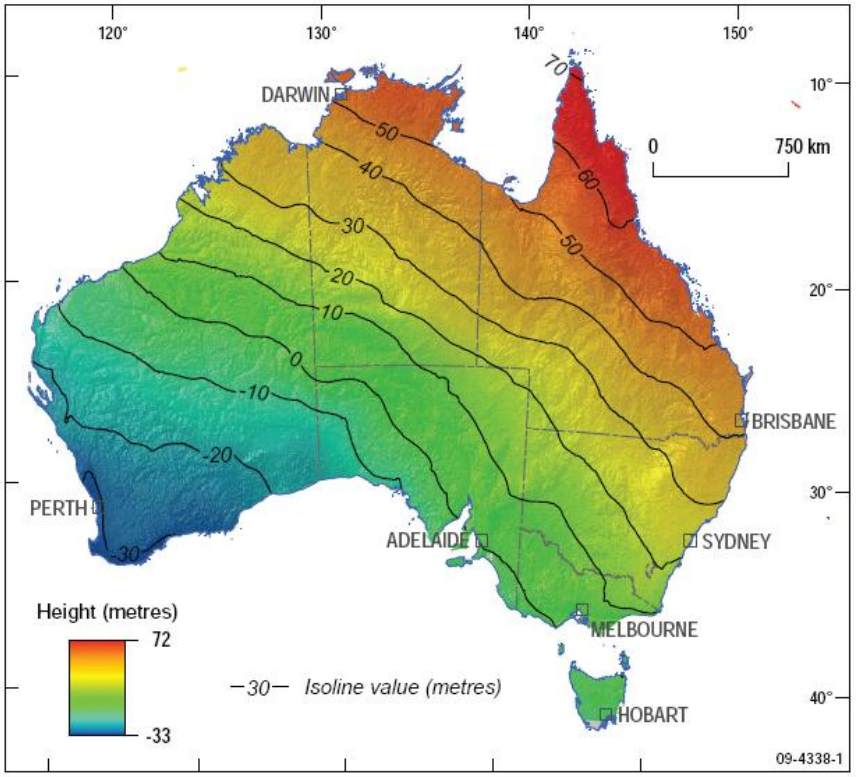
GDA94: problems, issues, complications

Heighting not well supported in GDA94

→ 9cm vertical bias with respect to the recent ITRFs

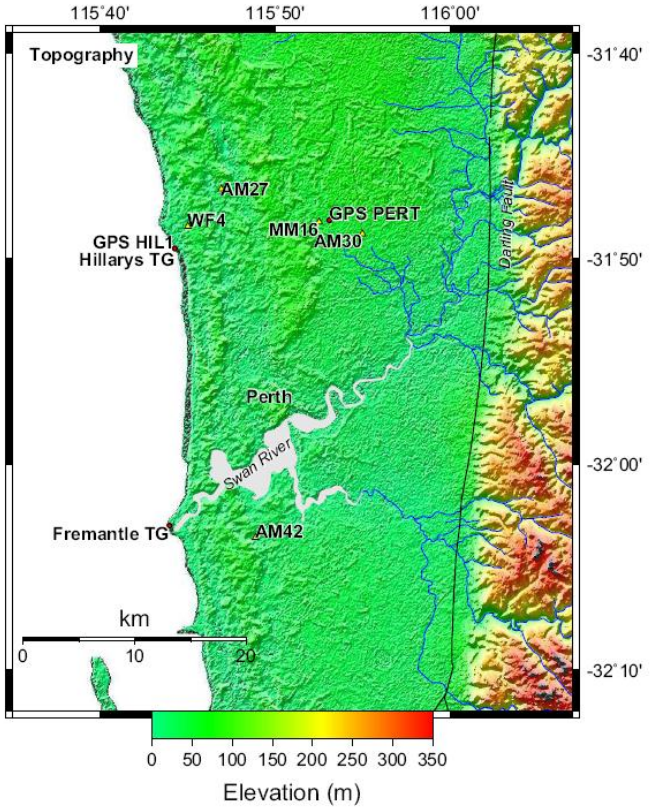
→ uncertainty of vertical coordinates is not rigorously propagated

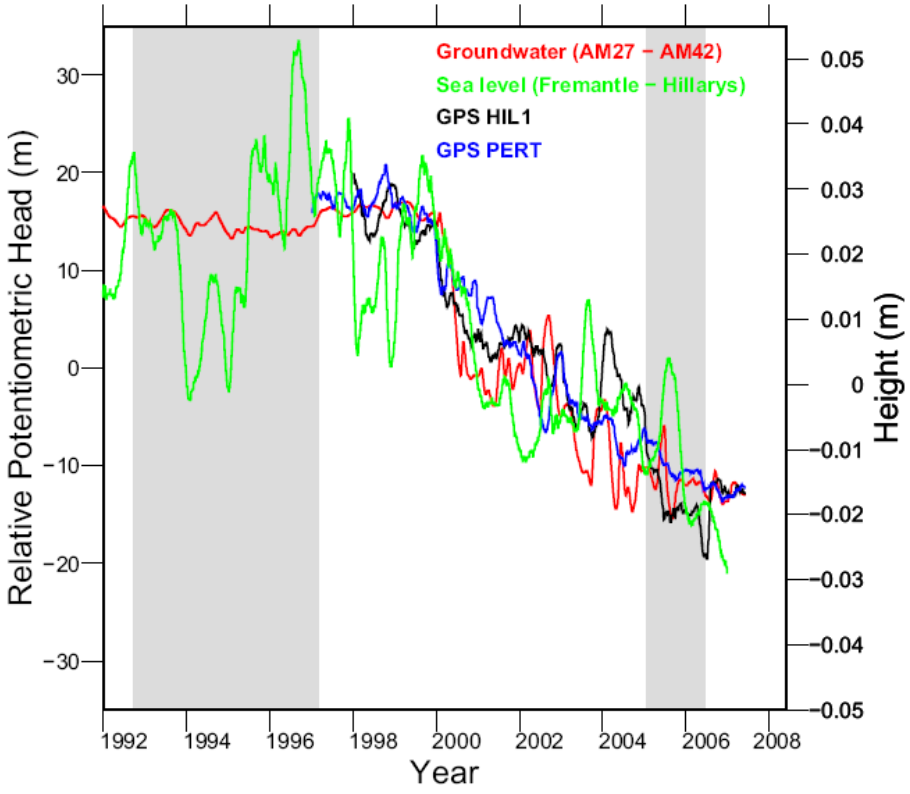




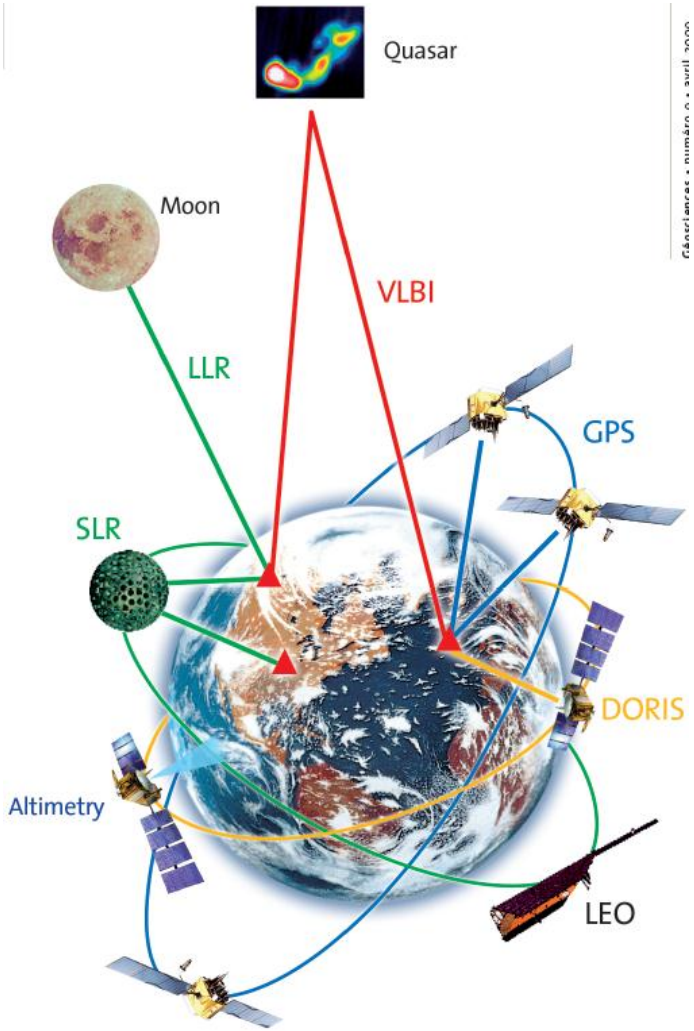
GDA94: problems, issues, complications

Coordinate transformation back to 1994 increasingly difficult

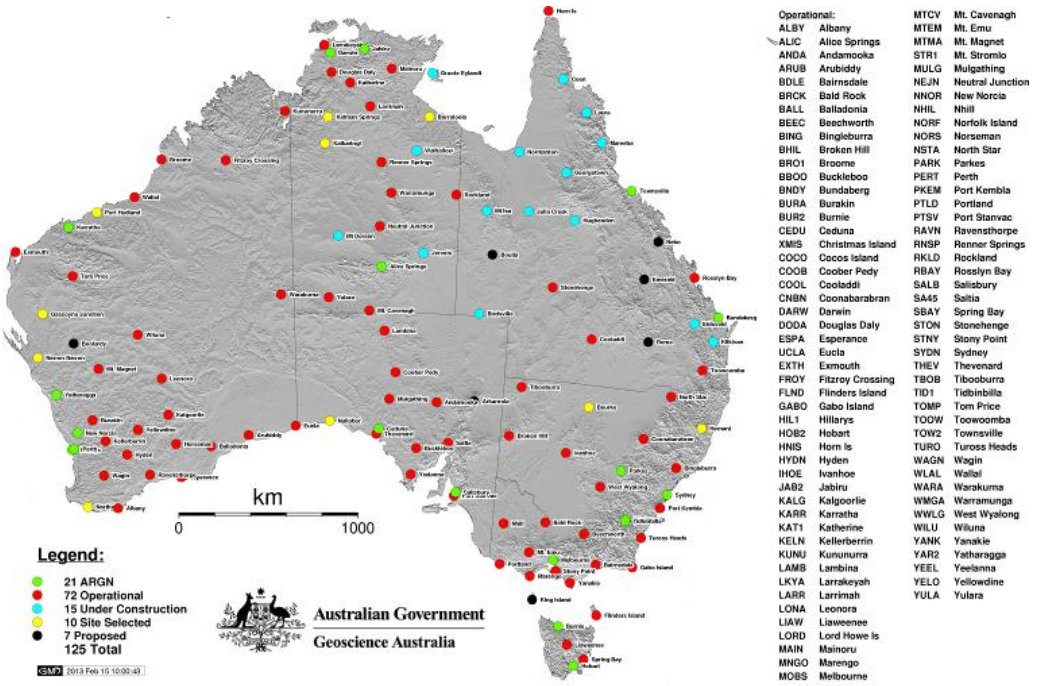




Ground and Space Infrastructure Developments

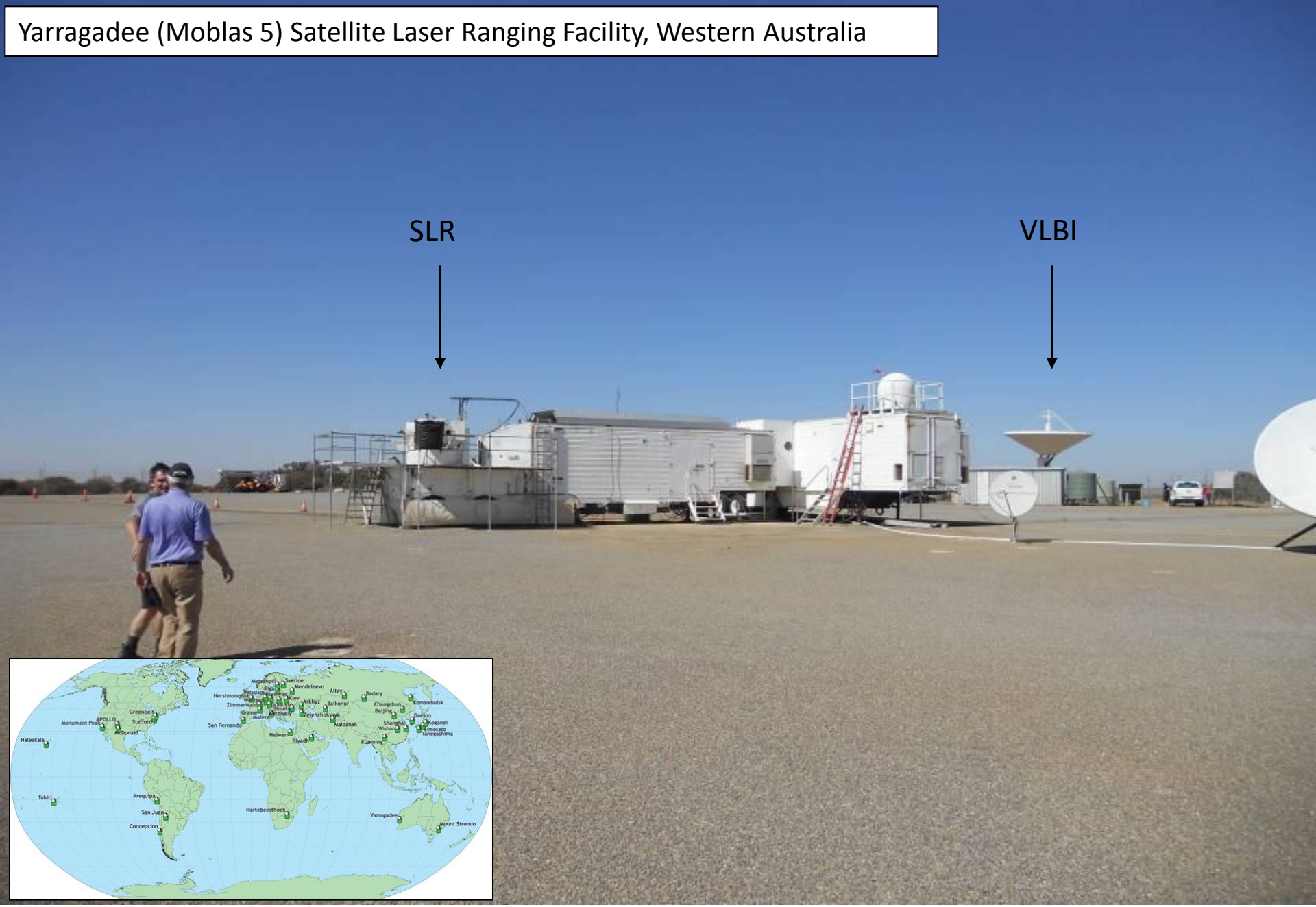


National GNSS Network

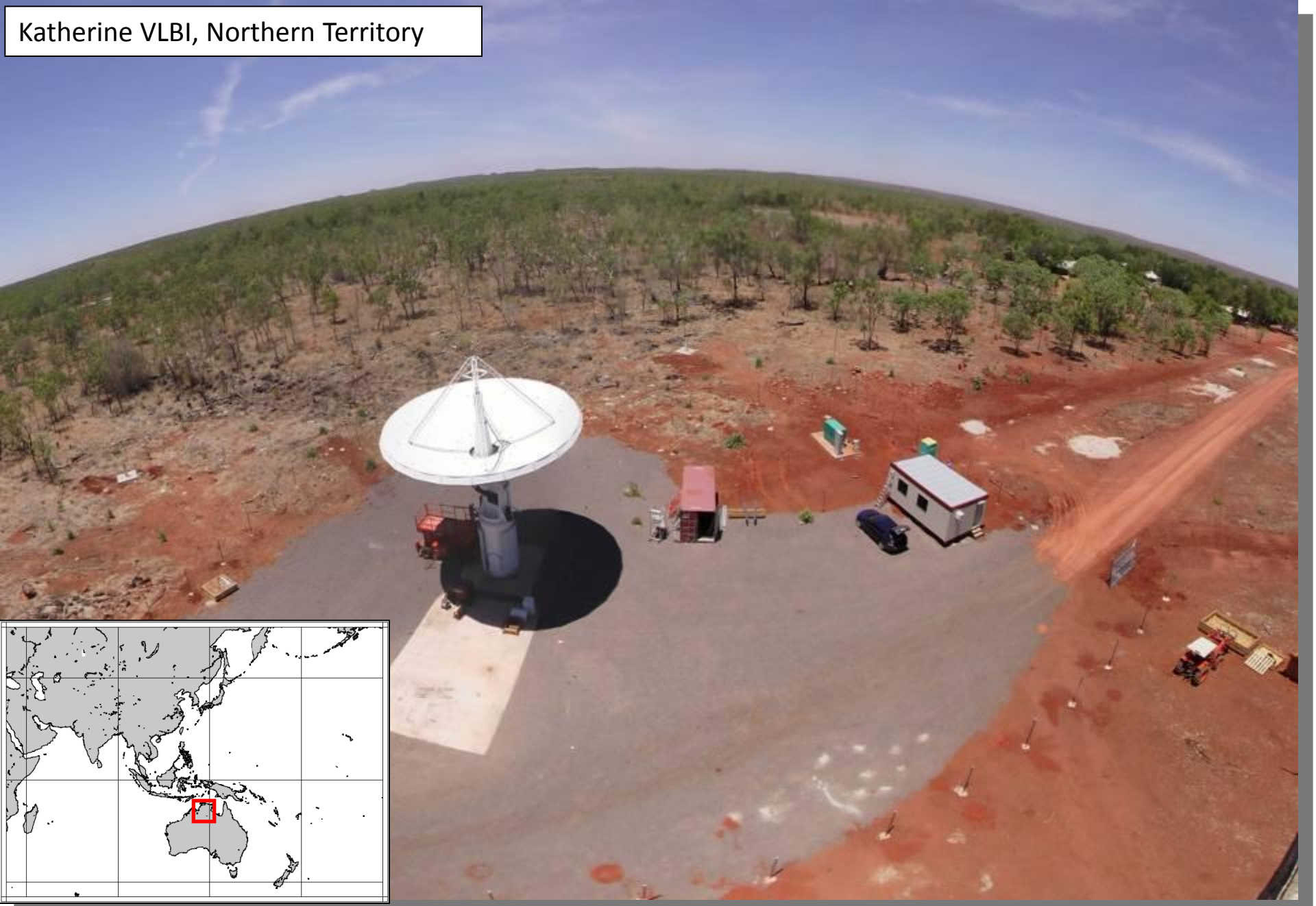


Mount Stromlo Satellite Laser Ranging Facility, Canberra

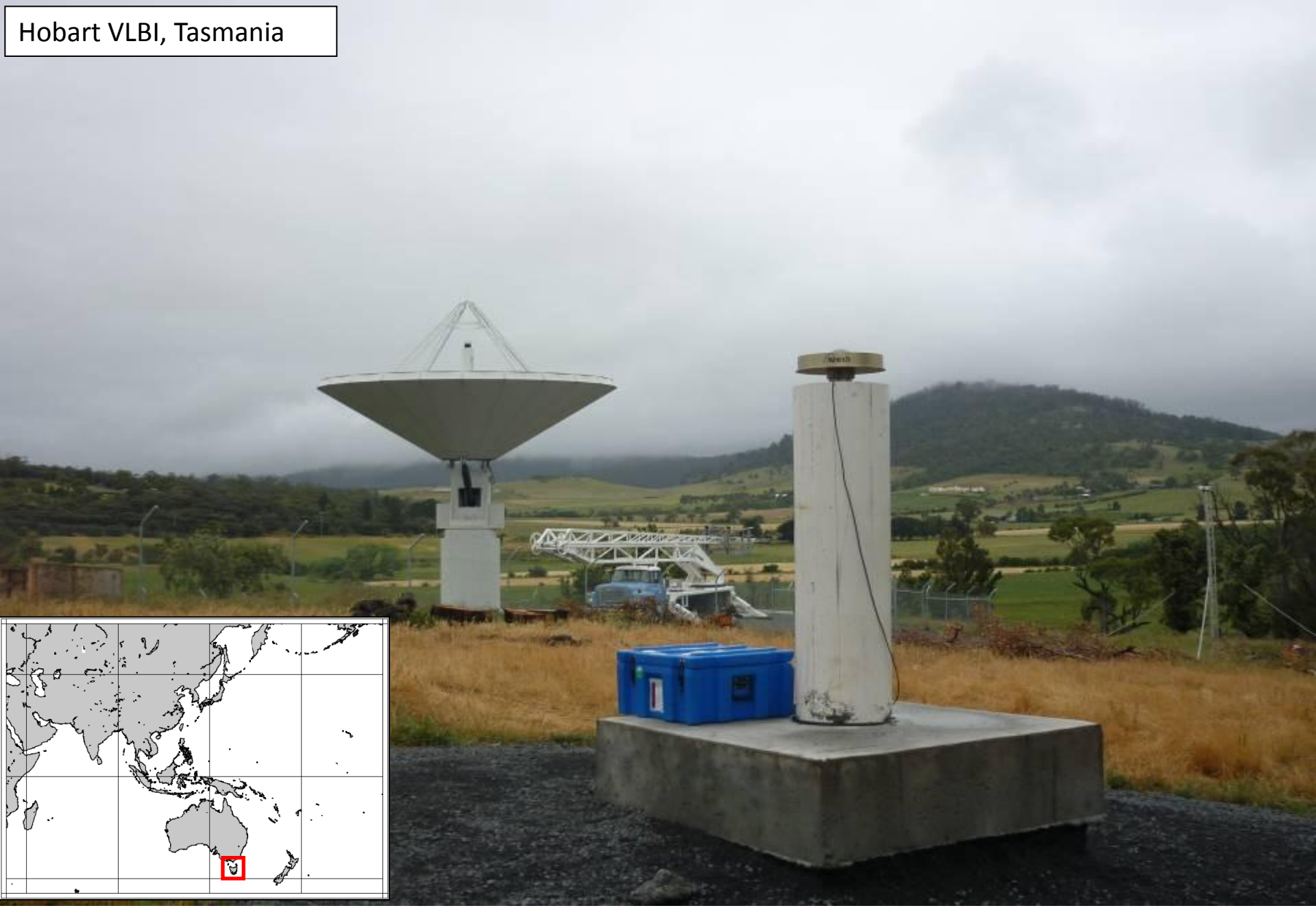
Yarragadee (Moblas 5) Satellite Laser Ranging Facility, Western Australia



Katherine VLBI, Northern Territory

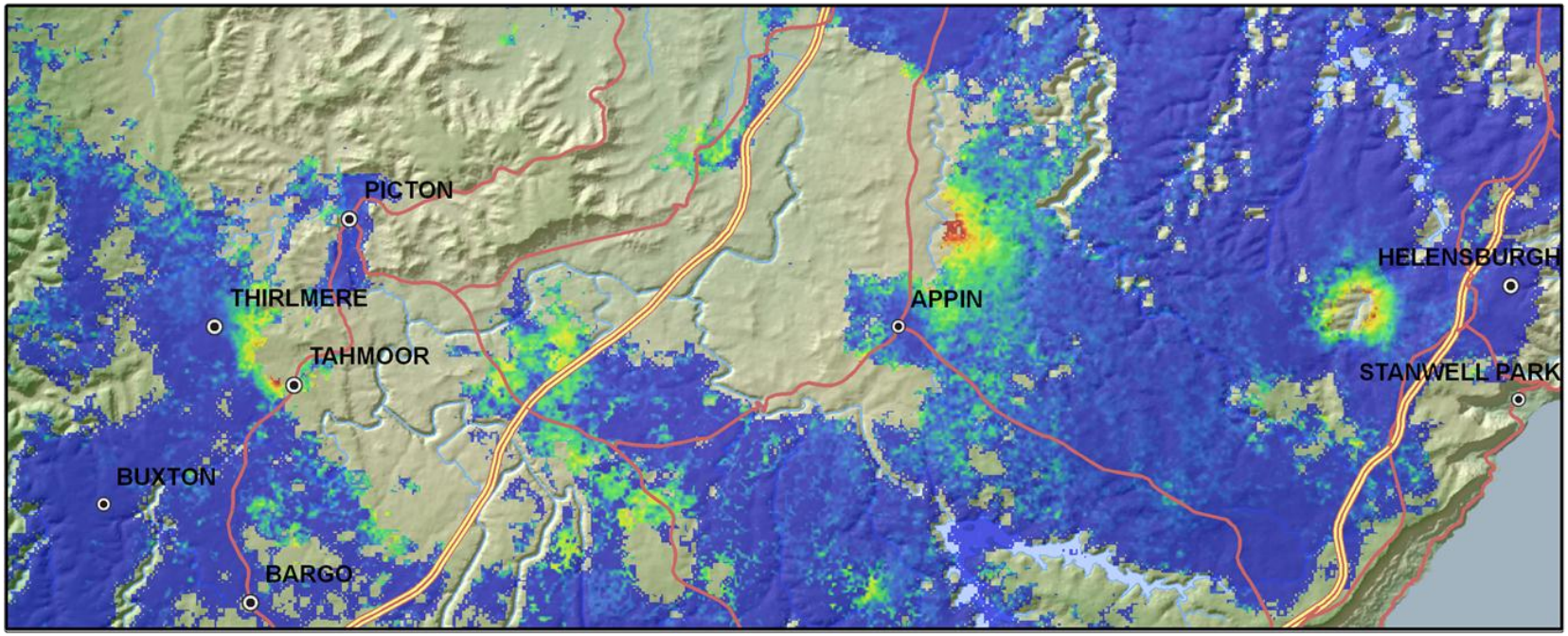


Hobart VLBI, Tasmania



Subsidence Mapping using satellite radar

Southern NSW Coalfields



ICSM Permanent Committee on Geodesy (PCG)

→ PCG ICSM's objective is to provide leadership and assistance to the geospatial industry to adapt in a rapidly changing environment

→ Australia's datum (GDA94) does not meet users expectations now or into the future i.e. in terms of accuracy, consistency and uncertainty

→ Users (industry, government, public) have an expectation that the positioning infrastructure will deliver +/- 2 cm (PU 95% CL)

→ These user expectations are realistic and achievable within the 2015-2020 timeframe

Modernising GDA: what should we aim for?

→ Datum should support +/- 2 cm user positioning (PU 95% CL)

→ The relationship to the ITRF is also always known at the +/- 2 cm (PU 95% CL) or better

→ Fully 3-D datum (i.e. ellipsoidal)

→ Relative uncertainty can be computed between any and every survey mark

Modernising GDA: what should we aim for?

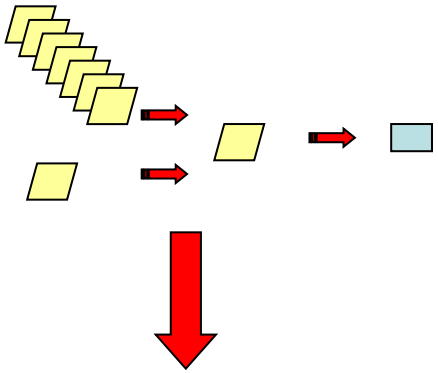
→ Datum updated continuously as new observations are contributed and blunders detected

→ Datum supports the continuous update of the national Geoid model

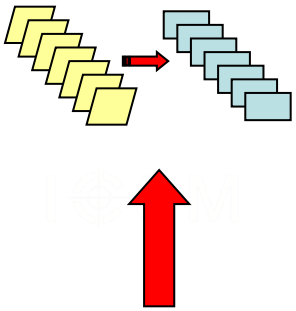
→ Datum supports time-based corrections (i.e. deformation models)

→ Datum has tools and services that facilitate its use by the mass-market (e.g., time based transformations)

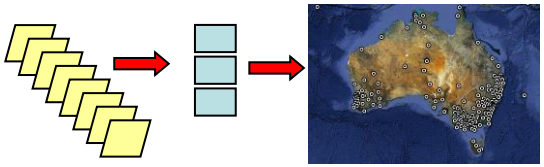
National GNSS Campaign Solution



Jurisdictional Adjustments



National GNSS CORS Solution



Australian Terrestrial Reference Frame (ATRF)

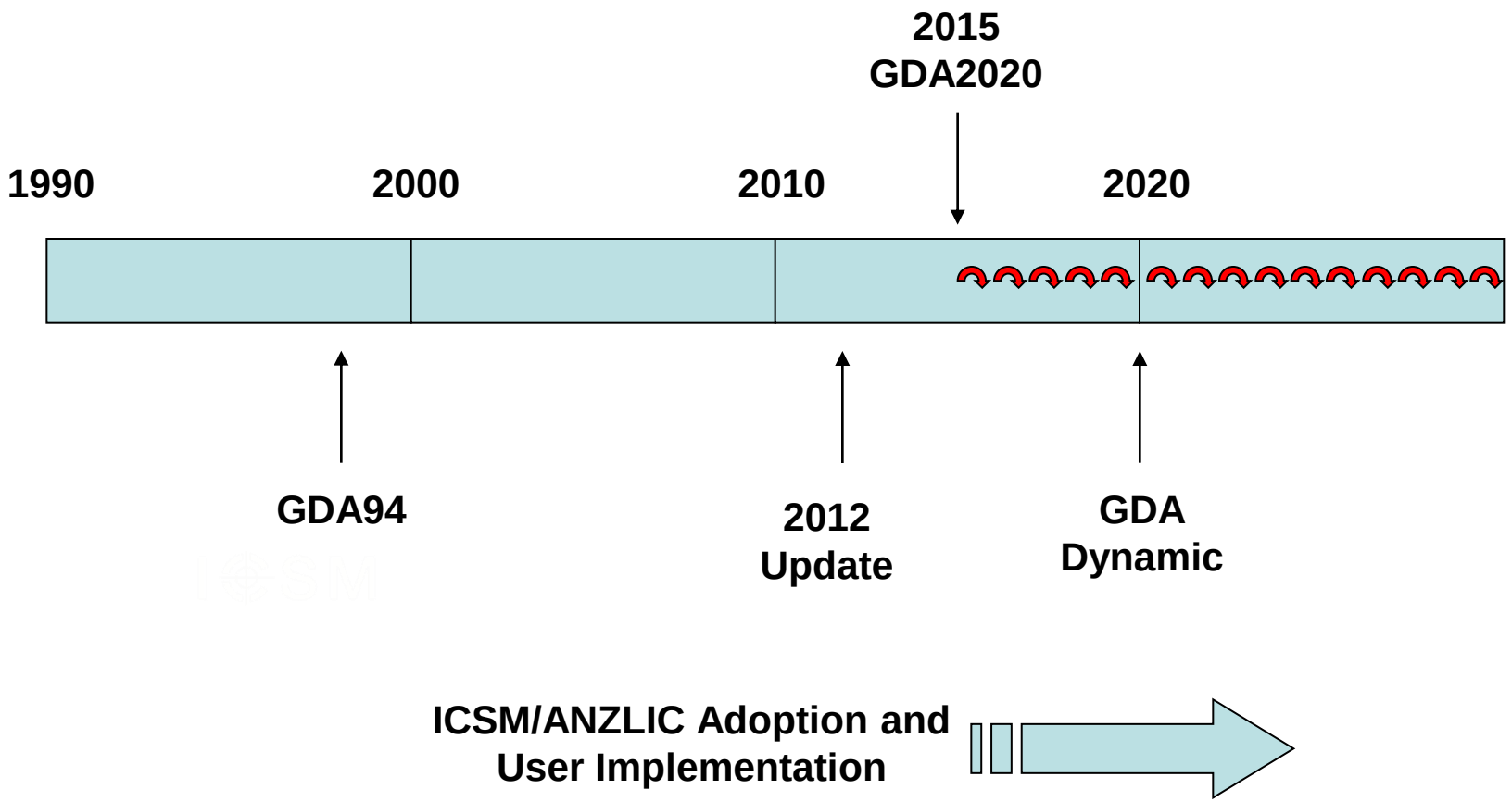
Fully rigorous geometric adjustment

→ aspire for an all stations-and-observations adjustment (down to the street corner)

→ phased-adjustment strategy

→ work-flows managed automatically (using e-Geodesy technology)

PCG Roadmap for a New National Datum



Final Remarks and Next Steps

What's happening now

→ Permanent Committee on Geodesy (PCG) work plan

→ CRCSI Datum Research Program

→ National Computational Infrastructure (NCI) development

Next Steps

→ Stakeholder consultations throughout 2013

→ Make the national adjustment 'operational'

→ Business case to ICSM/ANZLIC