
# ABSOLUTE GRAVITY MEASUREMENTS AT THE ALPINE RESEARCH CENTRE IN OBERGURGL (AUSTRIA) IN SEPTEMBER 2018

## Final Report

October 10, 2018

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## Foreword

This report contains the results of absolute gravity measurements carried out at Alpine Research Centre (University of Innsbruck) in Obergurgl. The measurements took place on the pier 0-173-02 (Figure 1) in September 2018.

The absolute gravimeter FG5X#216 was operated by Olivier Francis and Sajad Tabibi from the University of Luxembourg.

The measurements are part of an on-going research collaboration between the Geophysics Laboratory of the University of Luxembourg and Christian Ullrich from the Bundesamt für Eich- und Vermessungswesen (BEV, Federal Office of Metrology and Surveying) in Vienna, Austria.

After the completion of the measurements, the pier was occupied with the FG5#242 of the BEV. The comparison of the g-values will be used to estimate the offset between both gravimeters to ensure consistency of the results while different gravimeters will be used in the coming years.


**Figure 1.** Pier at the Alpine Research Centre (University of Innsbruck) in Obergurgl.

## Data processing

Raw data from the absolute gravimeters consist of vectors of time and position of the falling object during the drops. To obtain the gravity value, a linear equation representing the equation of motion is fit to the raw data including the gravity gradient which has been measured with relative meters.

The data processing follows the protocol adopted during absolute gravimeters comparisons at the BIPM in Sèvres (Francis and van Dam, 2003). Geophysical corrections are applied to the raw gravity data: Earth tides using modelled tidal parameters, atmospheric pressure effect using a constant admittance, and the polar motion effect using pole positions from the International Earth Rotation Service (http://hpiers.obspm.fr).

The g-soft v9.12.04.23 software from Microg-LaCoste Inc. was used for the processing. All the text outputs as well as some figures are compiled in the annexes of this report for future reference.

## Vertical Gravity Gradient

The vertical gravity gradient is needed to linearize the equation of motion but also to transfer the measured absolute gravity value from the reference height around 1.3 m to the desired height (1.22 in the present report). Its determination requires relative measurements using a smaller and portable relative gravimeter. We used -1.82 μGal/cm. This value was provided by Christian Ullrich.

## Results of the absolute gravity measurements

The FG5X#216 operated from the 17$^{th}$ of September 2018 at 09:45 UTC until the 8$^{th}$ of September 2018 at 12:55 UTC. A total of 51 sets of 100 drops (1 drop /10 sec) were taken with a rate of 1 set per hour. It represents a total of 5100 drops.

| Site | Gravity value/ μGal | Mean Set Standard Deviation/ μGal |
|---|---|---|
| **AGM @ 1.22 m** | **980 239 670.04** | **0.66** |

## Reference

Francis O., van Dam T.M., Processing of the Absolute data of the ICAG01, Cahiers du Centre Européen de Géodynamique et de Séismologie, vol.22, 45-48, 2003. https://doi.org/10.5281/zenodo.7890604

## ANNEXES

| **STATION: Alpine Research Centre (University of Innsbruck) in Obergurgl** | | | |
|---|---|---|---|
| City: | Obergurgl | Country: | Austria |
| Location: | Alpine Research Centre | Particularity: | |
| Situation: | Pier 0-173-02 | Remarks: | |
| Date: | 17-18 September 2018 | | |
| Code number: | 0-173-02 | | |
| Latitude: | 46.86709 degrees | | |
| Longitude: | 11.02489 degrees | | |
| Elevation: | 1935.40 m | | |
| Gradient: | -1.82 µgal/cm | | |
| Reference height | 0. 1290 m + 1.2583 m = 1.3873 m | | |
| Meter: | FG5X | | |
| S/N: | 216 | | |

**Tidal corrections using observed tidal parameters**

| **Polar motion correction** | | | **Air pressure correction** | |
|---|---|---|---|---|
| X-coordinate | 0.2121 | Arc seconds | Nominal air pressure: | 801.35 mbar |
| Y-coordinate | 0.3502 | Arc seconds | Barometric admittance factor | 0.3 µgal/mbar |

**Gravity**

| | | |
|---|---|---|
| Set gravity mean: | **980 239 670.04** | microgal |
| Set std. dev.: | **0.66** | microgal |
| Mean std. dev.: | 6.13 | microgal |
| Number of sets: | 51 | |
| Number of drops per set: | 100 | |
| Drop interval: | 10 seconds | |
| Set interval: | 60 minutes | |
| Nominal/datum height: | 1.22 m | |
| Author: O. Francis | | University of Luxembourg |
| Date: October 10, 2018 | | |

# Project file

Micro-g LaCoste g Processing Report
File Created: 11/06/18, 12:47:56

Project Name: OB201809
g Acquisition Version: 9.160516
g Processing Version: 9.120423

Company/Institution:
Operator: Olivier Francis

Station Data
Name: OBERGURLP
Site Code: PIER 0-173-02
Lat: 46.86709 Long: 11.02489 Elev: 1935.40 m
Setup Height: 12.90 cm
Transfer Height: 122.00 cm
Actual Height: 138.73 cm
Gradient: -1.820 µGal/cm
Nominal Air Pressure: 801.35 mBar
Barometric Admittance Factor: 0.30
Polar Motion Coord: 0.2121 " 0.3502 "
Earth Tide (ETGTAB) Selected
Potential Filename: C:\gData\gWavefiles\ETCPOT.dat
Delta Factor Filename: D:\ABSOLU\DATA\INI\OceanLoad-OBERGURLP.dff
Delta Factors

| Start | Stop | Amplitude | Phase | Term |
|---|---|---|---|---|
| 0.000000 | 0.000001 | 1.000000 | 0.0000 | DC |
| 0.000002 | 0.249951 | 1.160000 | 0.0000 | Long |
| 0.721500 | 0.906315 | 1.154250 | 0.0000 | Q1 |
| 0.921941 | 0.974188 | 1.154240 | 0.0000 | O1 |
| 0.989049 | 0.998028 | 1.149150 | 0.0000 | P1 |
| 0.999853 | 1.216397 | 1.134890 | 0.0000 | K1 |
| 1.719381 | 1.906462 | 1.161720 | 0.0000 | N2 |
| 1.923766 | 1.976926 | 1.161720 | 0.0000 | M2 |
| 1.991787 | 2.002885 | 1.161720 | 0.0000 | S2 |
| 2.003032 | 2.182843 | 1.161720 | 0.0000 | K2 |
| 2.753244 | 3.081254 | 1.07338 | 0.0000 | M3 |
| 3.791964 | 3.937897 | 1.03900 | 0.0000 | M4 |

Ocean Load ON, Filename: D:\ABSOLU\DATA\INI\OceanLoad-OBERGURLP.olf

| Waves: | M2 | S2 | K1 | O1 | N2 | P1 | K2 | Q1 | Mf | Mm | Ssa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Amplitude (µGal): | 1.447 | 0.478 | 0.134 | 0.135 | 0.294 | 0.047 | 0.125 | 0.037 | 0.000 | 0.000 | 0.000 |
| Phase (deg): | 56.2 | 28.4 | 71.9 | -188.8 | 73.5 | 84.3 | 26.6 | -131.8 | 0.0 | 0.0 | 0.0 |

Instrument Data
Meter Type: FG5
Meter S/N: X216
Factory Height: 125.83 cm
Rubidium Frequency: 10000000.00000 Hz
Laser: WEO100 (242)
ID: 632.99117754 nm ( 0.25 V)
IE: 632.99119473 nm ( -0.25 V)
IF: 632.99121259 nm ( -0.65 V)
IG: 632.99123023 nm ( -1.03 V)
IH: 632.99136890 nm ( -1.63 V)
II: 632.99139822 nm ( -1.38 V)
IJ: 632.99142704 nm ( -1.15 V)
Modulation Frequency: 8333.340 Hz

Processing Results

Date: 09/18/18
Time: 00:15:42
DOY: 261
Year: 2018
Time Offset (D h:m:s): 0 0:0:0
Gravity: 980239670.04 µGal
Set Scatter: 0.66 µGal
Measurement Precision: 0.09 µGal
Total Uncertainty: 0.09 µGal
Number of Sets Collected: 53
Number of Sets Processed: 51
Set #s Processed:
2,3,4,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,
42,43,44,45,46,47,48,49,50,51,52,53
Number of Sets NOT Processed: 2
Set #s NOT Processed: 1,5
Number of Drops/Set: 100
Total Drops Accepted: 5074
Total Drops Rejected: 26
Total Fringes Acquired: 1100
Fringe Start: 2
Processed Fringes: 1030
GuideCard Multiplex: 4
GuideCard Scale Factor: 250

Acquisition Settings
Set Interval: 60 min
Drop Interval: 10 sec
Number of Sets: 53
Number of Drops: 100

Gravity Corrections
Earth Tide (ETGTAB): -14.60 µGal
Ocean Load: -0.03 µGal
Polar Motion: -2.70 µGal
Barometric Pressure: 3.15 µGal
Transfer Height: 30.45 µGal
Reference Xo: 0.00 µGal

Uncertainties
Sigma Reject: 3.00
Earth Tide Factor: 0.000
Average Earth Tide Uncertainty: 0.00 µGal
Ocean Load Factor: 0.00
Average Ocean Load Uncertainty: 0.00 µGal
Barometric: 0.00 µGal
Polar Motion: 0.00 µGal
Laser: 0.00 µGal
Clock: 0.00 µGal
System Type: 0.00 µGal
Tidal Swell: 0.00 µGal
Water Table: 0.00 µGal
Unmodeled: 0.00 µGal
System Setup: 0.00 µGal
Gradient: 0.000 µGal (0.000 µGal/cm)

Comments:
Files Merged:
OB20180917.fg5
OB20180917a.fg5

# Set File

Source Data Filename: OB201809
g Acquisition Version: 9.160516
g Processing Version: 9.120423

| Set | Time | DOY | Year | Gravity | Sigma | Error | Uncert | Tide | Load | Baro | Polar | Transfer | Refxo | Tilt | Diffraction | SelfAttract | Temp | Pres | Chan5 | Chan6 | Chan7 | Chan8 | Chan9 | Chan10 | Accept | Reject |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 09:52:59 | 260 | 2018 | 980239670.425 | 4.212 | 0.428 | 0.428 | 2.050 | -0.860 | 3.448 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.116 | 812.845 | -0.006 | 184.794 | 60.505 | 0.000 | 0.000 | 0.000 | 97 | 3 |
| 3 | 10:53:00 | 260 | 2018 | 980239670.107 | 4.302 | 0.430 | 0.430 | -16.113 | -0.722 | 3.368 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.456 | 812.577 | -0.006 | 167.590 | 52.180 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 4 | 11:53:00 | 260 | 2018 | 980239671.286 | 4.152 | 0.415 | 0.415 | -32.491 | -0.440 | 3.293 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.600 | 812.326 | -0.006 | 156.960 | 48.110 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 6 | 13:20:51 | 260 | 2018 | 980239670.010 | 4.027 | 0.409 | 0.409 | -50.080 | 0.092 | 3.127 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 33.098 | 811.773 | -0.006 | 141.567 | 30.000 | 0.000 | 0.000 | 0.000 | 97 | 3 |
| 7 | 13:50:52 | 260 | 2018 | 980239670.193 | 4.524 | 0.452 | 0.452 | -53.978 | 0.266 | 3.092 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 33.013 | 811.658 | -0.006 | 149.300 | 29.930 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 8 | 14:20:51 | 260 | 2018 | 980239670.430 | 5.054 | 0.508 | 0.508 | -56.797 | 0.420 | 3.026 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 33.118 | 811.438 | -0.006 | 149.101 | 30.657 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 9 | 14:50:47 | 260 | 2018 | 980239670.193 | 4.877 | 0.493 | 0.493 | -58.615 | 0.545 | 3.006 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 33.190 | 811.371 | -0.007 | 146.663 | 28.878 | 0.000 | 0.000 | 0.000 | 98 | 2 |
| 10 | 15:20:52 | 260 | 2018 | 980239670.433 | 5.163 | 0.516 | 0.516 | -59.558 | 0.635 | 2.987 | -2.697 | 30.449 | 0.003 | 0.000 | 0.000 | 0.000 | 33.273 | 811.306 | -0.007 | 140.750 | 23.040 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 11 | 15:50:49 | 260 | 2018 | 980239670.607 | 5.547 | 0.558 | 0.558 | -59.764 | 0.686 | 2.983 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.970 | 811.294 | -0.007 | 83.051 | -2.727 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 12 | 16:20:52 | 260 | 2018 | 980239669.712 | 4.894 | 0.489 | 0.489 | -59.403 | 0.695 | 3.011 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.998 | 811.385 | -0.007 | 105.020 | 1.450 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 13 | 16:50:52 | 260 | 2018 | 980239670.057 | 4.921 | 0.492 | 0.492 | -58.645 | 0.663 | 3.061 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.950 | 811.554 | -0.007 | 95.940 | 3.560 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 14 | 17:20:51 | 260 | 2018 | 980239669.659 | 5.574 | 0.560 | 0.560 | -57.648 | 0.594 | 3.120 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.964 | 811.749 | -0.007 | 93.475 | 3.273 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 15 | 17:50:52 | 260 | 2018 | 980239670.659 | 5.430 | 0.543 | 0.543 | -56.548 | 0.492 | 3.172 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.945 | 811.923 | -0.007 | 92.660 | -1.430 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 16 | 18:20:52 | 260 | 2018 | 980239671.514 | 5.502 | 0.550 | 0.550 | -55.447 | 0.365 | 3.207 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.953 | 812.039 | -0.007 | 98.850 | -3.620 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 17 | 18:50:52 | 260 | 2018 | 980239670.747 | 6.088 | 0.609 | 0.609 | -54.406 | 0.222 | 3.267 | -2.697 | 30.449 | 0.003 | 0.000 | 0.000 | 0.000 | 32.968 | 812.239 | -0.007 | 95.800 | -1.640 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 18 | 19:20:52 | 260 | 2018 | 980239670.980 | 6.055 | 0.606 | 0.606 | -53.442 | 0.071 | 3.282 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.935 | 812.290 | -0.007 | 91.100 | -2.250 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 19 | 19:50:52 | 260 | 2018 | 980239669.842 | 6.340 | 0.634 | 0.634 | -52.528 | -0.077 | 3.300 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.854 | 812.349 | -0.007 | 87.070 | -4.320 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 20 | 20:20:50 | 260 | 2018 | 980239669.678 | 6.743 | 0.678 | 0.678 | -51.594 | -0.213 | 3.342 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.808 | 812.490 | -0.007 | 85.222 | -2.808 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 21 | 20:50:52 | 260 | 2018 | 980239670.395 | 5.833 | 0.583 | 0.583 | -50.535 | -0.329 | 3.350 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.758 | 812.515 | -0.007 | 84.700 | -9.240 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 22 | 21:20:52 | 260 | 2018 | 980239669.495 | 6.726 | 0.673 | 0.673 | -49.225 | -0.416 | 3.329 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.676 | 812.448 | -0.007 | 84.680 | -8.400 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 23 | 21:50:52 | 260 | 2018 | 980239669.245 | 6.172 | 0.617 | 0.617 | -47.522 | -0.470 | 3.287 | -2.697 | 30.449 | 0.003 | 0.000 | 0.000 | 0.000 | 32.692 | 812.307 | -0.007 | 78.170 | -6.790 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 24 | 22:20:52 | 260 | 2018 | 980239670.267 | 6.863 | 0.686 | 0.686 | -45.284 | -0.488 | 3.282 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.707 | 812.289 | -0.007 | 80.330 | -10.370 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 25 | 22:50:52 | 260 | 2018 | 980239671.034 | 7.269 | 0.727 | 0.727 | -42.378 | -0.467 | 3.270 | -2.697 | 30.449 | 0.003 | 0.000 | 0.000 | 0.000 | 32.582 | 812.249 | -0.006 | 80.490 | -13.490 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 26 | 23:20:52 | 260 | 2018 | 980239670.717 | 6.655 | 0.665 | 0.665 | -38.696 | -0.411 | 3.214 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.561 | 812.064 | -0.006 | 83.170 | -12.460 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 27 | 23:50:52 | 260 | 2018 | 980239670.085 | 6.431 | 0.643 | 0.643 | -34.161 | -0.323 | 3.195 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.531 | 811.999 | -0.006 | 83.800 | -18.500 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 28 | 00:20:52 | 261 | 2018 | 980239669.177 | 7.422 | 0.742 | 0.742 | -28.741 | -0.208 | 3.193 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.549 | 811.993 | -0.006 | 77.180 | -11.610 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 29 | 00:50:52 | 261 | 2018 | 980239669.522 | 6.764 | 0.676 | 0.676 | -22.447 | -0.075 | 3.157 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.465 | 811.873 | -0.007 | 76.360 | -15.650 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 30 | 01:20:52 | 261 | 2018 | 980239669.606 | 6.339 | 0.634 | 0.634 | -15.346 | 0.069 | 3.163 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.477 | 811.895 | -0.007 | 69.990 | -17.680 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 31 | 01:50:52 | 261 | 2018 | 980239669.334 | 6.093 | 0.609 | 0.609 | -7.553 | 0.214 | 3.134 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.416 | 811.798 | -0.007 | 64.530 | -16.290 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 32 | 02:20:52 | 261 | 2018 | 980239668.215 | 6.249 | 0.625 | 0.625 | 0.765 | 0.349 | 3.113 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.355 | 811.728 | -0.007 | 63.190 | -18.220 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 33 | 02:50:52 | 261 | 2018 | 980239669.533 | 6.087 | 0.609 | 0.609 | 9.395 | 0.467 | 3.101 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.377 | 811.688 | -0.007 | 60.650 | -15.940 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 34 | 03:20:52 | 261 | 2018 | 980239669.524 | 6.460 | 0.646 | 0.646 | 18.086 | 0.559 | 3.111 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.394 | 811.719 | -0.007 | 63.020 | -16.300 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 35 | 03:50:52 | 261 | 2018 | 980239669.330 | 6.130 | 0.613 | 0.613 | 26.558 | 0.619 | 3.083 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.301 | 811.627 | -0.007 | 64.210 | -23.510 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 36 | 04:20:52 | 261 | 2018 | 980239669.298 | 6.952 | 0.695 | 0.695 | 34.513 | 0.641 | 3.084 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.297 | 811.629 | -0.007 | 58.400 | -19.510 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 37 | 04:50:52 | 261 | 2018 | 980239670.131 | 6.945 | 0.695 | 0.695 | 41.647 | 0.624 | 3.080 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.369 | 811.616 | -0.007 | 60.930 | -21.880 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 38 | 05:20:52 | 261 | 2018 | 980239669.852 | 6.477 | 0.648 | 0.648 | 47.666 | 0.567 | 3.110 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.306 | 811.716 | -0.007 | 56.050 | -14.260 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 39 | 05:50:56 | 261 | 2018 | 980239669.595 | 5.794 | 0.585 | 0.585 | 52.307 | 0.474 | 3.129 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.359 | 811.780 | -0.007 | 62.041 | -15.071 | 0.000 | 0.000 | 0.000 | 98 | 2 |
| 40 | 06:20:52 | 261 | 2018 | 980239670.468 | 6.709 | 0.671 | 0.671 | 55.312 | 0.348 | 3.128 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.467 | 811.777 | -0.007 | 58.630 | -15.590 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 41 | 06:50:49 | 261 | 2018 | 980239669.726 | 6.203 | 0.630 | 0.630 | 56.525 | 0.198 | 3.105 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.506 | 811.700 | -0.007 | 62.701 | -16.969 | 0.000 | 0.000 | 0.000 | 97 | 3 |
| 42 | 07:20:56 | 261 | 2018 | 980239671.018 | 5.950 | 0.601 | 0.601 | 55.815 | 0.028 | 3.105 | -2.697 | 30.449 | 0.003 | 0.000 | 0.000 | 0.000 | 32.486 | 811.700 | -0.007 | 66.714 | -11.255 | 0.000 | 0.000 | 0.000 | 98 | 2 |
| 43 | 07:50:50 | 261 | 2018 | 980239670.132 | 7.740 | 0.782 | 0.782 | 53.152 | -0.147 | 3.147 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.496 | 811.841 | -0.007 | 69.143 | -12.276 | 0.000 | 0.000 | 0.000 | 98 | 2 |
| 44 | 08:20:52 | 261 | 2018 | 980239670.067 | 9.630 | 0.963 | 0.963 | 48.546 | -0.322 | 3.150 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.477 | 811.851 | -0.007 | 72.940 | -13.910 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 45 | 08:50:52 | 261 | 2018 | 980239669.290 | 6.837 | 0.684 | 0.684 | 42.128 | -0.483 | 3.157 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.519 | 811.872 | -0.007 | 76.950 | -10.840 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 46 | 09:20:52 | 261 | 2018 | 980239669.490 | 7.118 | 0.712 | 0.712 | 34.088 | -0.624 | 3.127 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.704 | 811.772 | -0.007 | 79.480 | -6.410 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 47 | 09:50:49 | 261 | 2018 | 980239669.798 | 7.709 | 0.775 | 0.775 | 24.711 | -0.734 | 3.116 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.735 | 811.737 | -0.007 | 83.778 | -6.081 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 48 | 10:20:53 | 261 | 2018 | 980239668.865 | 6.097 | 0.613 | 0.613 | 14.265 | -0.808 | 3.125 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.880 | 811.768 | -0.007 | 87.525 | -7.313 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 49 | 10:50:57 | 261 | 2018 | 980239669.933 | 5.906 | 0.594 | 0.594 | 3.176 | -0.842 | 3.123 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.887 | 811.761 | -0.007 | 86.899 | -4.465 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 50 | 11:20:52 | 261 | 2018 | 980239669.895 | 6.647 | 0.665 | 0.665 | -8.103 | -0.832 | 3.047 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.913 | 811.508 | -0.007 | 81.920 | -7.380 | 0.000 | 0.000 | 0.000 | 100 | 0 |
| 51 | 11:50:52 | 261 | 2018 | 980239669.904 | 6.207 | 0.621 | 0.621 | -19.241 | -0.779 | 3.003 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 32.947 | 811.359 | -0.007 | 83.770 | -2.300 | 0.000 | 0.000 | 0.000 | 100 | 0 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 52 | 12:20:52 | 261 | 2018 | 980239668.234 | 6.915 | 0.695 | 0.695 | -29.806 | -0.687 | 2.978 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 33.068 | 811.275 | -0.007 | 85.626 | -2.222 | 0.000 | 0.000 | 0.000 | 99 | 1 |
| 53 | 12:50:50 | 261 | 2018 | 980239670.060 | 6.029 | 0.606 | 0.606 | -39.429 | -0.560 | 2.910 | -2.697 | 30.449 | 0.002 | 0.000 | 0.000 | 0.000 | 33.046 | 811.050 | -0.007 | 88.424 | -2.889 | 0.000 | 0.000 | 0.000 | 99 | 1 |

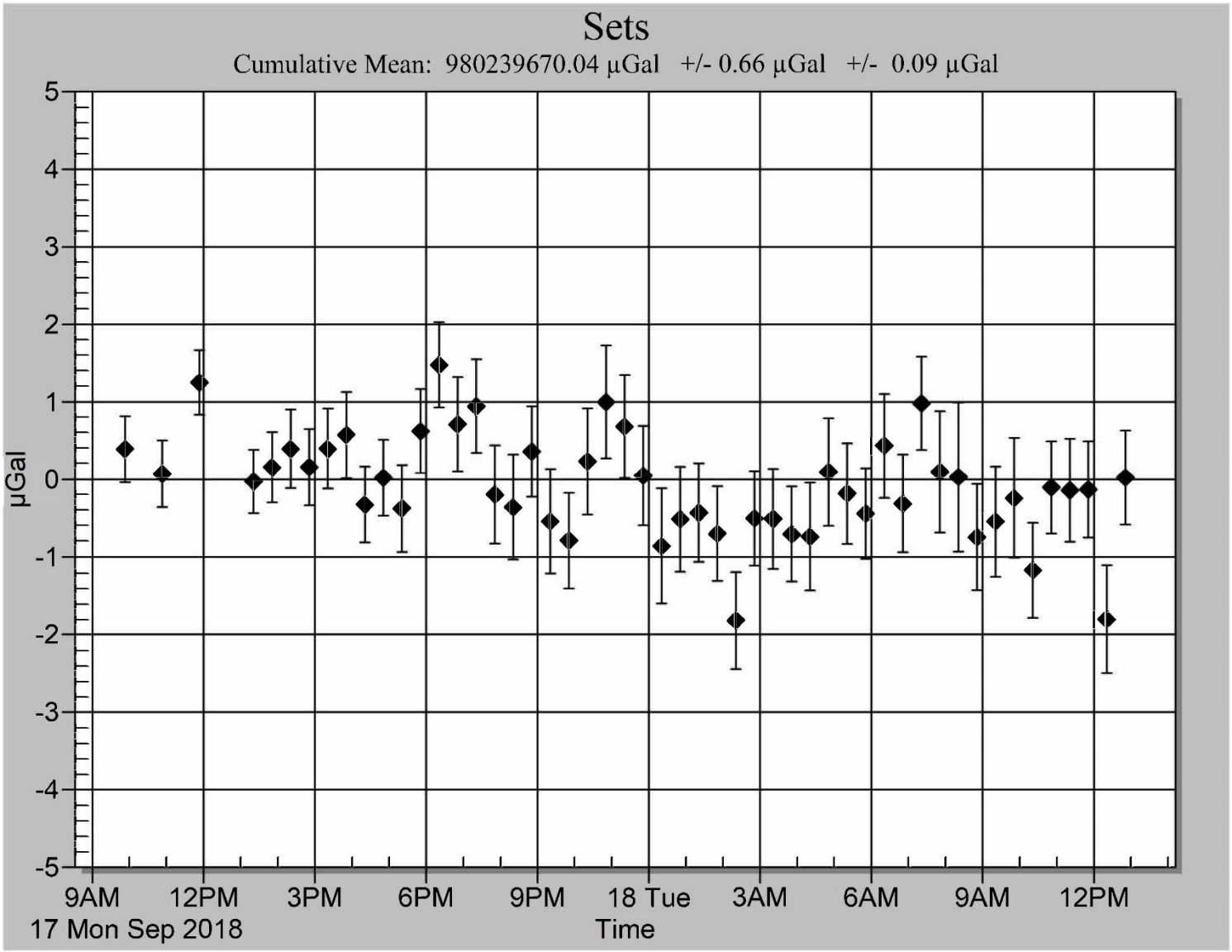


**Figure 2.** Plot of the set gravity values (1 set = 100 drops).

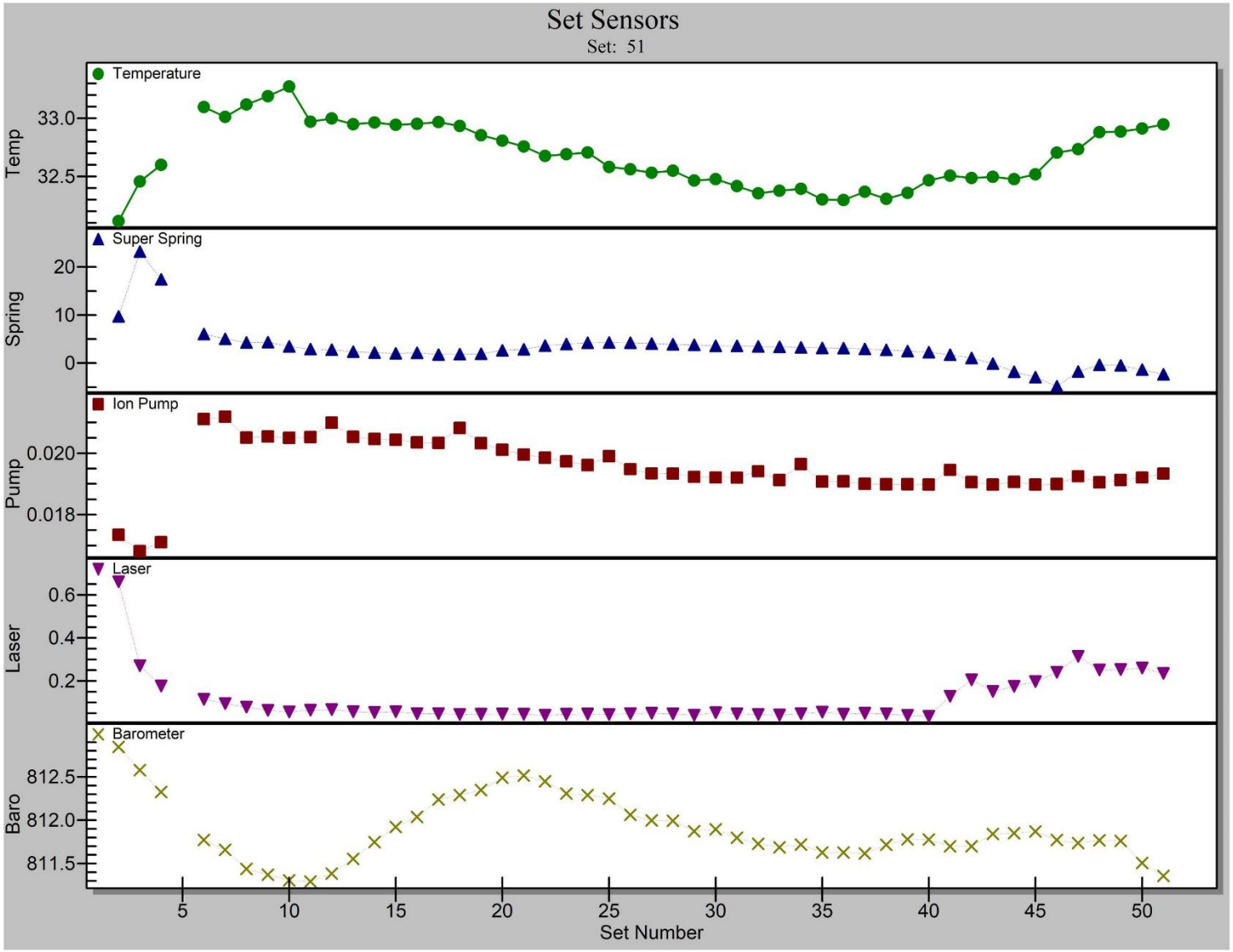


**Figure 3.** Plot of the set sensor parameters (1 set = 100 drops).

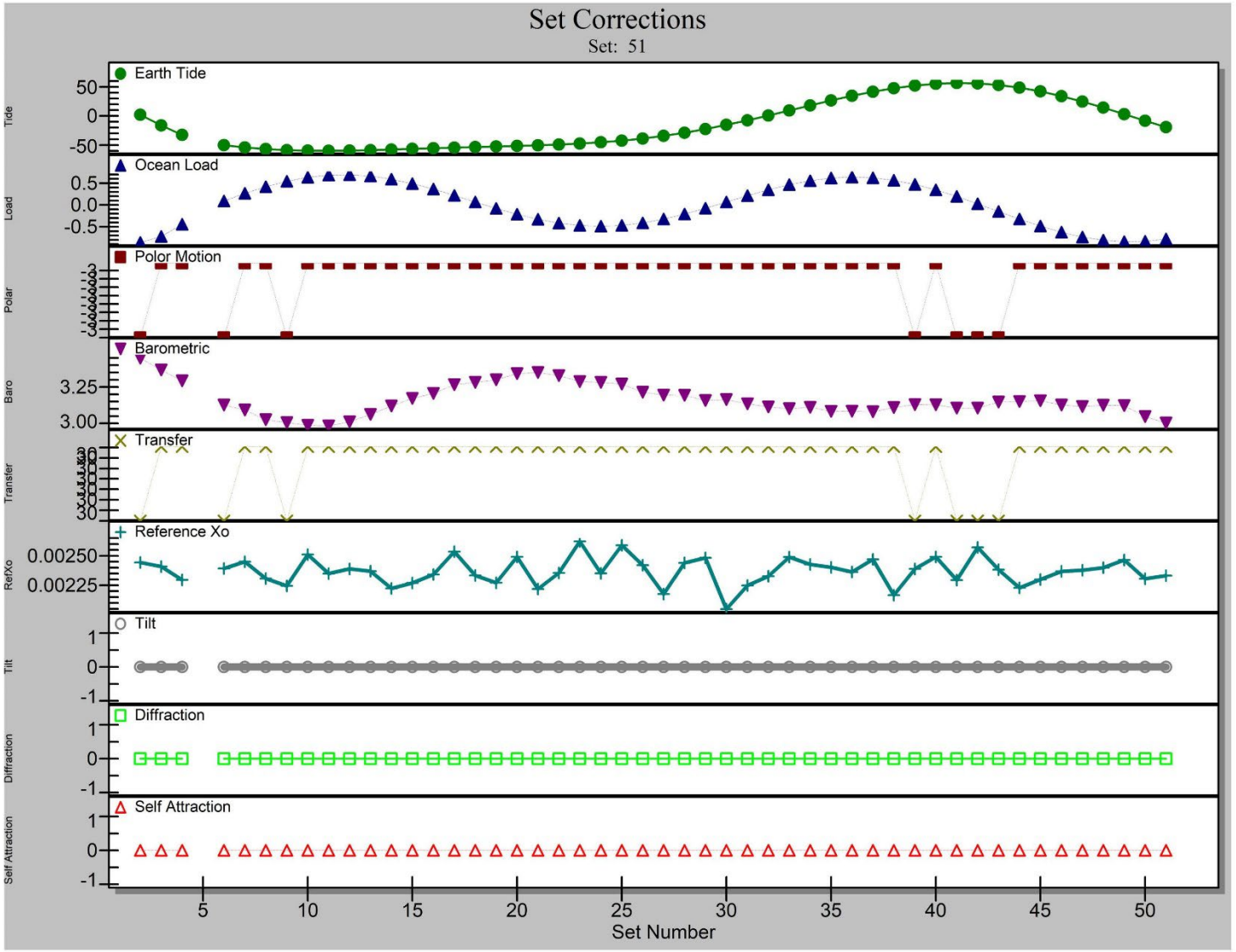


**Figure 4.** Plot of the set corrections values (1 set = 100 drops).