Dr Aletha de Witt

Director: Radio Astronomy Projects
Department of Science, Technology
and Innovation (DSTI)

Pillar 8: R&D and Next-Generation Supply Chain: Innovation Without Borders

Making sure it's possible

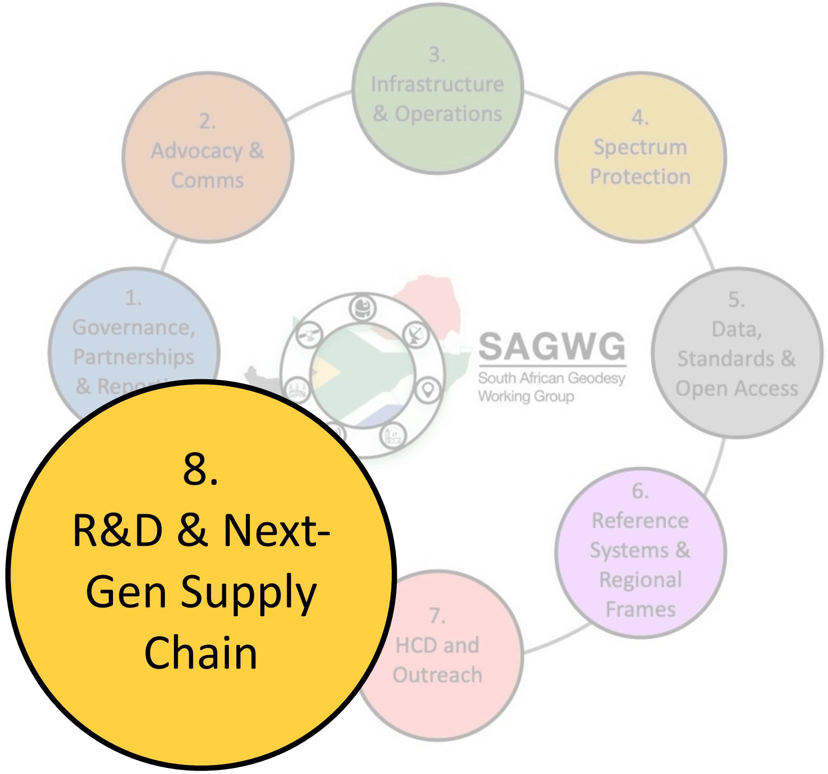
science, technology & innovation
Department: Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA

South African Geodesy Workshop
1-2 October 2025, SAAO, Cape Town

SAGWG
South African Geodesy Working Group

2030 NDP

Shaping Tomorrow's Geodesy, Today



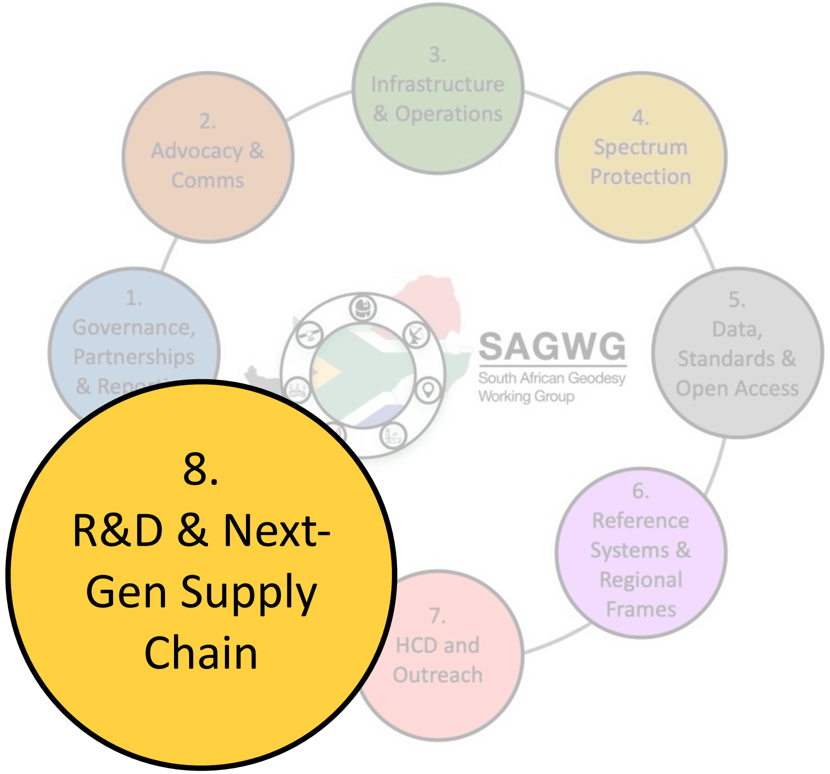
Support and advance geodetic research, development, and innovation, adopt emerging technologies, align with global initiatives, and build next-generation capacity for Africa's leadership in the geodesy supply chain

Development Plan Activities

Phase 3: A next-generation global geodesy supply chain

- Provide information to UN-GGCE regarding what are the operational requirements constituting a next-generation global geodesy supply chain
- Undertake the geodetic research and development required to sustain and enhance the global geodesy supply chain
- Where appropriate, support space missions relevant to geodesy such as the ESA Genesis mission or the NASA/ESA joint missions on satellite gravimetry
- Support projects where South Africa is already leading globally in developing new techniques and solutions
- Strengthen current SA-led geodetic R&D projects and encourage innovation, commercialisation, and multi-domain collaborations
- Adopt and implement emerging technologies — including machine learning and AI applications (e.g. in ionospheric modelling) — and ensure national infrastructure (e.g. VLBI receivers, HPC capacity) keeps pace with international developments
- Ensure geodesists have access to national HPC infrastructure for data-intensive research, modelling, and analysis
- Develop and support innovative infrastructure solutions for African capacity-building (e.g. remote stations, shared infrastructure models)

Shaping Tomorrow’s Geodesy, Today



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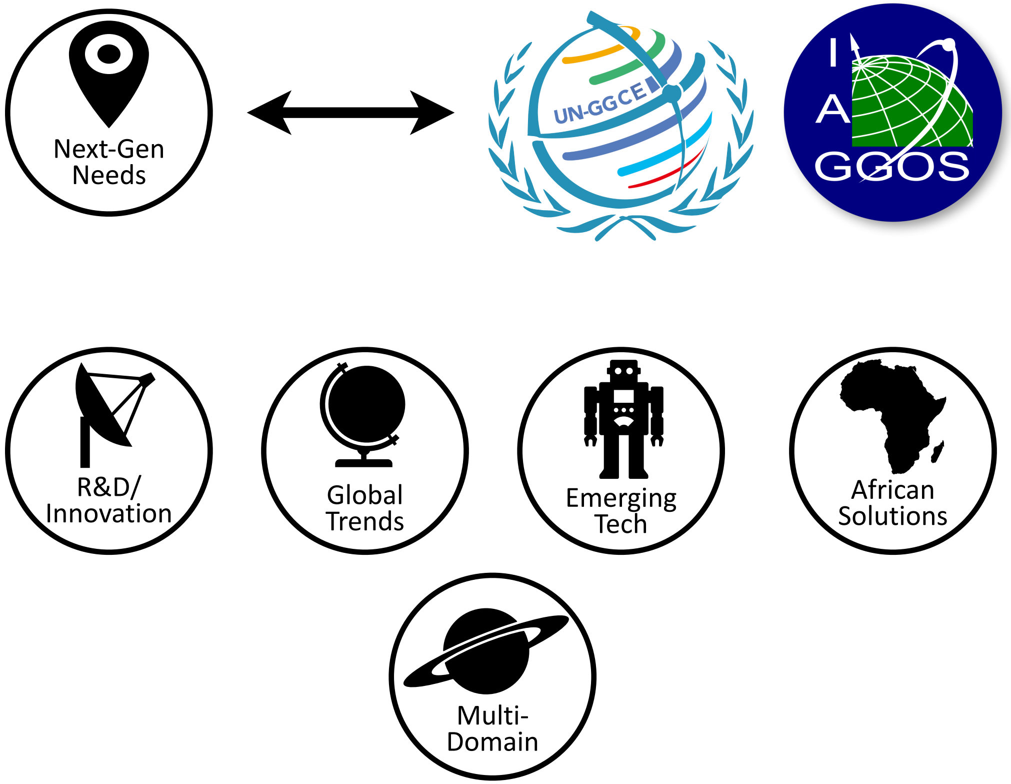

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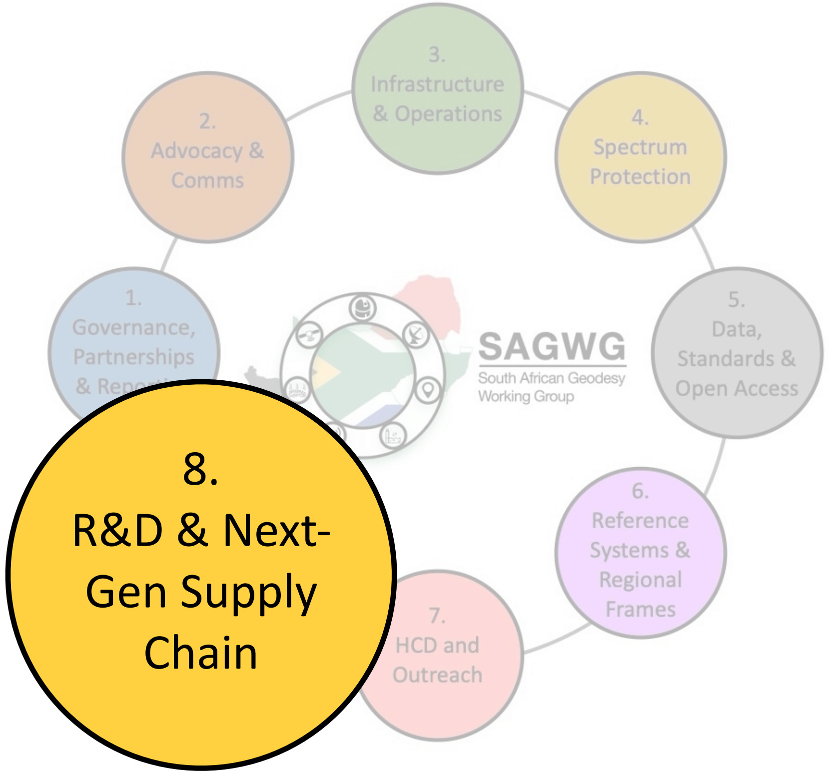

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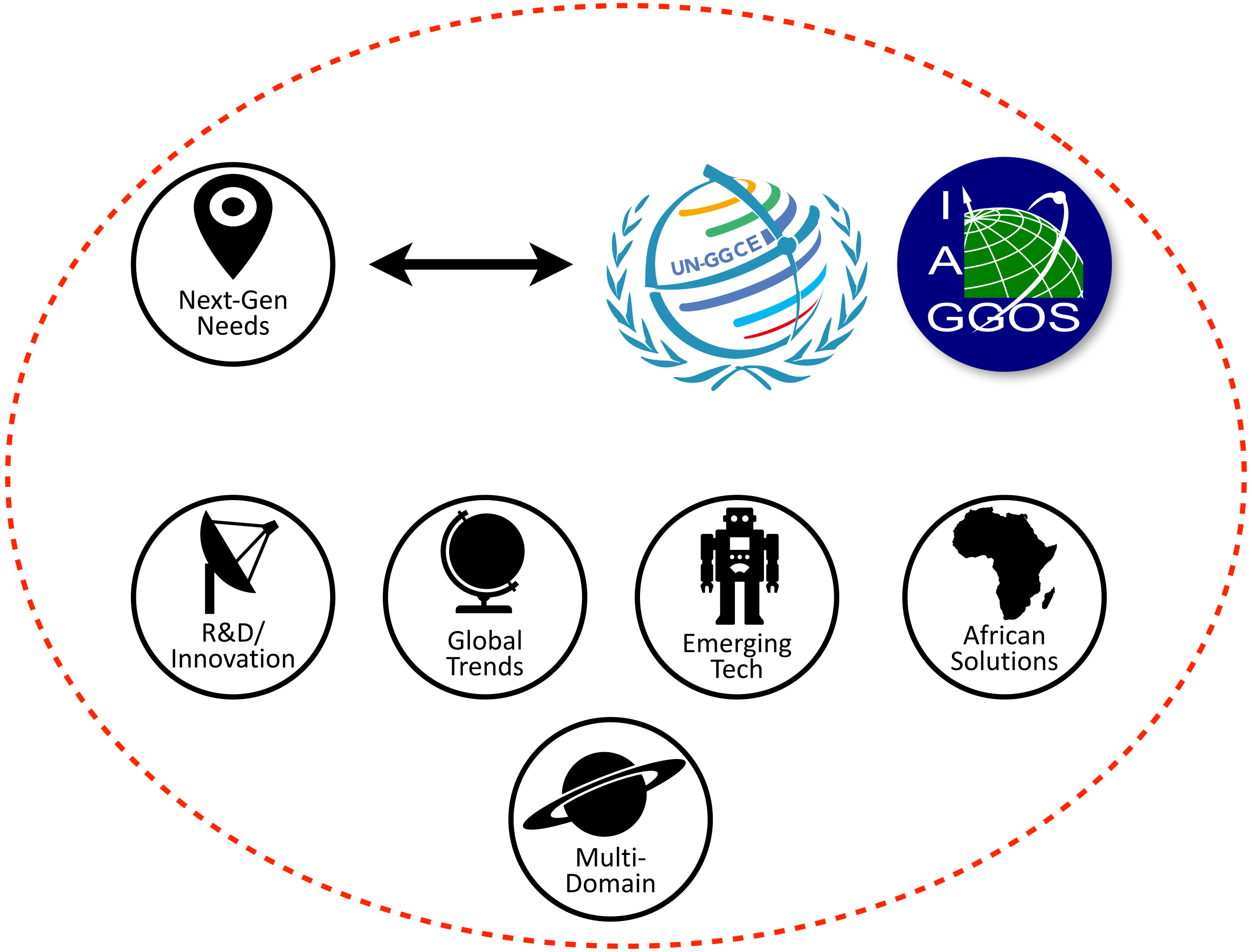
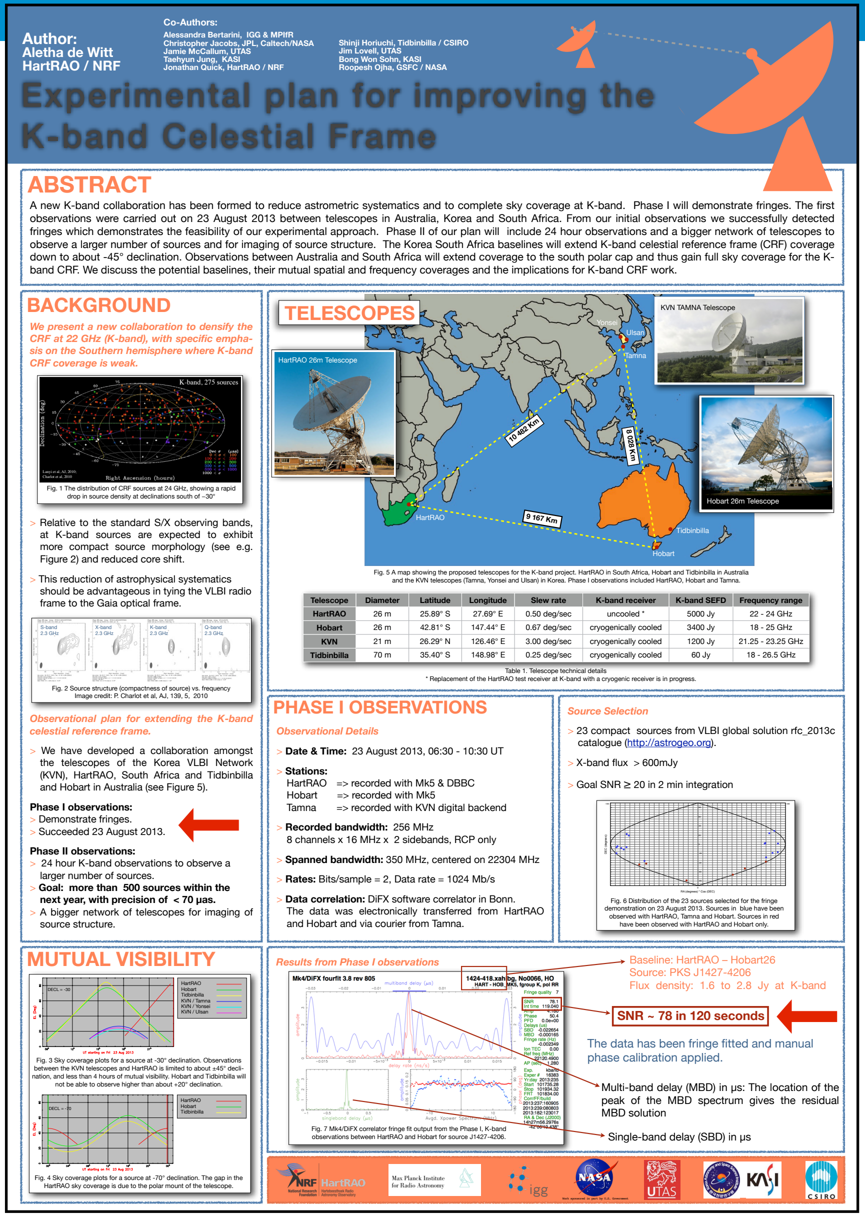
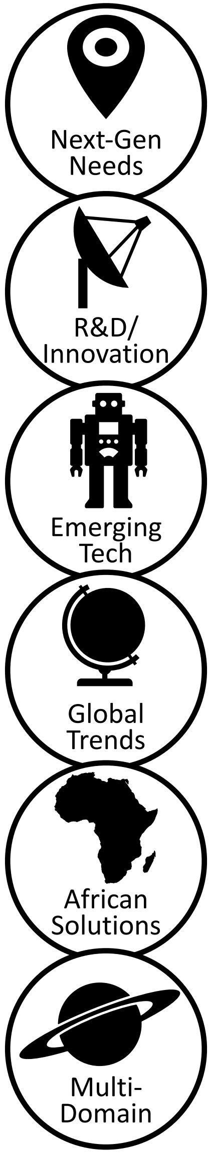


Astro2Geo K-Band Project: Ticking All the Boxes



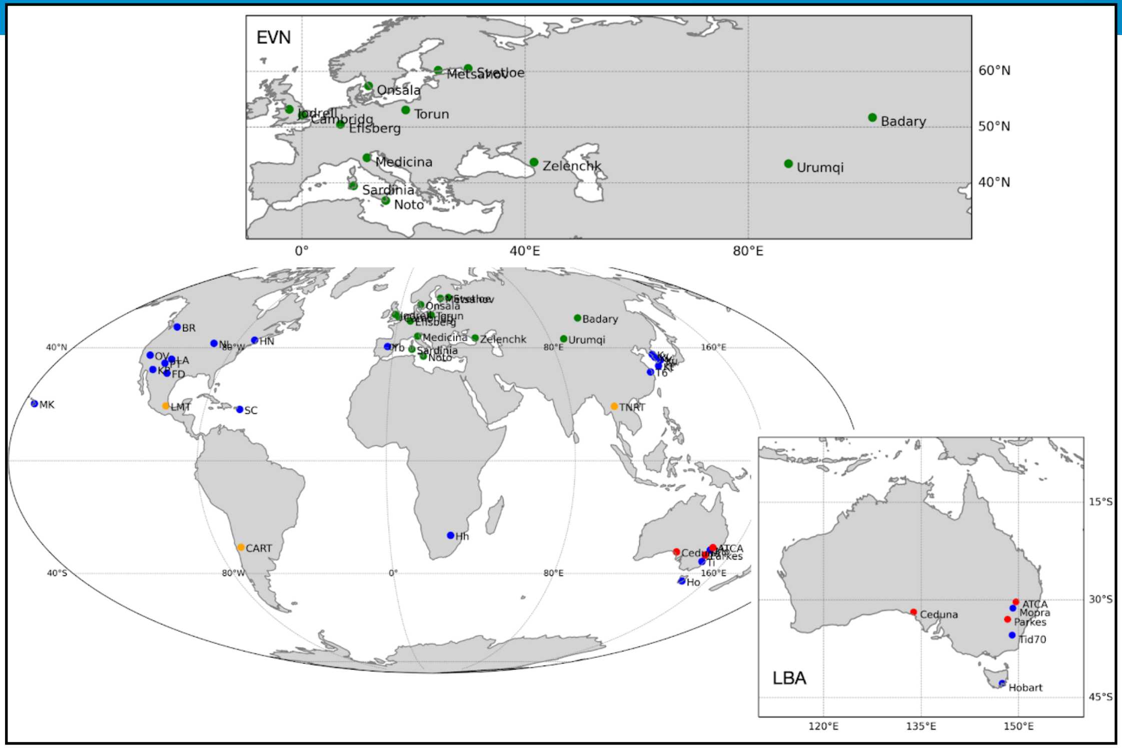
- South Africa leads an international effort to improve the ICRF
- Concept of moving to higher radio frequencies (K-band, 24 GHz) was conceived in 2012 during a snowstorm in Helsinki
- First observational results were presented at the IVS General Meeting in 2013
- In 2018, the K-band CRF was officially adopted by the IAU as part of ICRF3, alongside the traditional S/X-band (2.3/8.4 GHz) frame
- The Astro2Geo K-band Project and website were launched in 2023
- By July 2025, K-band achieved higher precision than the S/X frame

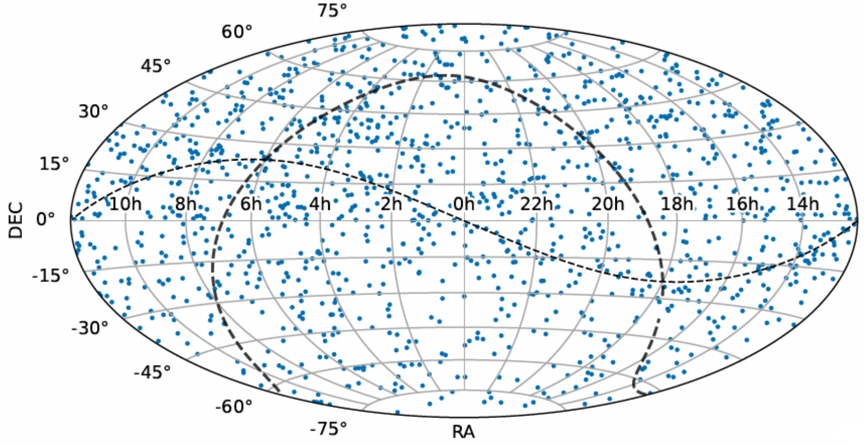
Astro2Geo K-Band Project: Ticking All the Boxes

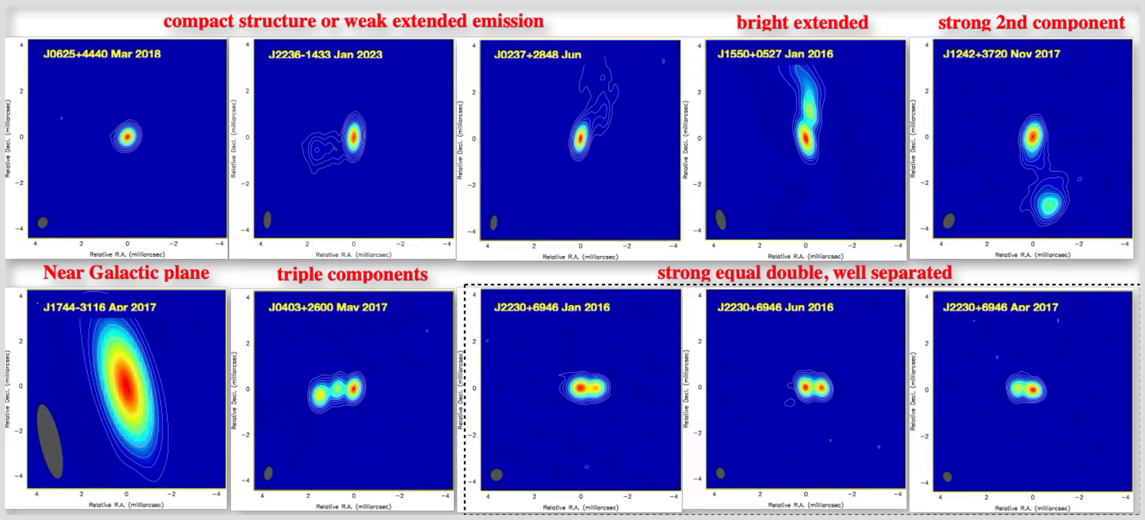


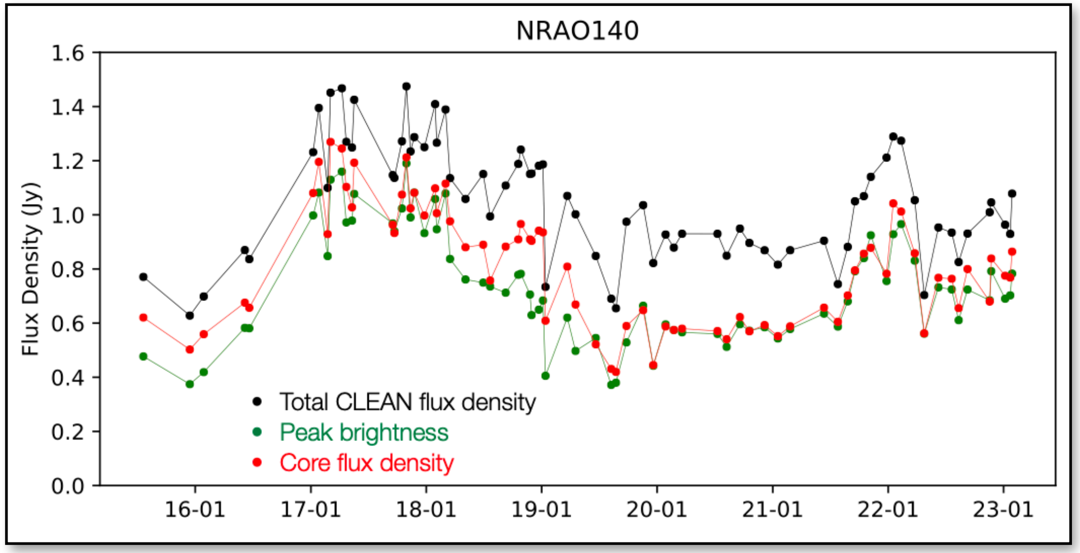
- Higher precision CRF through reduced source structure effects and improved resolution. Operating at 24 GHz avoids much of the RFI plaguing lower bands.
- Tackling challenges in scheduling, correlation, and atmospheric modelling. Receiver development —> also higher frequencies and tri-band (K/Q/W) receivers
- Applying machine learning/AI for improved ionospheric calibration in single-band mode. Advances in high-frequency receivers and in recording & network systems that now enable higher data rates
- VLBI networks worldwide are moving to higher frequencies (K, Q, W) & multi/broadband receivers
- Planning K-band receivers for new African telescopes (e.g., AMT in Namibia)
- ICRF K-band adopted by the IAU in 2018. K-band data submitted for the next ITRF solution (station positions, EOP). VLBI monitoring and imaging of AGN contributes to many astronomy projects

Astro2Geo K-Band Project: Ticking All the Boxes









Dankie
Enkosi
Ha khensa
Re a leboga
Ro livhuwa
Siyabonga
Siyathokoza
Thank you

Making sure it's possible