The intercomparison of the scalar magnetometers at the Geophysical Observatory Arti, September 2017

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On September 21-22, 2017 at the Geophysical Observatory Arti, Institute of Geophysics (Ekaterinburg), a intercomparison of scalar magnetometers was carried out. Main tasks were (1) to make an estimation of the systematic error of the absolute scalar magnetometers, using Overhauser scalar magnetometer POS-1 N11 (Quantum Magnetometry Laboratory of Ural Federal University, Yekaterinburg) as reference; (2) to get an experience of scalar magnetometer intercomparison technology and to train of the participants; (3) to organize the communication of the specialists who are engaged by observatory and field magnetic measurements; (4) to discuss the problems of magnetic observatories and Russian magnetometry in general. 11 magnetologists from institutes and universities of the Urals, Kamchatka and Altay took part in the work. 10 scalar magnetometers were presented to intercomparison, including 3 - GSM-19W, 4 - POS-1, 1 - Scintrex SM-5, 1 - Geometrix G-859.

Special area at observatory Arti was prepared at glade near magnetic pavilions. Four wooden pillars with diameter about 0.4 meters were installed. Height of underground and overground parts of pillar have height is about 1 and 1.5 meters, accordingly. One pair of pillars was selected as main (Figure 1) and second pair was used in addition. Distances between pillar are 11.5 and 12.5 meters. Before preparing for magnetic measurements this area was checked for uniformity of field.

Figure 1: Intercomparison of scalar magnetometers GSM-19W (remote pillar) and POS-1 (near pillar). The supports were used to install the sensors in fixed place.

Good synchronization of timers by GPS was provided. Method of intercomparison was in accordance with (Jankowski and Sucksdorff, 1996; Rasson, 2004). Results are presented in Table 1. Reference magnetometer POS-1 N11 was verified at D.I.Mendeleev Institute for Metrology (VNIIM) on May 12, 2016.

Magnetometer (Institute)	N	dFsys (std), nT	dFgrad (std), nT
GSM-19W (PET, IKIR)	5	-0.43 (0.05)	+0.85 (0.05)
GSM-19W (IVS)	5	-0.32 (0.04)	+0.79 (0.04)
GSM-19W (KamGU)	5	-0.66 (0.07)	+0.76 (0.04)
POS-1 (IGF)	5	+0.11 (0.02)	+1.03 (0.03)
POS-1 (GASU)	5	+0.34 (0.04)	+0.97 (0.05)
POS-1 (IGF)	5	+0.23 (0.02)	+0.76 (0.01)
POS-1–aero (QML UrFU)	5	-0.02 (0.02)	+0.95 (0.05)
POS-4 (QML UrFU) – bad data	4	-0.26 (0.34)	+1.12 (0.09)
Scintrex SM-5 (IGF)	5	+2.63 (0.03)	+0.60 (0.02)
Geometrix G-859 (IGF) 1st day	3	+4.33 (0.03)	+0.75 (0.01)
Geometrix G-859 (IGF) 2nd day	5	+4.45 (0.05)	+0.77 (0.01)

Table 1: Results of intercomparison: N - number of sets (set is measurements during 1.5 minutes at every pillars), dFsys is offset of tested magnetometer from reference magnetometer POS-1 N11, dFgrad is difference of F between pillars. Standard deviation is presented in parentheses.

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