Vienna SAC-SOS: ANALYSIS OF THE RUSSIAN VLBI SESSIONS

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Abstract

The Institute of Geodesy and Geophysics (IGG) of the Vienna University of Technology as an IVS Special Analysis Center for Specific Observing Sessions (SAC-SOS) has analysed the Russian VLBI sessions with the software VieVS. Since 2006, 223 experiments have been carried out. About half of those are 24h sessions, the others are Intensive sessions of a shorter duration of a few hours for the near-real time determination of Universal Time. Furthermore due to the large east-west extent, the Russian Quasar network might be well suited for estimating other Earth orientation parameters. We processed all Russian sessions using the Vienna VLBI Software VieVS and estimated Earth orientation parameters, station coordinates and station velocities. If experiments with a sigma a posteriori (s_0) of 3.5 or larger are treated as outliers, 87% of the sessions are suitable for parameter estimation.

Russian Geodetic VLBI Network

The Russian VLBI Network "Quasar" consists of the three radio astronomical observatories Badary, Zelenchukskaya and Svetloe (Fig. 1). Aside from the international VLBI observations, e.g. of the IVS, the Russian network follows an additional observing program to provide the full set of Earth orientation parameters (EOP) using 24 hour sessions and UT1-UTC using shorter Intensive sessions. VLBI measurements for the new network started in 2006.

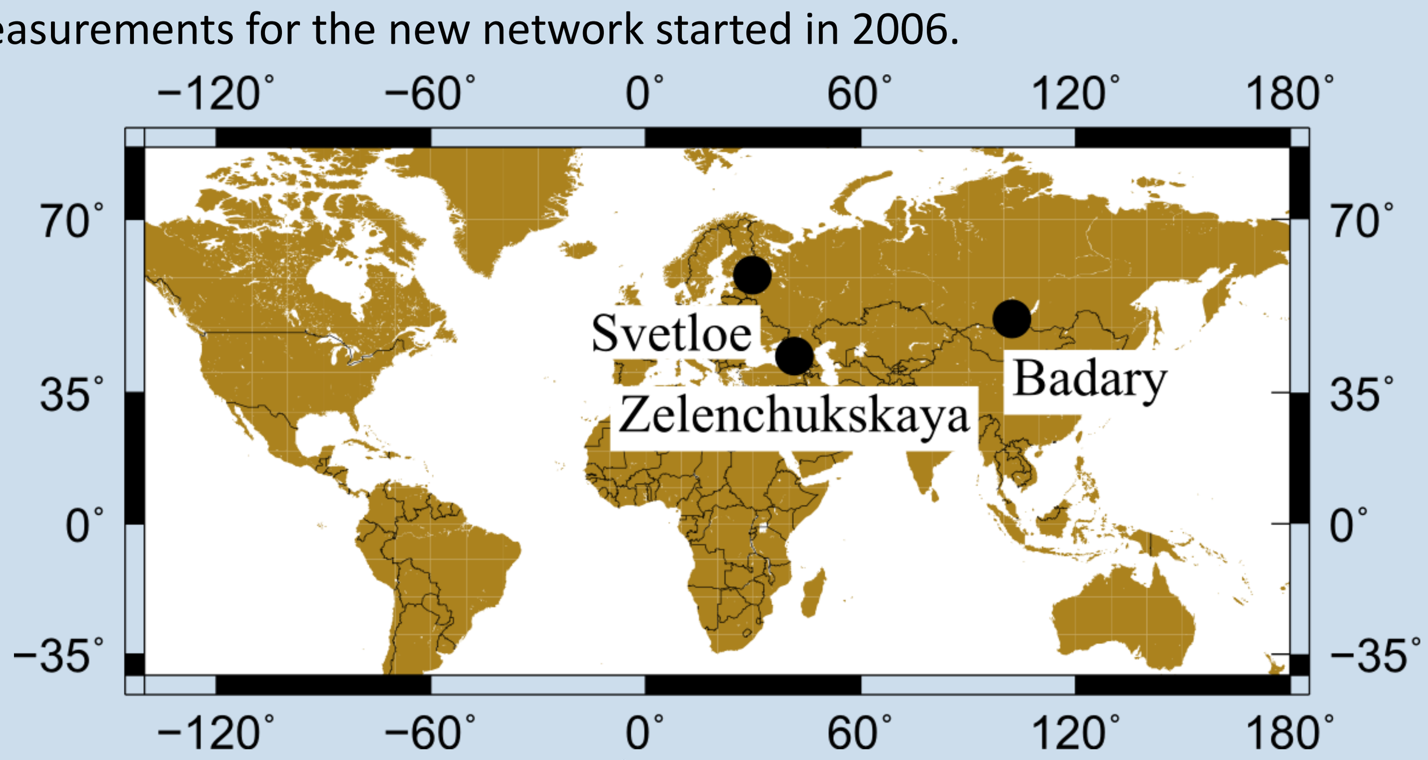

Fig. 1. Russian Quasar VLBI network

The histogram of sigma a posteriori (s_0) values is shown in Fig. 2. Although the majority of values is below 3, there are a couple of sessions with s_0 larger than 5. If a threshold of 3.5 is chosen and all sessions above this value are assumed to be outliers, there are 87% usable Russian sessions. Therefore a total number of 193 sessions (92 24 hour sessions, 101 Intensive sessions) could be used for this study.

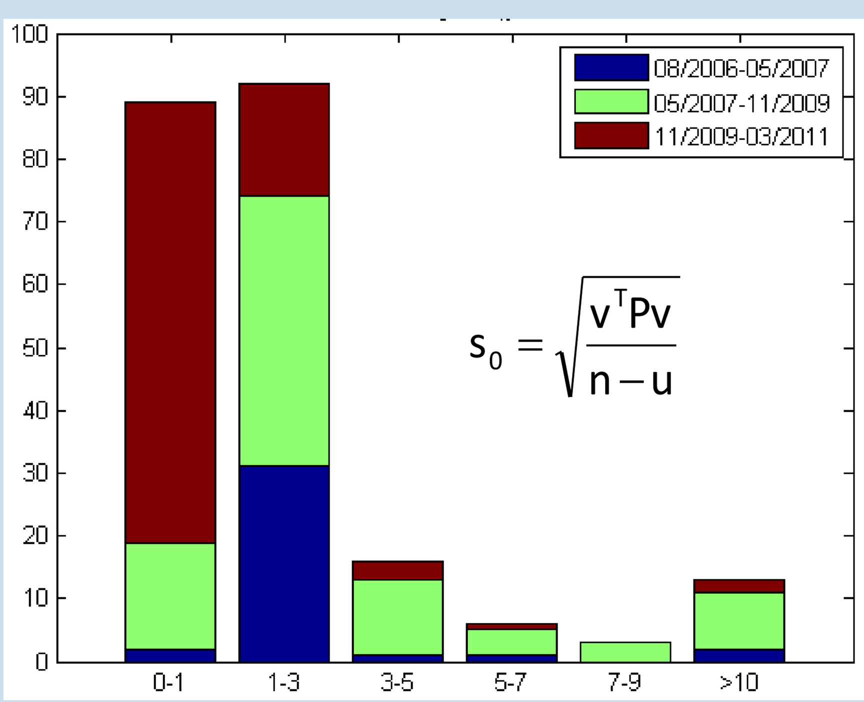

Fig. 2. Histogram of s_0 values of all russian sessions

Earth Orientation Parameters

Due to the large east-west extent of the Quasar network, it might be well suited for estimating Earth orientation parameters. Polar motion values show stronger variability during 2008 and 2009 (Fig. 4 and Fig. 5). Standard deviation values, separated for these periods, are shown in Table 1.

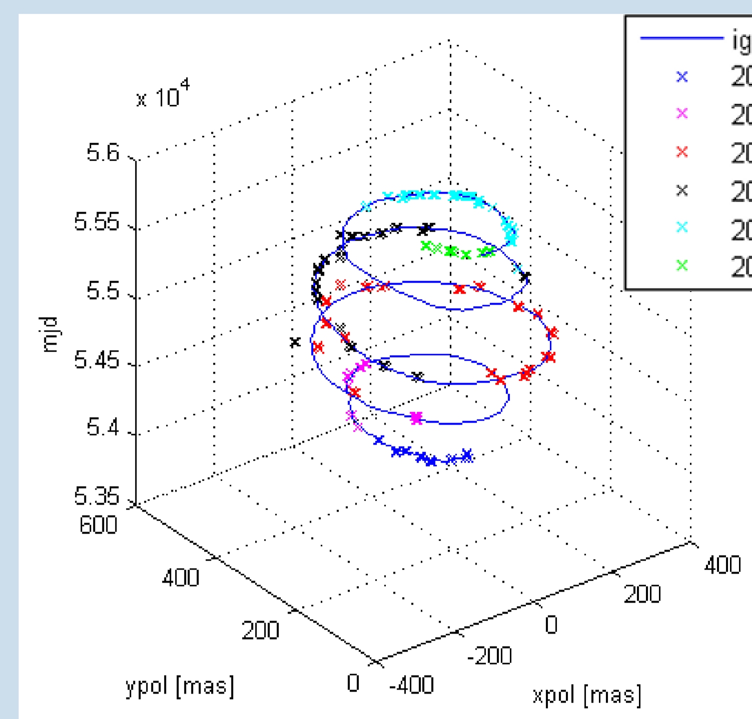

Fig. 4. Polar motion from Russian VLBI Sessions [µs]

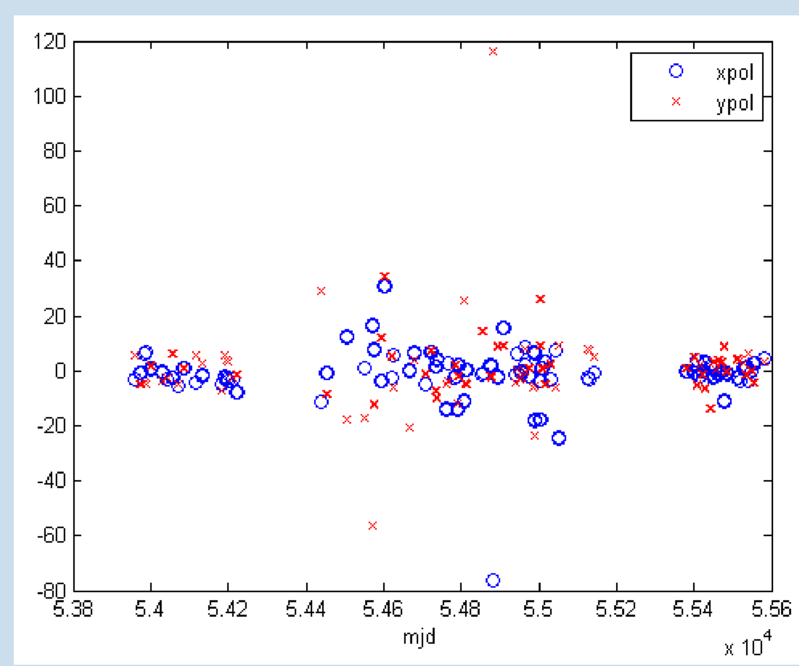

Fig. 5. Polar motion differences (VLBI-IGS) [mas]

RMS w.r.t. IERS 08 C04	Xpol [mas]	Ypol [mas]	UT1-UTC [µs]
08/06 - 05/07	3.6	4.5	335.0
12/07 - 11/09	14.3	21.8	128.1
07/10 - 01/11	3.2	5.0	59.5
Total	11.0	16.8	159.5

Table 1. RMS values for Polar Motion w.r.t. IERS 08 C04

For the determination of UT1-UTC, Intensive sessions are carried out within this network. Fig. 6 shows the estimated DUT1 values with the leap second on December 31st 2008.

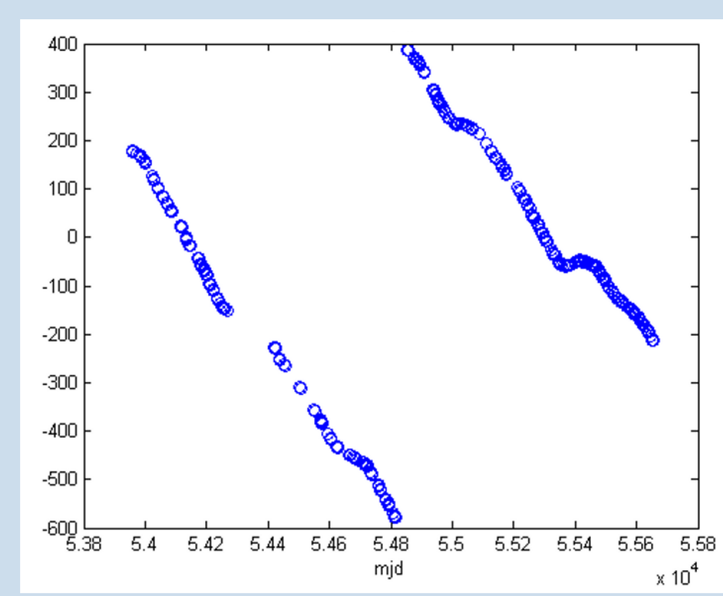

Fig. 6. UT1-UTC from Russian VLBI sessions [µs]

Station velocities

In addition to Earth orientation parameters, station velocities have been calculated (Fig. 3). The movements show a good agreement with plate motions models and with velocities from other publications.

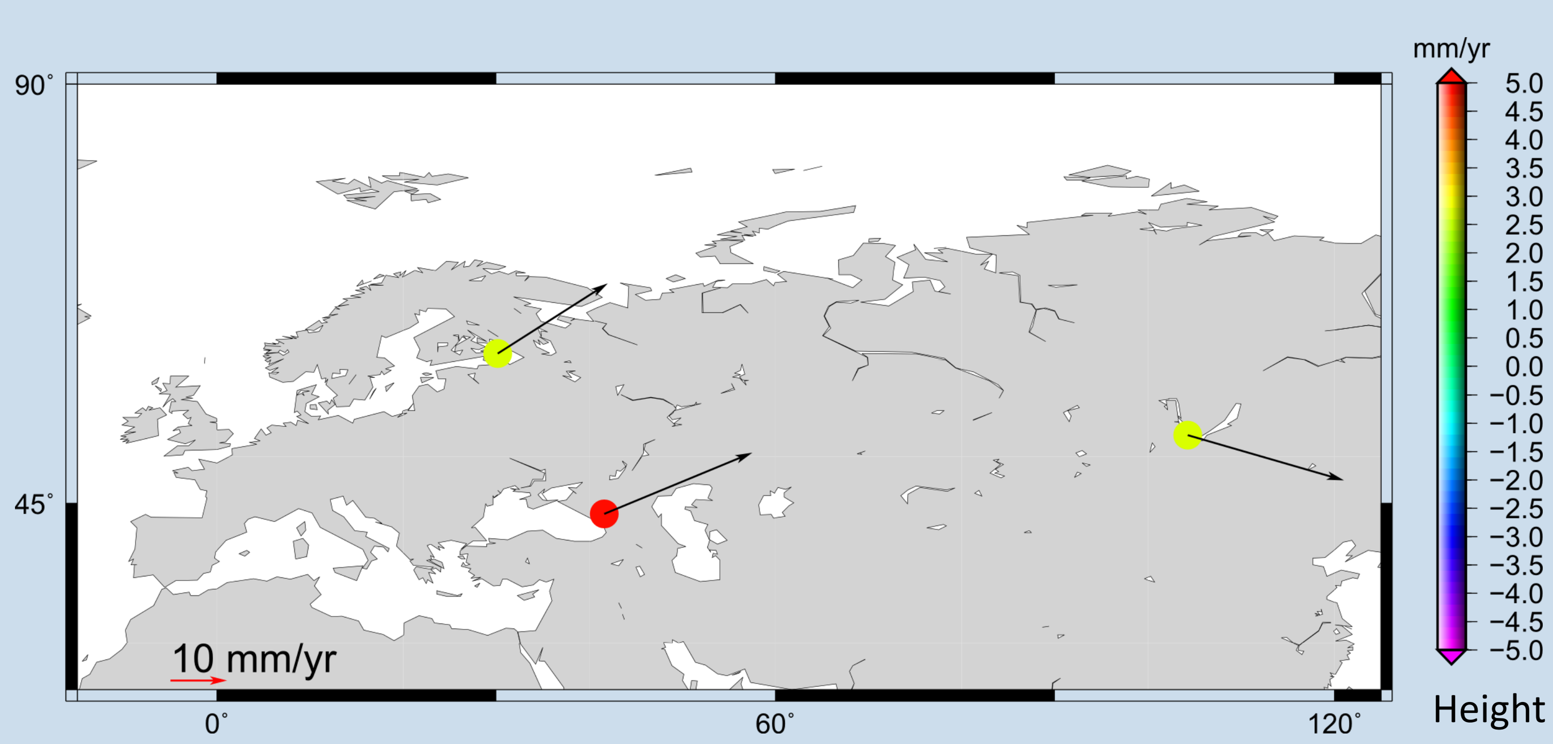

Fig. 3. Station velocities for the Quasar network

Repeatabilities

The baseline lengths of the Russian network are 2014.7 km (Sv-Zc), 4281.7 km (Sv-Bd) and 4404.9 km. Fig. 7 shows the repeatabilites of the baseline length measurements. The repeatabilities are larger than expected. Even for the shortest baseline the standard deviation is nearly 24 mm, reaching up to more then 34 mm for the longest baseline.

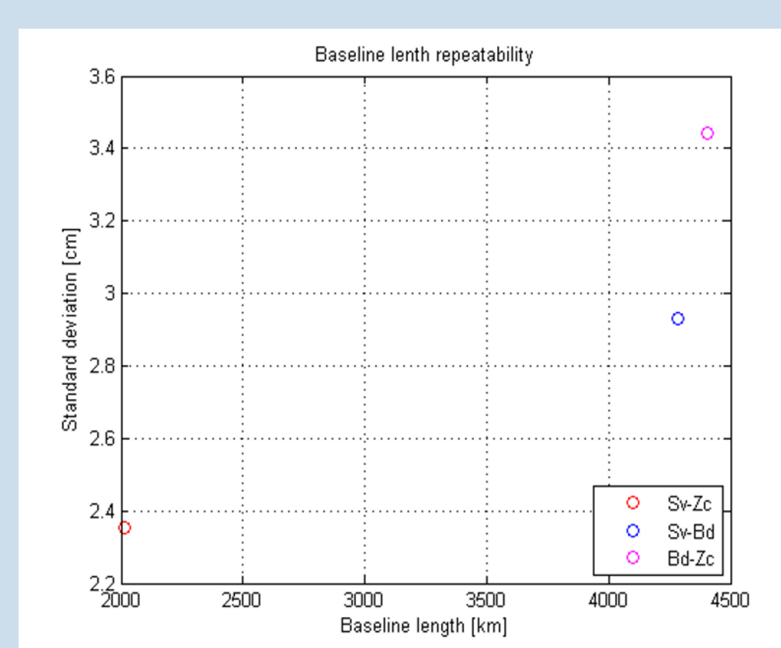

Fig. 7. Baseline length repeatability

References

A. Finkelstein et al., EOP determination from observations of Russian VLBI-network "Quasar". 20th EVGA Meeting, Bonn, 2009.

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