First observations with the new dual sphere superconducting gravimeter OSG-073 and comparisons of parallel observations with older SG T020

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Superconducting gravimeters in the Metsähovi Geodetic observatory

T020  10.08.1994 -

< ---- 3 m ---- >

OSG-073  08.02.2014 -
The installation: 27.01. – 07.02.
Superconducting gravimeter GWR T020 20 years

Installed in August 1994 by Eric Brinton
Continuous recording started 10.08.1994
Operation will continue until summer 2015 (?), one year parallel with OSG-073

The helium emissions effect on rubidium clock of AG
Problem can be avoided by using other frequency standards
Superconducting gravimeter OSG-073 at GRW in November 2013
Photos: R. Widmer-Schnidrig
The new dual sphere superconducting gravimeter GWR OSG-073

Installed by Richard Warburton
27.01. – 7.02. 2014

XP replaced by Windows 7

Remote control by internet

Automatic data transfer (2x27 channels, 59 MB)
4 K° cryogenic refrigerator (2x)
No need liquid helium

Sensors are side by side

Left (Node 6): High-Q, sphere
17 grams
- Very low noise sensor

Right (Node 7): Standard iGrav,
sphere 5 grams
- Small drift
Calibration with FG5X 3 times

S20 N6 10.6. – 17.6. 2014 AB (331)
First 3 months (8.2.2014 - )

N6 green
N7 red
T020 blue
9 months linear drifts  (Tide, airpressure and polar motion corrected)

N6  8.8 μgal/year

N7  4.9 μgal/year

T020 1.2 μgal/year
Fig. 2. Noise level of different GGP stations, Metsähovi SG T020 shown as “ME T020” (Rosat 2011)
Figure 3. Amplitude spectra of the time-varying gravity residuals recorded at BFO (upper plot) and ME (lower plot) after the $M_w$ 8.8 Maule, Chile, earthquake of 27 February 2010.

Fig. 3. Comparison of free oscillation spectra: The old SG T020 at Metsähovi (T020) and BFO 056_L (Rosat 2011).

Time domain comparison N6, N7 and T020, 16.06.2014
Gravity effects by strong rein

Precipitation

< 4 hours >
Hydrological effects on gravity

N6, N7, T020

GW, TW

SM, PREC
The effect of very strong microseism

Saturation in the feedback electronics

N6 1-sec

N6 1-min filt

N7 1-sec

N7 1-min filt
Conclusions

N7 (iGrav) and T020 have similar noise level
N6 (High-Q) has considerably lower noise
N6 is comparable to BFO (or better ?)
All gravimeters work well

Dynamic range of N6 can cause problems due to MS
(during some days)

Horizontal distance of 3 m is notable
(local hydrology)
Thank for your attention