Activity Report on the Asia-Oceania VLBI Group (AOV)

Takahiro WAKASUGI

(Geospatial Information Authority of Japan)

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Q. What is AOV?

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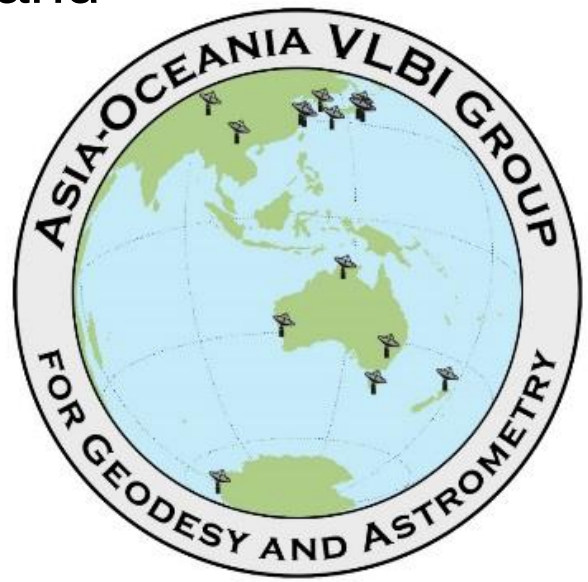
A.

Asia-**O**ceania **V**LBI Group for Geodesy and Astrometry

- International collaboration of geodetic and astrometric VLBI researchers

  in the Asia-Oceania region.
- A regional subgroup of the IVS.



Backgrounds

- The Asia-Oceania (AO) region is highly dynamic in geophysics and climate, with a large number of destructive earthquakes, tsunamis, typhoons, and cyclones.
  - Determination of the Geodetic Reference Frame for the region contributes to Earth Observations and better understanding of tectonic plate motion, atmospheric variations etc.

- VLBI component in AO region is rapidly glowing compared to IVS launch.
  - More international collaboration to take full advantage of components in the region
  - Rise of the position in the VLBI community

The Beginning

- It was six years ago at the conference dinner of 21st EVGA Meeting in Finland.
  - Some Asian researchers (Jungho Cho from KASI, Fengchun Shu from SHAO, Shinobu Kurihara from GSI, and so on) discussed the idea of regional collaboration on geodetic VLBI in Asia.
- The idea was extended to Oceanian region for more effective cooperation.
- The foundation of a regional VLBI community for Asia-Oceania region was agreed at the 30th IVS Directing Board Meeting in September, 2013.

Progress

- The group was named as “Asia-Oceania VLBI Group for Geodesy and Astrometry” and its acronym was called “AOV”.
- It is a regional subgroup of the IVS similar to the EVGA.
- The kick-off meeting was held at Shanghai in conjunction with the 8th IVS General Meeting and Terms of Reference was discussed and finalized.
- Jim Lovell (UTAS) was elected to the first AOV Chair and he pointed out Ryoji Kawabata (GSI) as the Secretary.
- AOV sessions started at March 2015.
- Takahiro Wakasugi (GSI) and Lucia McCallum (UTAS) assumed as the second Chair and Secretary since 2017.

Components

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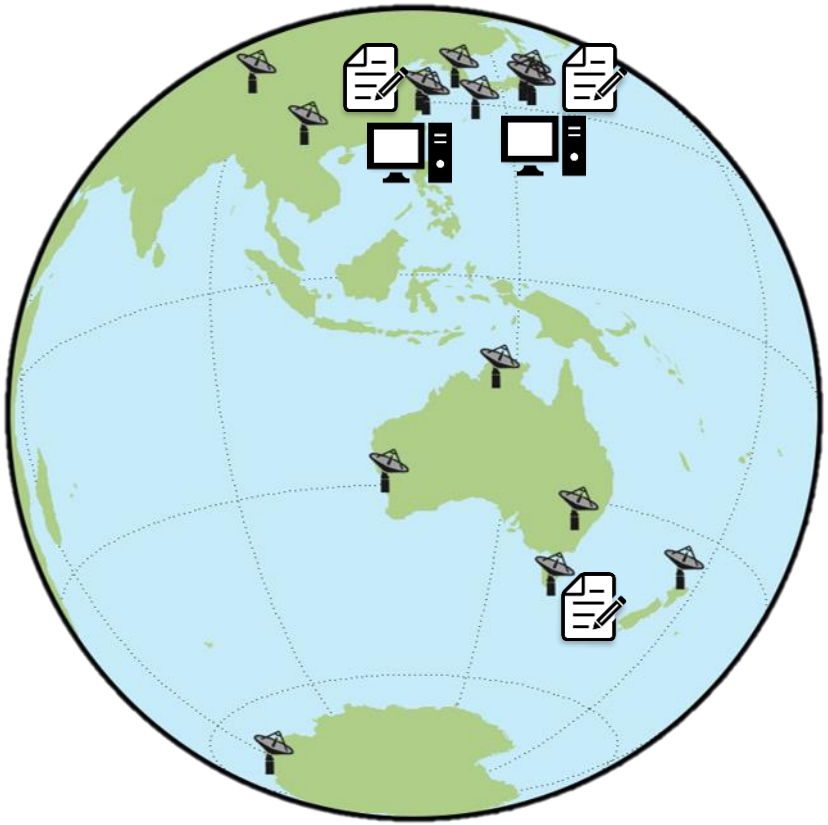
- AOV is composed of 12 organizations in five countries.
  - AUS (3), CHN (2), KOR(2), JPN (4), NZL (1)

Organizations	Country	Organizations	Country
Commonwealth Scientific and Industrial Research Organization (CSIRO)	AUS	Korea Astronomical and Space Science Institute (KASI)	KOR
Geoscience Australia (GA)	AUS	National Geographic Information Institute (NGII)	KOR
University of Tasmania (UTAS)	AUS	Geospatial Information Authority of Japan (GSI)	JPN
Shanghai Astronomical Observatory (SHAO)	CHN	National Astronomical Observatory of Japan (NAOJ)	JPN
Xinjiang Astronomical Observatory (XAO)	CHN	National Institute of Information and Communications Technology (NICT)	JPN
Auckland University of Technology (AUT)	NZL	National Institute of Polar Research	JPN

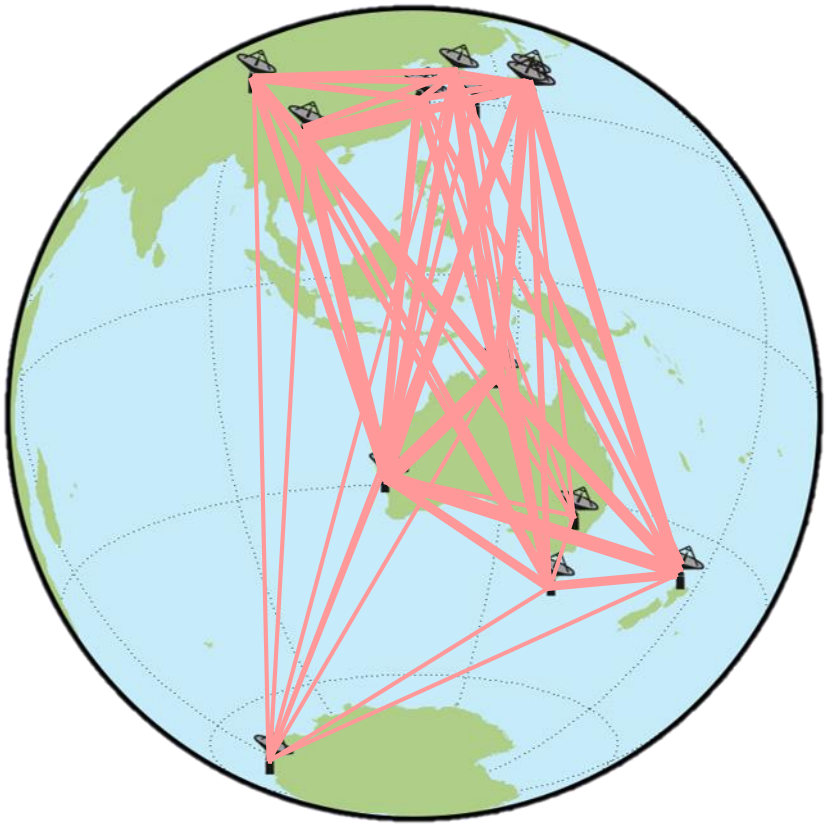
Components

- A total of 19 stations has been involved in AOV sessions
  - AUS (5), CHN (4), KOR(1), JPN (8), NZL (1)
- Three Schedulers (GSI, SHAO, and UTAS)
- Two Correlators (GSI and SHAO)



Observations

- AOV sessions
  - started at March 21, 2015,
  - were carried out six times per year until 2017,
  - are performed 12 times per year since 2018,
  - are conducted 32 times so far.



Observations

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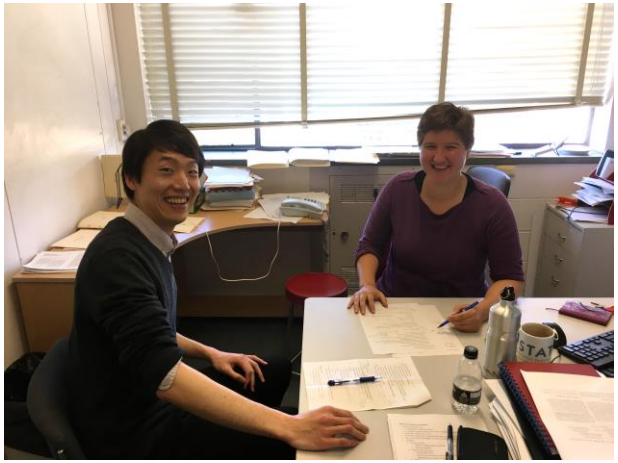
- AOV sessions in 2019
  - 12 sessions are planned.
  - Six for Geodesy, six for Astrometry.
  - All sessions are performed at the data rate of 1Gbps by upgrade of the system at Syowa (128Mbps so far).

Session	Date	Num. of stations	Scheduler	Correlator	Data rate	Bandwidth	Purpose
AOV031	JAN21	8	SHAO	SHAO	1 Gbps	1 GHz	Astro.
AOV032	FEB12	9	GSI	GSI	1 Gbps	512 MHz	Geodesy
AOV033	MAR20	8	SHAO	SHAO	1 Gbps	1 GHz	Astro.
AOV034	APR03	10	SHAO	SHAO	1 Gbps	1 GHz	Astro.
AOV035	MAY14	9	GSI	GSI	1 Gbps	512 MHz	Geodesy
AOV036	JUN18	9	SHAO	SHAO	1 Gbps	1 GHz	Astro.
AOV037	JUL17	8	SHAO	SHAO	1 Gbps	1 GHz	Astro.
AOV038	AUG07	10	UTAS	GSI	1 Gbps	512 MHz	Geodesy
AOV039	SEP17	10	GSI	GSI	1 Gbps	512 MHz	Geodesy
AOV040	OCT15	10	SHAO	SHAO	1 Gbps	1 GHz	Astro.
AOV041	NOV12	9	UTAS	GSI	1 Gbps	512 MHz	Geodesy
AOV042	DEC03	9	GSI	GSI	1 Gbps	512 MHz	Geodesy

Meetings

- 1st Meeting in Nov 2015 in Hobart
- 2nd Meeting in Jul-Aug 2017 in Kobe, Japan
- AOV retreat Mar 2018 in Hobart
- 3rd Meeting in Nov 2018 in Canberra



Results

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- Geodetic Analysis

Software	Calc/Solve
Period	AOV: 2015-2018 (AOV001-024) Others: 1980-2018
# of sessions	6493
Estimated parameters	Station position/velocity EOP Source position
Apriori	ITRF2014 USNO finals, IAU2006/2000 Precession/Nutation ICRF2

Results

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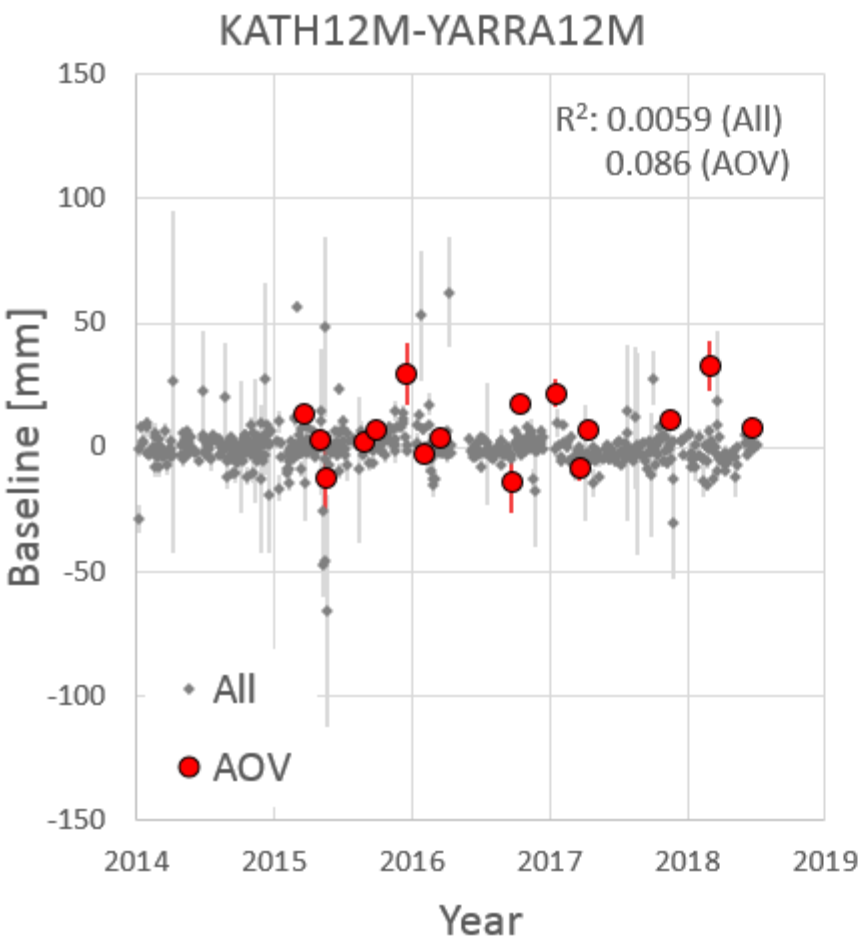
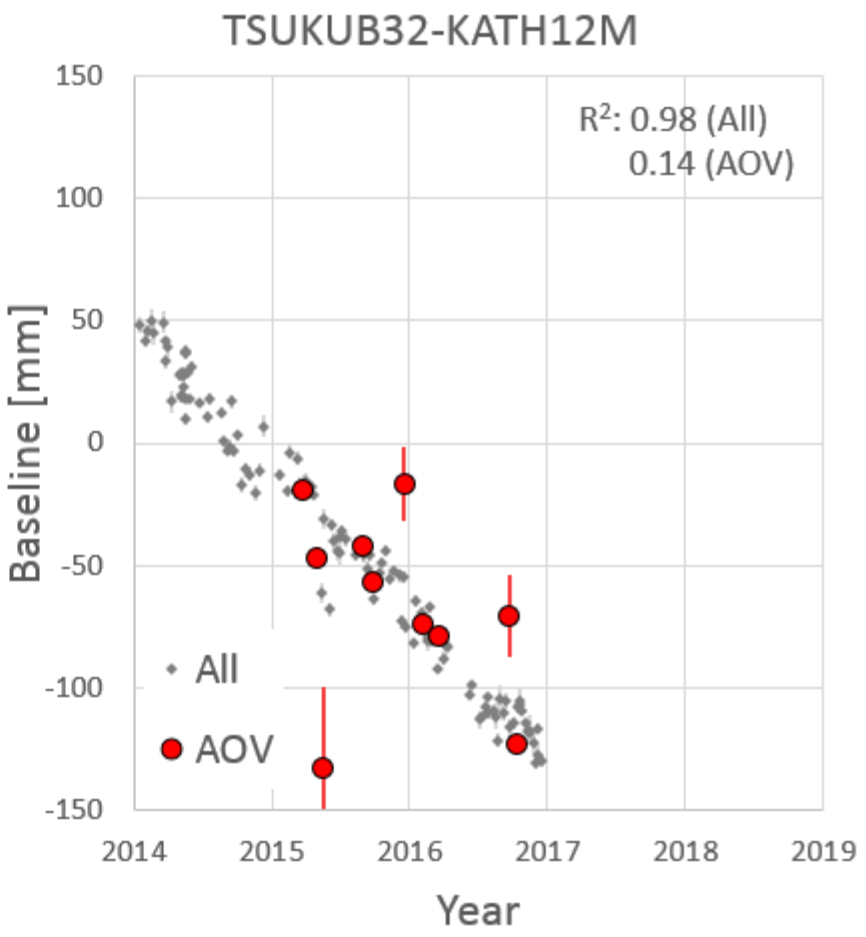
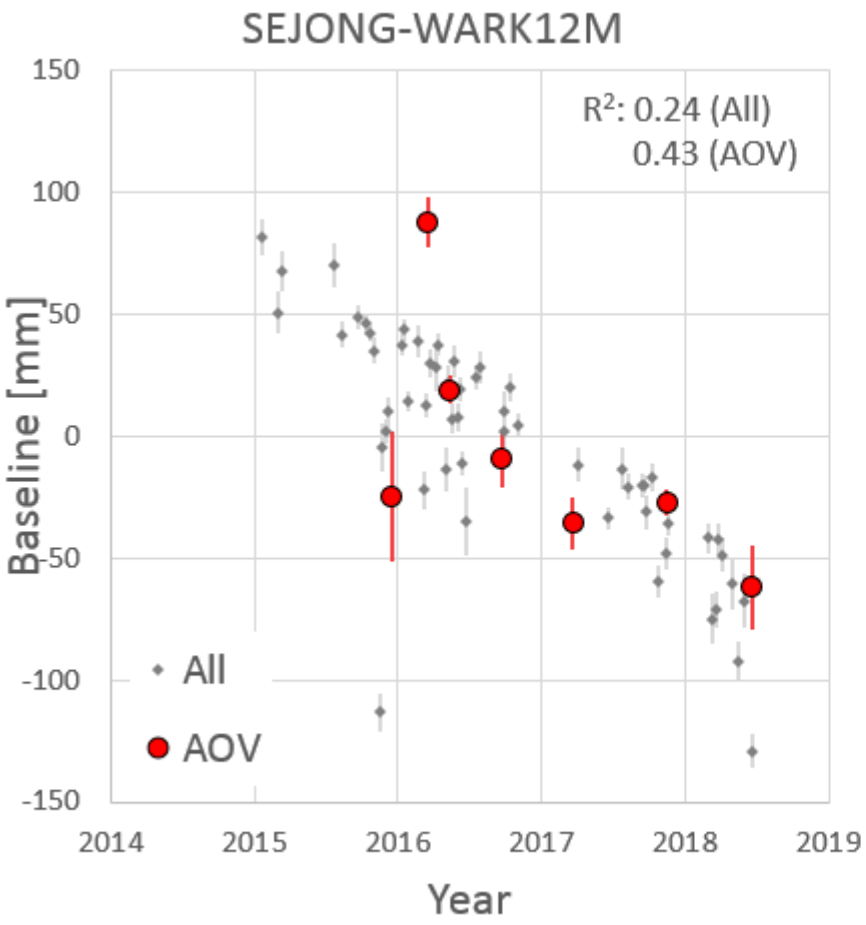
- Consistent with other sessions

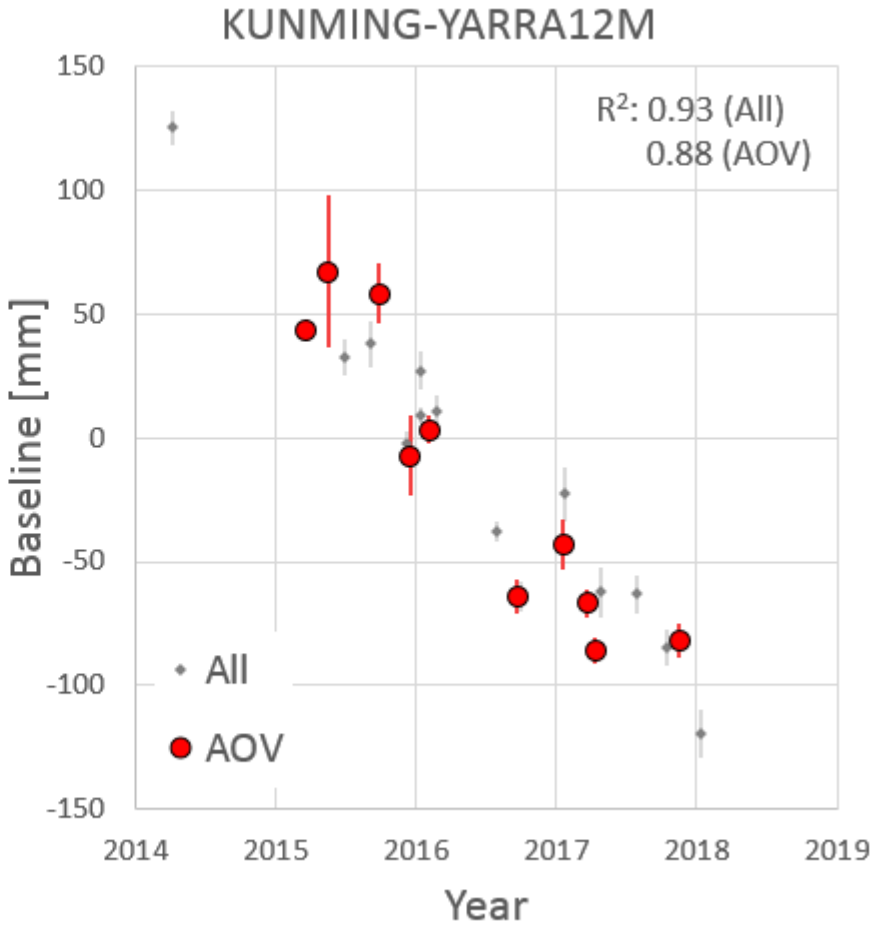




Results

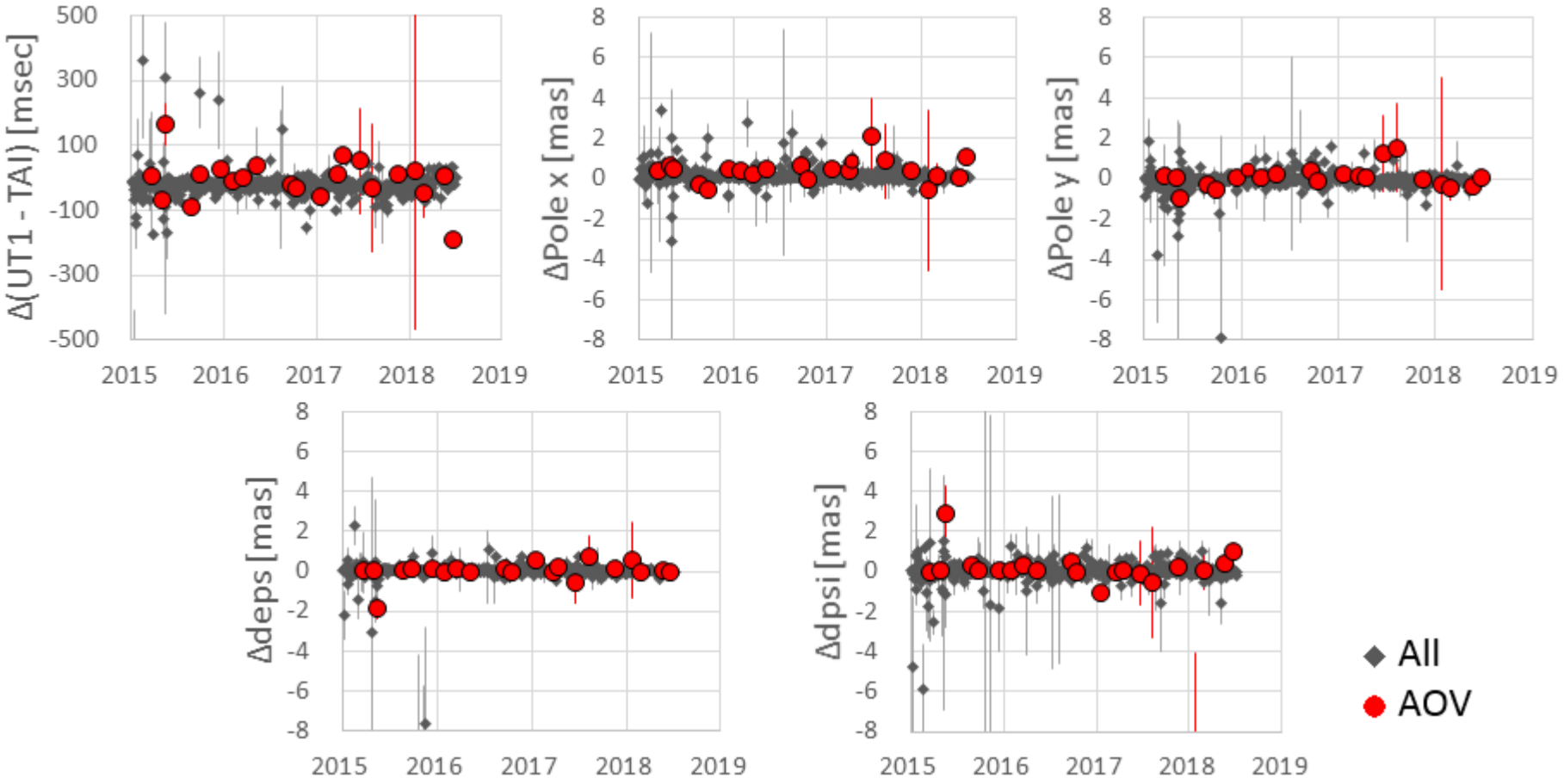
- Consistent with other sessions





Results

- Estimate the residuals to IERS EOPC04.08 series
- Sensitivity is comparable to other sessions



Results

- Astrometry
  - Please visit “P210 High sensitivity astrometry with the AOV” by Fengchun Shu
- General Relativity
  - Please hear the talk “O210 Observations of radio sources near the Sun” by Oleg Titov

Future

- VGOS experiments in AOV ?
  - Not yet, but…
  - Broadband experiments by NICT (“O112” Italy-Japan broadband VLBI experiment for optical clock comparison)
  - Operational Mixed-mode observations by UTAS
  - Shanghai VGOS station is coming soon
  - New VLBI project in Thailand

Thank you for your kind attention.

Please visit our website

http://auscope.phys.utas.edu.au/aov/index.html