UNIVERSITY of TASMANIA

Update on UTAS facilities and GeoVLBI initiatives

Lucia McCallum

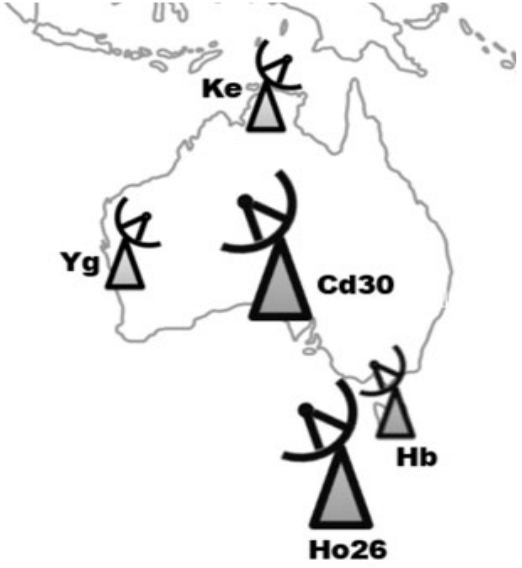
RAFCAP meeting, May 15, 2025

Introduction

- Lucia McCallum, VLBI scientist @ the University of Tasmania
- PhD (geodetic VLBI), Vienna University of Technology, Austria
- Lead scientist of the AuScope VLBI project (Australia's geodetic VLBI observations)
- International VLBI Service for Geodesy and Astrometry (IVS) Directing Board
- Chair of the Asia-Oceania VLBI group (AOV)

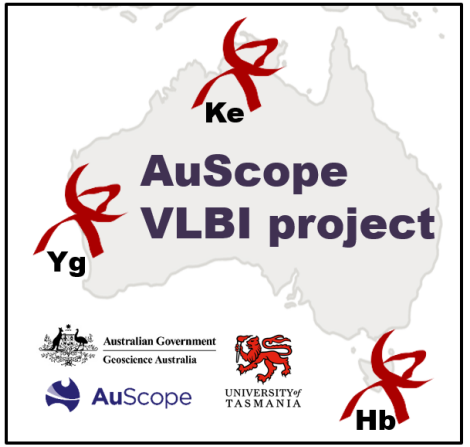
UTAS facilities

- Hobart 26m
- Ceduna 30m
- Hobart 12m
- Yarragadee 12m
- Katherine 12m



AuScope VLBI array

- Operated in a research collaboration with Geoscience Australia.
- All sites are operated remotely from Hobart, with very little man-power support at the remote sites.
- Operational since 2011 as legacy S/X receivers.
- Since 2020: Upgraded to VGOS wide-band receivers.
- Hobart and Yarragadee connected with multi-Gbps connections, with Katherine to follow this year.
- 170 days of observing (24-hr sessions) per year.
- UTAS is a partner of the UN-GGCE



United Nations
Global Geodetic
Centre of Excellence

PARTNER

IVS – The International VLBI Service for Geodesy and Astrometry

- **A non-profit and best effort organization, coordinating geodetic VLBI globally.**
- **80+ permanent components, in 20+ countries.**
- **A GGOS service.**
- **An essential piece of the global geodesy supply chain; delivering high-quality geodetic products essential for socio-economic development.**
- **VLBI is a fundamental geodetic technique that underpins high-accuracy positioning by observing weak cosmic radiation using a global network of radio telescopes.**

VGOS – next generation VLBI Global Observing System

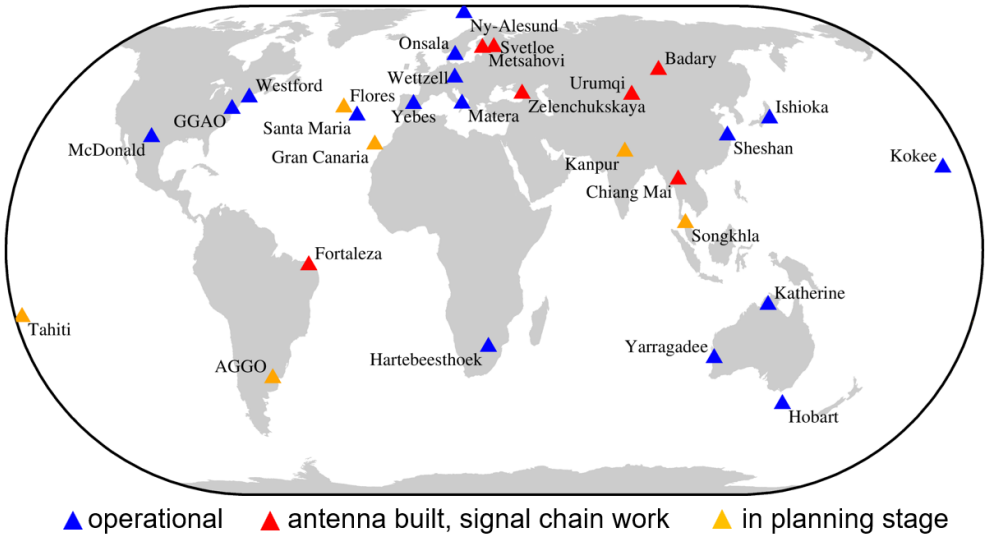
S/X legacy network

- observations going back to 1979
- today: ~40 stations
- large variety of radio telescopes
  - •diameter 6 m – 100 m
  - •slow and deforming “astro” telescopes
  - •losing stations (e.g. Ny-Ålesund 20 m)
- 2/8 GHz, one circular polarization

VGOS network

- started 2017, operational since 2020
- 2025: 17 stations
- 13 m class radio telescopes
- broadband 3-14 GHz, dual polarized

Evolution of the VGOS network



Today’s VGOS is about a factor of 2.5 better than legacy S/X; with even potential for even higher precision.

Today's message

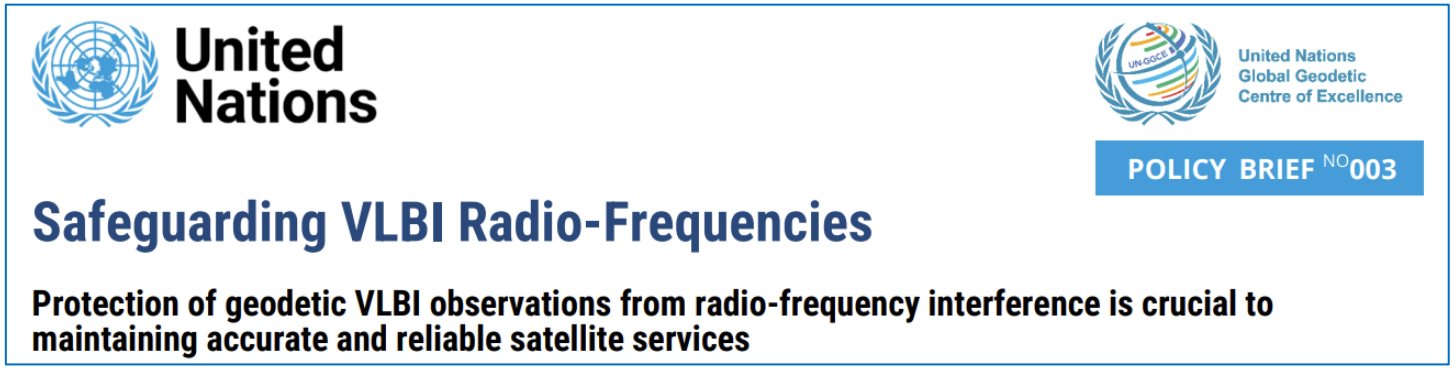
- **VGOS technology operates on a wideband system, comprising up to 32 channels of 32MHz across a wide frequency range between 3-14 GHz.**
- **Geodetic VLBI with 32 channels of 32 MHz bandwidth each exceeds the bandwidth of allocated RAS bands.**
- **The VGOS broadband receiver catches all emissions, wanted cosmic radiation as well as unwanted manmade emissions.**
- **Frequency protection for VGOS needs to be different than for legacy S/X. It is not about loosing one of many bands anymore, but rather complete overload of the receiver and damage to the LNA.**
- **The expansion of telecommunications services is an existential threat to geodetic VLBI. The essential services such as GPS and its need for long-term accurate Earth rotation monitoring are thus in danger.**
- **The immediate protection of geodetic VLBI is necessary to continue such crucial services.**

Current activities

- **Awareness campaign about the importance of VLBI and the global geodesy supply chain for everyone.**

- **Policy brief by the United Nations UN GGCE on Safeguarding VLBI Radio-Frequencies.**

  https://ggim.un.org/UNGGCE/documents/202250509_Policy_Brief_Spectrum.pdf



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POLICY BRIEF NO 003

Safeguarding VLBI Radio-Frequencies

Protection of geodetic VLBI observations from radio-frequency interference is crucial to maintaining accurate and reliable satellite services

1. Raise Awareness
2. Advocate for Protection
3. Extend Radio Astronomy Service Bands
4. Support World Radiocommunication Conference Agenda Item on VLBI
5. Register VLBI Sites
6. Establish national protection areas
7. Support International Resolutions

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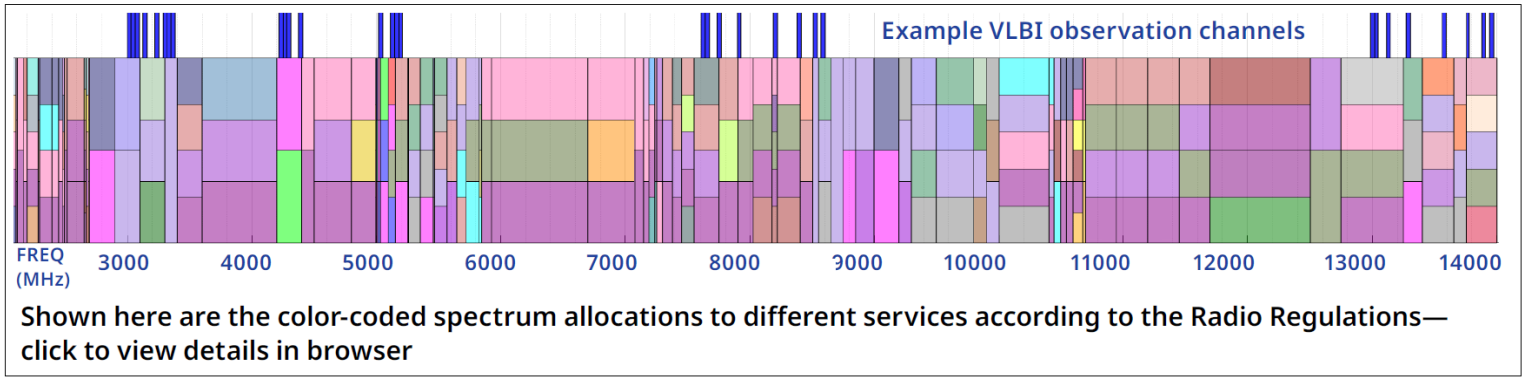
Allocation of bands used by geodetic VLBI

- **The frequency bands used by geodetic VLBI observations should be entered in the Radio Regulations (RR). "Geodetic VLBI" must be a new Agenda Item at the World Radio Conference 2031 (WRC-2031), whose agenda will be set at WRC-2027.**

- **National spectrum agencies should propose Geodetic VLBI as a preliminary Agenda Item to the WRC-2027 and/or support such an initiative in a joint proposal.**

- **Without such protective measures, the demand for high-quality geodetic VLBI data that we all depend on is not effectively fulfilled. It endangers the goals of the UN GA Resolution 69/266 "A global geodetic reference frame for a sustainable development":**



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Thank you

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