

Recent Geodetic VLBI Results from Shanghai Observatory

YE Shuhua, QIAN Zhihan, CHEN Gang and ZHOU Ruixian

Shanghai Observatory/CAS, Shanghai 200030, P.R.China

Abstract. Since 1988, the VLBI station equipped with a 25 m radio telescope located at She-Shan, near Shanghai, operated by Shanghai Observatory/CAS has participated in several tens international geodetic VLBI experiments. The length change rates of eight trans-continent or inter-continent baselines have been determined. A 1–2 cm eastward movement of Shanghai was also detected from those VLBI experiments.

1. International Geodetic VLBI Projects Involved

Table 1.

Project	Experiment code	Participant
CDP and DOSE, NASA	PPM-S, XASIA, X-PAC, GLOBAL	SHAO, FBKS, KASH, KA34, KAUA, KWJL, DSS45, TASM, HART, WETZ, WEST, SANT
Chinese-Japanese Joint VLBI Observation	WPVN	SHAO, KASH, KA34, MRCS, DAITO
Chinese-German Geodetic VLBI Project	SHAWE	SHAO, WETZ, MEDI, HART

Notes: SHAO - 25 m antenna, She-Shan, near Shanghai, P.R.China.
DAITO - 3 m transportable antenna, S. Daito Island, Japan.
DSS45 - 34 m antenna, Canberra, Australia.
FBKS - 26 m antenna, Fairbanks, Alaska, US.
KASH - 26 m antenna, Kashima, Japan.
KA34 - 34 m antenna, Kashima, Japan.
KAUA - 9 m antenna, Kauai, Hawaii, US.
HART - 26 m antenna, Hartebeesthoek, South Africa.
MEDI - 32 m antenna, Medicina, Bologna, Italy.
MRCS - 10 m antenna, Marcus Island, Japan.
SANT - 14 m antenna, Santiago, Chile.
TASM - 26 m antenna, Hobart, Tasmania, Australia.
WETZ - 20 m antenna, Wetzell, Bavaria, Germany.
WEST - 18 m antenna, Westford, MA, US.

2. Measurements of Inter-Continent Baselines

Data analysis: Standard: IERS Standards (1989)
Software: SOLVK (provided by T. Herring)

Table 2. Results of baseline lengths.

Baseline	Length* (mm)	Error (mm)	Rate (mm/yr)	Error (mm/yr)
SHAO - KASH	1875920038.8	±2.4	-27.3	±1.3
SHAO - MRCS	3270841103.2	±6.2	-114.5	±4.9
SHAO - FBKS	663555841.5	±9.2	-13.3	±5.8
SHAO - KAUA	7310293868.8	±9.9	-87.4	±6.2
SHAO - DSS45	7411128856.5	±5.2	-59.2	±4.3
SHAO - TASM	7965496493.8	±6.3	-45.9	±6.8
SHAO - WETZ	8003555605.9	±10.4	20.4	±12.6
SHAO - HART	10160763406.6	±13.1	13.4	±15.2

*Epoch: 1991.0

Note: The databases of those geodetic VLBI experiments involved Shanghai were provided by GSFC, NASA, US; CRL, Japan; and GIUB, Germany.

3. Horizontal Velocity of Shanghai VLBI Station

Table 3. Differences between predicted and observed baseline rates.

Baseline	Predicted rate* V_{pre} (mm/yr)	Observed rate V_{obs} (mm/yr)	δV ($V_{pre} - V_{obs}$) (mm/yr)	Local Azimuth ($^{\circ}$)
SHAO - KASH	-14.1	-27.3	13.2	68.2
SHAO - MRCS	-93.4	-114.5	21.1	95.0
SHAO - FBKS	-6.9	-13.3	6.4	28.5
SHAO - KAUA	-71.1	-87.4	16.3	75.6
SHAO - WETZ	0	20.4	-20.4	320.5

*Derived from the VLBI plate model (MAO and QIAN, 1993).

Assumed: SHAO and WETZ are on the Eurasian plate; MRCS and KAUA are on the Pacific plate; KASH and FBKS are on the N. American plate.

Results:

- Horizontal velocity: 18.6 ± 5.9 mm/yr;
- local azimuth: $114.^{\circ}2 \pm 8.^{\circ}5$;
- WRMS: ± 2.9 mm/yr.

4. Discussions

- About 2 cm eastward movement of Shanghai detected by VLBI is consistent with the estimation from average rates of the deformation in portions of eastern and central areas of Asia based on the large earthquakes. Probably, it is caused by the northward movement of the Indian Subcontinent which pushes the Chinese continent to north and east (MOLNAR and DENG, 1984);

- if a local westward movement of Kashima site is considered, the value of the horizontal velocity of Shanghai will be decreased to 1 cm. More VLBI observations on more baselines which involve Shanghai are needed for the future demonstration.

5. Future Geodetic VLBI Programs (1994–1996)

- Measurement of Shanghai-Urumqi baseline and its change rate;
- measurement of the baselines between Urumqi and those VLBI stations which are located in other countries, and the position and velocity of Urumqi site;
- monitoring of the local crustal motions of Shanghai and Urumqi VLBI sites by local GPS networks.

REFERENCES

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