

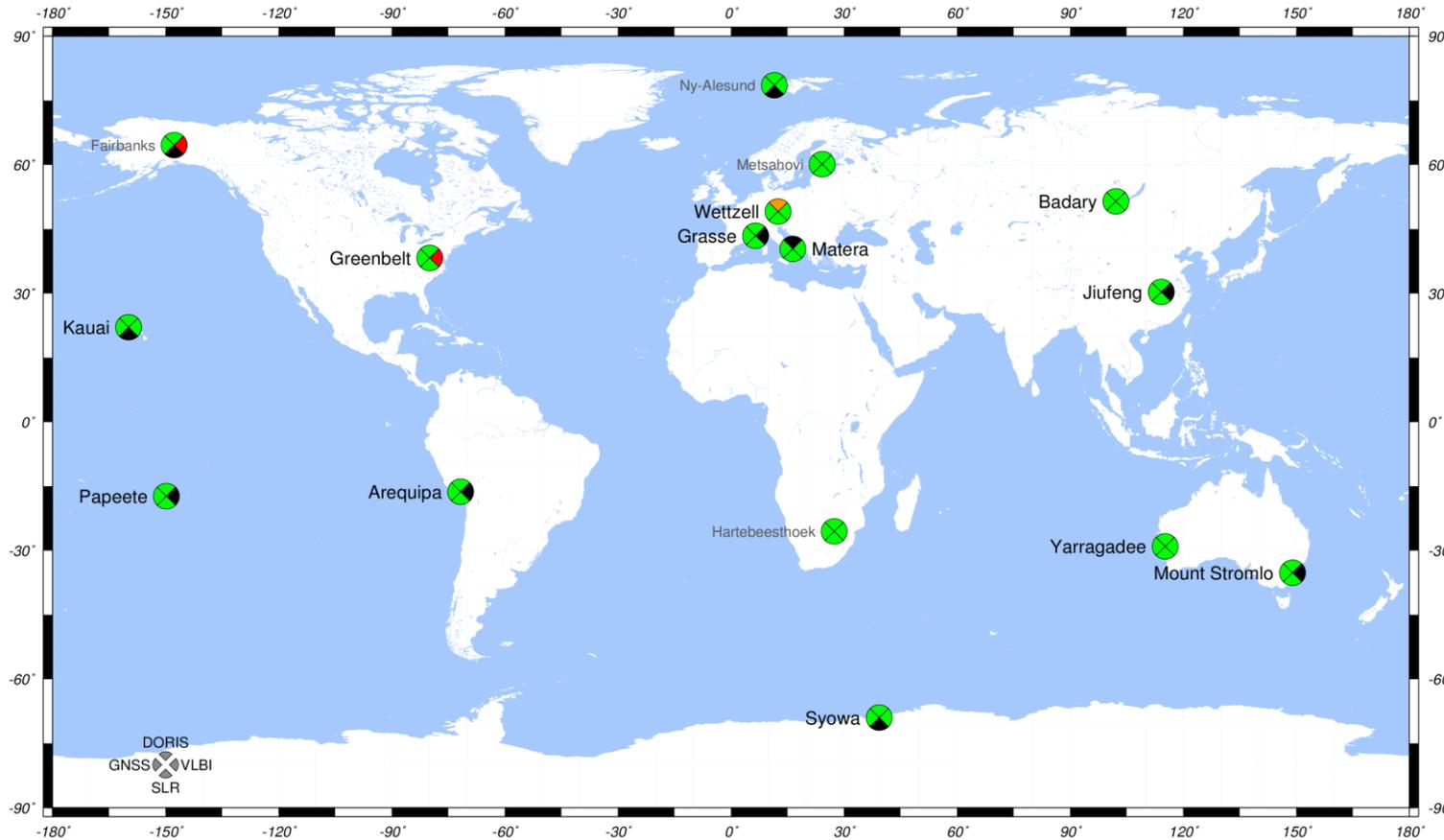
## G14A-06 - Analysis of the DORIS, GNSS, SLR, VLBI and gravimetric time series at the GGOS core sites

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- **Motivation & Goals:** analysis of the time series at the 3-5 multi-technique GGOS sites to
  - Analyze and compare the spectral content of the space geodetic and gravity time series.
  - Evaluate the level of agreement between the space geodesy measurements and the physical tie vectors.
- **Data sources:**
  - DORIS: coordinate time series from the latest IDS combined series (ids 12).
  - GNSS : coordinate time series from the IGS Combination Center (<ftp://igs-rf.ign.fr/>).
  - Laser : coordinate time series from the operational ILRS combination.
  - VLBI : coordinate time series from GSFC.
  - Gravity: BGI.



# Multi technique sites



# techniques	# sites
4	6
3	10

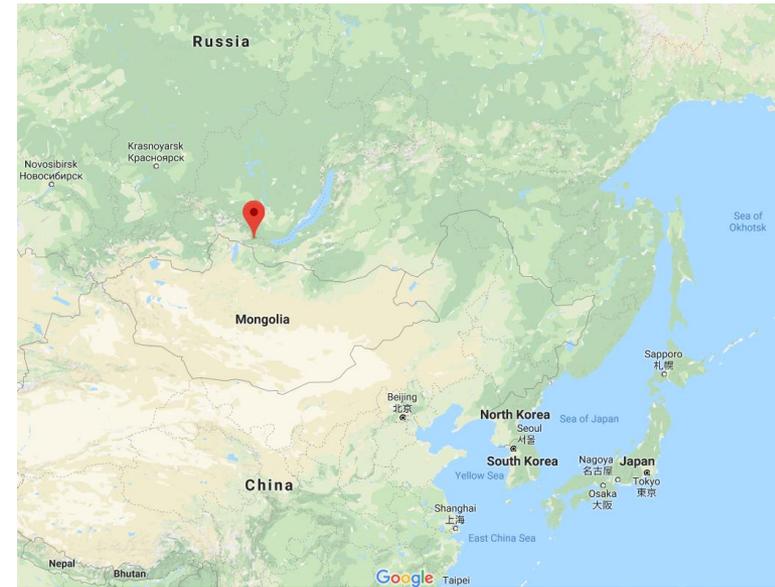
- Fairbanks, Hartebeesthoek, Metsahovi, Ny-Alesund: co-location > 1km.
- Wettzell: DORIS started recently (2016/09/27).



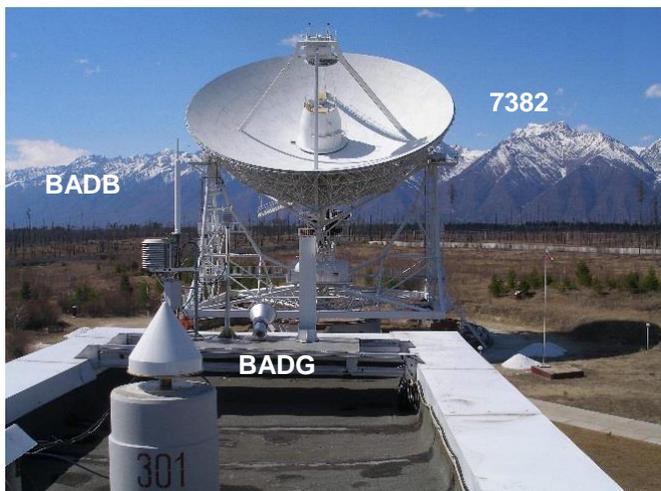
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# Badary (Russia)

- **Host agency:** Institute of Applied Astronomy (of the Russian Academy of Sciences)
- **4 techniques**
- **DORIS:**
  - Since 1991/12/11.
  - BADA, BADB.
- **GNSS:**
  - Since 2005/04/01.
  - BADG.
- **SLR:**
  - Since 2011/07/10.
  - 1890 (BADL).
- **VLBI:**
  - Since 2007/03/01.
  - 7382.
- **Tie vectors:**
  - BADB/BADG/7382.



# Badary (Russia) - Sitelog



Technique	Monument Description (from sitelogs)
DORIS (BADB)	Ant. support: 30cm sided very rigid metal tower 1m high Installed on: Thick aluminium plate fixed on the terrace roof of a 3 storied building.
GNSS (BADG)	Stainless plate on concrete pillar on flat roof of 2-storied laboratory building (16m above the ground).
SLR (BADL)	Concrete pillar.

Unit: m	DORIS	GNSS	SLR	VLBI
DORIS		4.285	46.324	92.457
GNSS	4.285		45.562	96.619
SLR	46.324	45,562		104.208
VLBI	92.457	96.619	104.208	

Date	Technique	Event
2004/08/10	DORIS	Station change (BADA → BADB)
2006/09/25	Ties	BADB vs BADG, BADB vs 1890
2007/04/02	GNSS	Antenna change
2010/03/15	GNSS	Antenna change
2011/06/06	Ties	1890 vs 7382

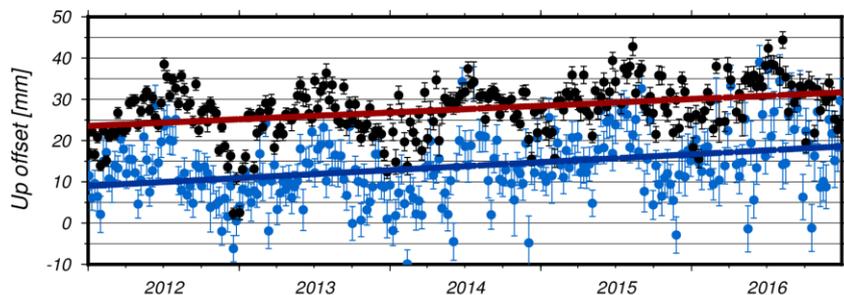
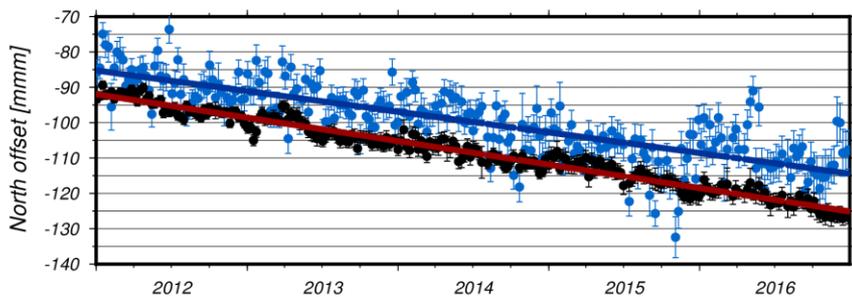
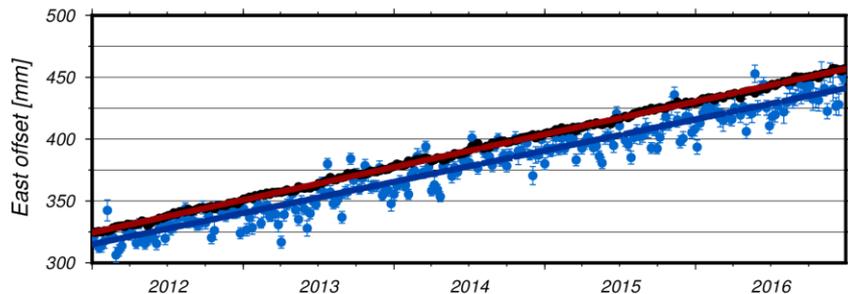


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# Badary (Russia) – Time series

## DORIS - GNSS

Time Span: 2012.0-2017.0



## Mean Velocity

Unit: mm/yr	DORIS	GNSS	VLBI
Vel – East	25.3 ± 0.6	26.5 ± 0.1	26.1 ± 0.4
Vel – North	-5.9 ± 0.4	-6.6 ± 0.1	-6.2 ± 0.3
Vel - Up	1.9 ± 0.5	1.6 ± 0.3	1.1 ± 0.9

→ ENU velocities all agree to w/in their respective std dev

## Annual Signal Content

Units: mm & deg	DORIS	GNSS	VLBI
East	-	-	-
North	-	1.0 ± 0.2 (126.2)	-
Up	4.3 ± 0.7 (32.9)	5.2 ± 0.5 (28.0)	-

→ Very good agreement between DORIS and GNSS in the up.

# Yarragadee (Australia)

- **Host agency: Geoscience Australia**
- **4 techniques**
- **DORIS:**
  - YARA, YARB, YASB - Since 1992/09/14.
- **GNSS:**
  - YAR2, YAR3, YARR - Since 1990/12/03.
- **SLR:**
  - 7090 (YARL, Moblas-5) - Since 1979/07/01.
- **VLBI:**
  - 7376 - Since 2011/05/18.



# Yarragadee (Australia) - Sitelog



Technique	Monument Description (from sitelogs)
DORIS (YASB)	0.3m stainless steel tripod on 1.5m high concrete pillar.
GNSS (YAR2)	Stainless plate on concrete pillar on flat roof of 2-storied laboratory building (16m above the ground).
SLR (7090)	Concrete block.

Unit: m	DORIS	GNSS	SLR	VLBI
DORIS		48.080	36.690	155.779
GNSS	48.080		23.152	147.451
SLR	36.690	23.152		131.615
VLBI	155.779	147.451	131.615	

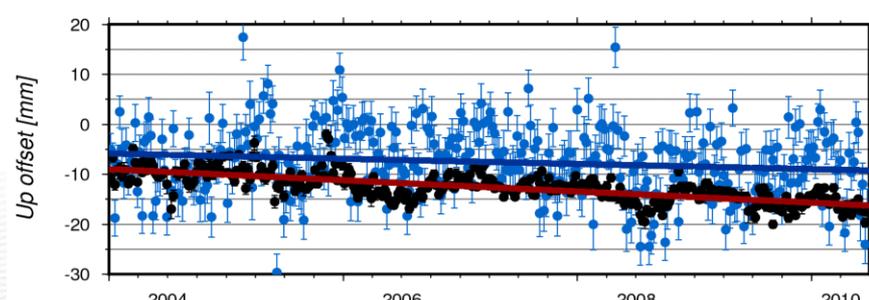
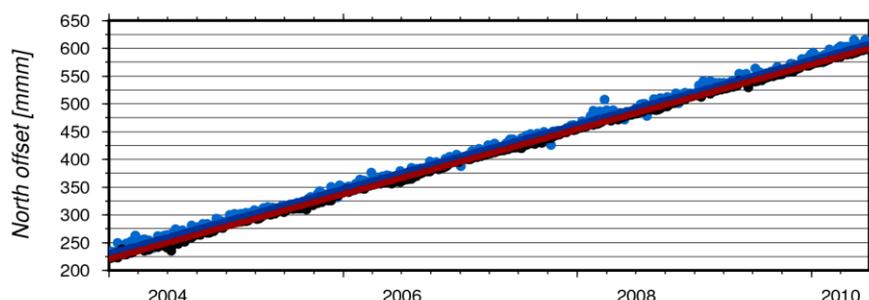
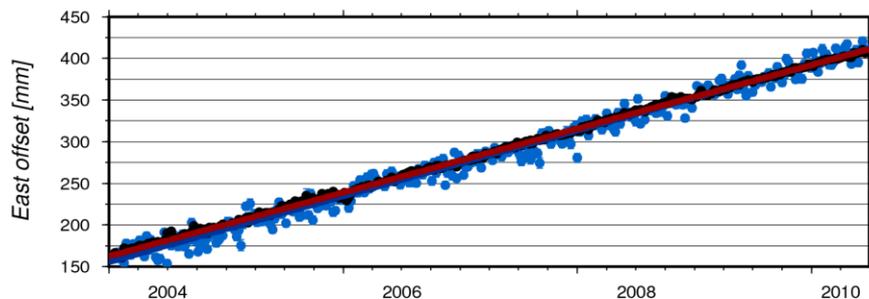
Date	Technique	Event
1997/08/18	GNSS	Antenna change
1998/08/01	Ties	YARA vs YAR2, YARA vs 7090
1999/10/01	Ties	YARB vs YAR2
1999/10/04	DORIS	Station change (YARA → YARB)
2002/05/13	GNSS	Antenna change
2003/11/01	Ties	YASB vs YAR2, YARB/YASB vs 7090
2003/11/27	DORIS	Station change (YARB → YASB)
2010/06/12	Ties	7090 vs 7376
2013/06/17	GNSS	Antenna change



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**DORIS –SLR**

# Yarragadee (Australia) - Time series



Time Span: 2004.0-2010.5

## Mean Velocity

Unit: mm/yr	DORIS	GNSS	SLR
Vel – East	$39.4 \pm 0.3$	$38.7 \pm 0.1$	$38.3 \pm 0.1$
Vel – North	$58.1 \pm 0.2$	$58.1 \pm 0.1$	$58.4 \pm 0.1$
Vel - Up	$-0.5 \pm 0.2$	$0.2 \pm 0.1$	$-1.1 \pm 0.1$

- ➔ EN velocities all agree to w/in their respective std dev
- ➔ Up velocity must be analyzed

- **Summary**

- List of 3-4-5 technique sites.
- List of stations, time periods, station events, monument types, ties from the technique sitelog files.
- Badary: good agreement for the ENU velocities and annual amplitude for DORIS and GNSS. This signal may result from the hydrologic and atmospheric loading.
- Yarragadee: up velocity differences must be investigated.

- **Next**

- More detailed analysis of the periodic signals and tie discrepancies.
- Comparisons with ITRF2014, DTRF2014 output.
- Adding of gravimetric data.
- More sites.