

Geodetic reference frame of Asia and the Pacific assimilating VLBI observation

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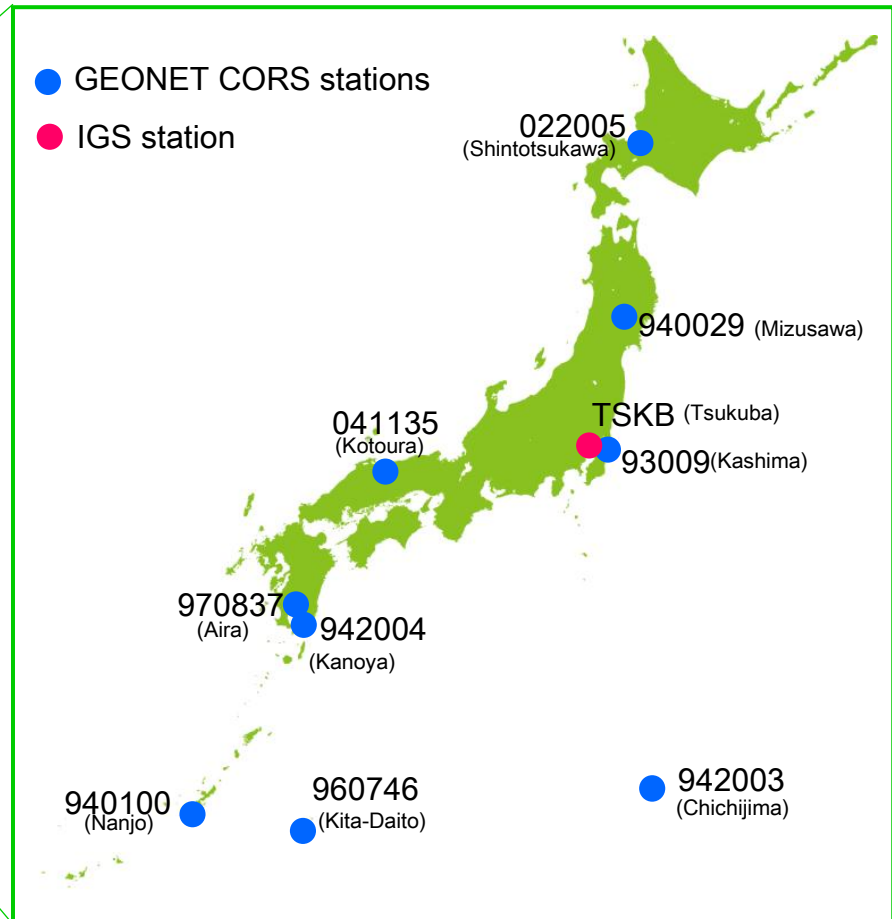
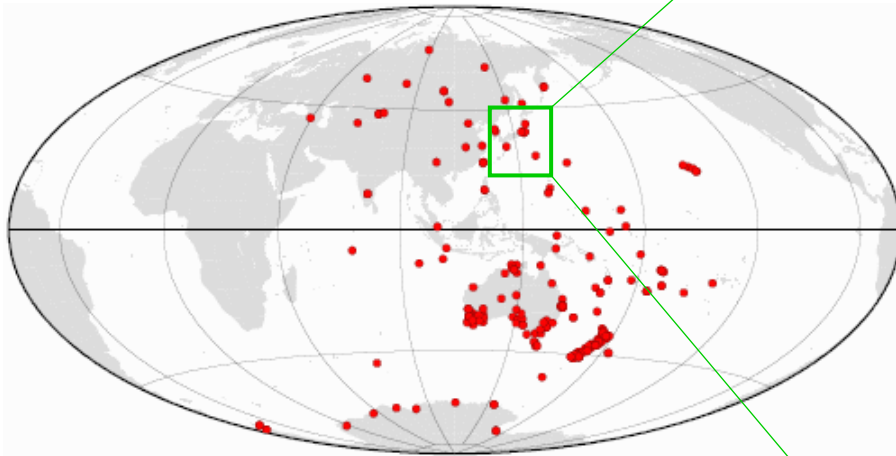
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**Cooperation of Japan for building
Regional Geodetic Reference
Frame in Asia and the Pacific**

Participation in APREF

- Asia-Pacific Reference Frame (APREF) is a regional geodetic reference frame realized from GNSS observation.
- Japan is participating in APREF with network stations.



JICA training course

< Management and Utilization of National Control Points for Efficiency of Survey >

- Capacity building for CORS network and GNSS observation by sharing experiences and technologies.
- Started in 2015 and accepted 8 participants from 7 countries.

【 Purposes 】

- To learn satellite positioning and CORS system.
- To learn method best fit to each country for management and utilization of national control points and reference frame.
- To learn transition from local to Global Geodetic Reference Frame.



【Major Subjects】

- GNSS Survey Technology
- CORS system
- Gravity measurement
and Geoid development
- Conversion from local to
Global Geodetic Reference Frame
etc.

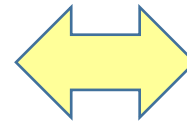


Asia Oceania VLBI Group (AOV)

Enhancing consistency with ITRF

A Challenge to enhance consistency between APREF and ITRF

- APREF has already become an essential infrastructure for Asia and the Pacific and facilitated the densification of the regional geodetic observation network.
- However, the current frame is developed only from collaborative GNSS observations.
- Integration of VLBI observations into APREF can improve consistency between APREF and ITRF.



Asia Oceania VLBI Group (AOV)

- Asia-Oceania VLBI Group for Geodesy and Astrometry
- Subgroup of IVS (International VLBI Service for Geodesy and Astrometry)
- Established in 2014 to foster regional collaboration of VLBI
- Composed of IVS Member Organizations in Asia-Oceania Region
- Chair: Jim Lovell (University of Tasmania, Australia)
- Secretary: Ryoji Kawabata (GSI, Japan)



Terms of Reference for the Asia-Oceania VLBI Group for Geodesy and Astrometry (AOV)

The AOV is a group of scientists in the Asia-Oceania region supporting geodetic and astrometric Very Long Baseline Interferometry (VLBI). It is a subgroup of the International VLBI Service for Geodesy and Astrometry (IVS).

The Asia-Oceania region is highly dynamic in geophysics and climate, with a large number of destructive earthquakes, tsunamis, typhoons and cyclones. Many countries in the region will experience the effects of climate change much sooner or to a greater degree than other regions, due to more frequent extreme weather events and rising sea levels for example. In order to better understand the risks and reduce the effects of these phenomena, the AOV has an important role to play through measurement of tectonic plate motions, atmospheric variations and determination of the Geodetic Reference Frame for the region. The AOV seeks to:

1. foster the use of VLBI, with a particular focus on producing high quality data and science results in geodesy and astrometry from the Asia-Oceania region.
2. form and strengthen links between the different Asia-Oceania VLBI components in technology development and from observations to data analysis.
3. promote and represent Asia-Oceania geodetic and astrometric VLBI within the broader international scientific communities.
4. provide and archive information and scientific results of Asia-Oceania geodetic and astrometric VLBI.
5. organize regular working meetings to improve communication and cooperation between members of the AOV.
6. support and promote education and training in geodetic and astrometric VLBI and related technology in the region.

AOV Members

AOV is composed of 5 countries, 12 institutions of IVS.

Member Organization	Country
Auckland University of Technology (UTAS)	New Zealand
Commonwealth Scientific and Industrial Research Organization (CSIRO)	Australia
Geoscience Australia (GA)	Australia
Geospatial Information Authority of Japan (GSI) [Secretariat]	Japan
Korea Astronomy and Space Science Institute (KASI)	South Korea
National Astronomical Observatory of Japan (NAOJ)	Japan
National Geographic Information Institute (NGII)	South Korea
National Institute of Information and Communications Technology (NICT)	Japan
National Institute of Polar Research (NIPR)	Japan
Shanghai Astronomical Observatory (SHAO)	China
University of Tasmania (UTAS) [Chair]	Australia
Xinjiang Astronomical Observatory (XAO)	China

AOV Observing Network

AOV members are sharing their resources of VLBI.

5 countries,
17 telescopes



Code	Name	Country
Ai	Aira 10m	Japan
Hb	Hobart 12m	Australia
Ho	Hobart 26m	Australia
Is	Ishioka	Japan
K1	Kashima 11m	Japan
Kb	Kashima 34m	Japan
Ke	Katherine 12m	Australia
Kg	Koganei 11m	Japan
Km	Kunming 40m	China
Kv	Sejong 22m	Korea
Pa	Parks 64m	Australia
Sh	Seshan 25m	China
Sy	Syowa 11m	Japan
T6	Tianma 65m	China
Ts	Tsukuba 32m	Japan
Ur	Urumqi 25m	China
Vm	Mizusawa 20m	Japan
Ww	Warkworth 12m	New Zealand
Yg	Yarragadee 12m	Australia

AOV Activities

- Collaborative VLBI Observations

- Six VLBI Observations scheduled in 2015 as IVS regular sessions
- ~ 10 Stations forming regional VLBI Network
- Sharing schedulers and correlators among AOV

Code	Date	Stations	Scheduler	Correlator
AOV001	Mar. 21	Ai Hb Is K1 Ke Kg Km Sh Ts Ur Ww Yg	UTAS	SHAO
AOV002	Apr. 30	Hb Is Ke Kv Sy Ts Vm Ww Yg	GSI	GSI
AOV003	May 17	Hb Ho Is K1 Ke Kg Km Pa T6 Ts Ww Yg	UTAS	GSI
AOV004	Aug. 26	Hb Is Kb Ke Kv Sh Ts Ww Yg	SHAO	NGII
AOV005	Sep. 26	Is K1 Kb Ke Kg Ts Ur Vm Ww Yg	GSI	NGII
AOV006	Dec. 16	Hb Is Kb Ke Km Kv Sh Ts Ur Ww Yg	SHAO	SHAO

- Face to Face Meeting

- First Scientific Meeting in this November 19-20 in Hobart, Australia

Future Collaboration within AOV

- Regular Observation
 - Continue regional VLBI observations in order to accumulate VLBI data
- New VLBI system
 - IVS is promoting new VLBI system, VLBI Global Observing System (VGOS)
 - Regional VLBI experiments among AOV for VGOS realization
- **Contribution to Regional Reference Frame**
 - AOV products will be submitted to IERS through IVS in order to improve ITRF
 - Utilized for Consistency Check for APREF with ITRF

Enhancing consistency between APREF and ITRF

- APREF is developed through GNSS observations and thus a globally consistent regional reference frame for the Asia-Pacific region.
- Integration of VLBI solution into APREF is effective to improve consistency between APREF and ITRF.
- AOV is a collaborative initiative to enhance regional VLBI collaboration for the region.
- Japan serves as a secretariat of AOV, and is contributing to the development and maintenance of regional reference frame more consistent with ITRF.

Conclusion

- Densification of GNSS observation network can contribute to densification of regional geodetic reference frame, APREF.
- Member countries are encouraged to join GNSS observation network in order to densify APREF.
- GSI will continue to contribute to capacity building on GNSS observation and CORS system through JICA training course.
- Integration of VLBI observations into APREF is effective to improve consistency between APREF and ITRF.
- Asia-Pacific should contribute to ITRF through regional VLBI collaboration, AOV, by submitting the products to IERS.

Thank you