Geoscience Australia Analysis Center Report

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Abstract This report gives an overview of the activities of the Geoscience Australia IVS Analysis Center during 2023–2024.

1 General Information

The Geoscience Australia (GA) International VLBI Service for Geodesy and Astrometry (IVS) Analysis Center is located in Canberra within the National Geodesy Section, Positioning Australia Branch, Space Division of Geoscience Australia.

2 Activities during the Years 2023–2024

2.1 New Hiring

In mid-2023, GA welcomed Adelaide University PhD graduate Simon Willcocks. Simon was brought on to assist Oleg Titov with performing weekly uploads of IVS SINEX files as well as assist with other general tasks at the analysis center.

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2.2 GA Began Regular Daily SINEX Submissions

GA has generated 2,645 daily SINEX files from 24-hour sessions dating back to January 1993 and uploaded them to the Crustal Dynamics Data Information System (CDDIS) repository (see Figure 1 for a partial snapshot of the Earth Orientation Parameters (EOP) outputs made). The SINEX files were generated using the MATLAB^{TM}-based VieVS software created by Technische Universität Wien, Austria. Assistance in getting the software working as well as meeting SINEX guidelines were supplied by Prof. Hana Krásná (Vienna University of Technology, Austria) and Dr. Sabine Bachmann (Federal Agency for Cartography and Geodesy, "BKG", Germany), respectively. Uploads were made for the IRIS-A (1993), NEOS-RAPID (1994–2001), and IVS-R1 and IVS-R4 (2002–present) sessions. The daily SINEX files of the IVS-R1 and IVS-R4 sessions were uploaded on a weekly basis under the aus2023a suffix.

2.3 Installation of Fiber Optic Cable to the Yarragadee Geodetic Observatory

Through the support of the Australian Academic and Research Network (AARNet), the YARRA12M station (Western Australia) can now transmit data remotely due to the installation of a fiber optic cable to the site, giving it wired network access. The KATH12M (Northern Territory) station is also in the process of installing a fiber optic cable, so it too can transmit data remotely.

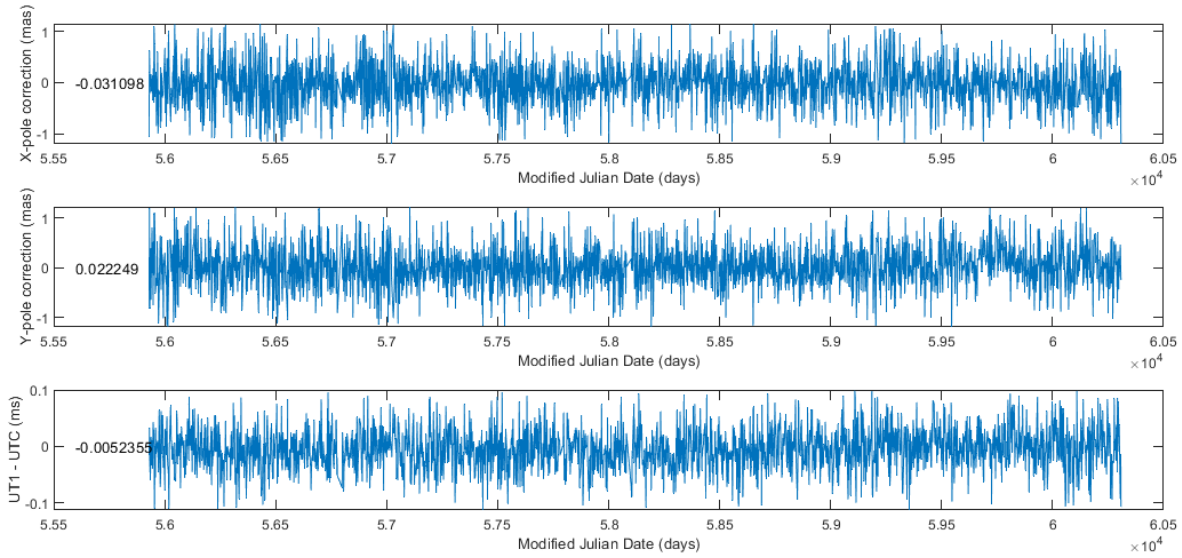

Fig. 1 Twelve years of EOP corrections (January 2012 – December 2023) produced by GA using the VieVS software.

2.4 Establishment of NCI Upload Server

In mid-2024, GA funded and installed a new server (Figure 2) to support the correlation work undertaken by the University of Tasmania, Hobart, utilizing the National Computational Infrastructure (NCI) Gadi supercomputer based in Canberra. This new server allows for the direct uploading of HDDs and SSDs from the KATH12M station to the correlator, while Yarragadee and the two Hobart antennas can upload their data remotely.

Fig. 2 Picture of new upload terminal in GA server room.

2.5 Updates to the CRF

Over the two years (2023–2024), three celestial reference frame (CRF) solutions have been prepared using the OCCAM 6.3 software. The latest solution was released in February 2025 (`https://ivs.bkg.bund.de/data_dir/vlbi/ivsproducts/crf/aus2025a.crf.gz`).

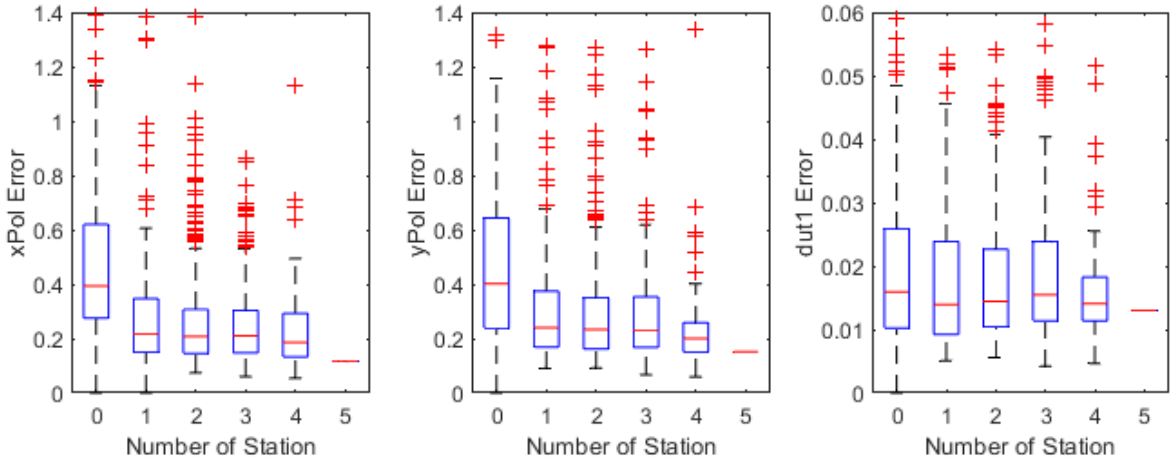

Fig. 3 Box and Whisker plots of three EOP values (x-pole, y-pole, and dut1) with formal errors based on the number of Australian and New Zealand VLBI stations participating in 1,245 IVS-R1 and IVS-R4 sessions between 2012 and 2023.

2.6 Review of the Impact of Australian Based VLBI Stations

GA initiated a self-reflective study to evaluate how the three Australian AuScope VLBI stations (plus HOBART26 in Tasmania and WARK12M in New Zealand) have contributed to global VLBI accuracy. The five Australian and New Zealand VLBI stations occupy a unique region of the terrestrial reference frame. Initial results show that they were all among the top 15 most frequently used stations in IVS-R1 and IVS-R4 sessions between 2012 and 2023, and they are responsible for over 50% of radio sources in the southern celestial hemisphere. Alongside their importance in the stated areas, they are also found to drastically improve EOP estimations when we compare sessions with and without Australian stations present (Figure 3).

Acknowledgements

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