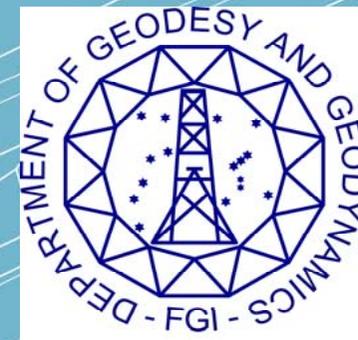


Superconducting gravimeters during 2014-2018 at Metsähovi geodetic research station, Finland

1st Workshop on the International Geodynamics and Earth Tide
Service (IGETS) 18-20 June 2018, Potsdam (Germany)

Heikki Virtanen and Arttu Raja-Halli
Finnish Geospatial Research Institute, FGI
National Land Survey

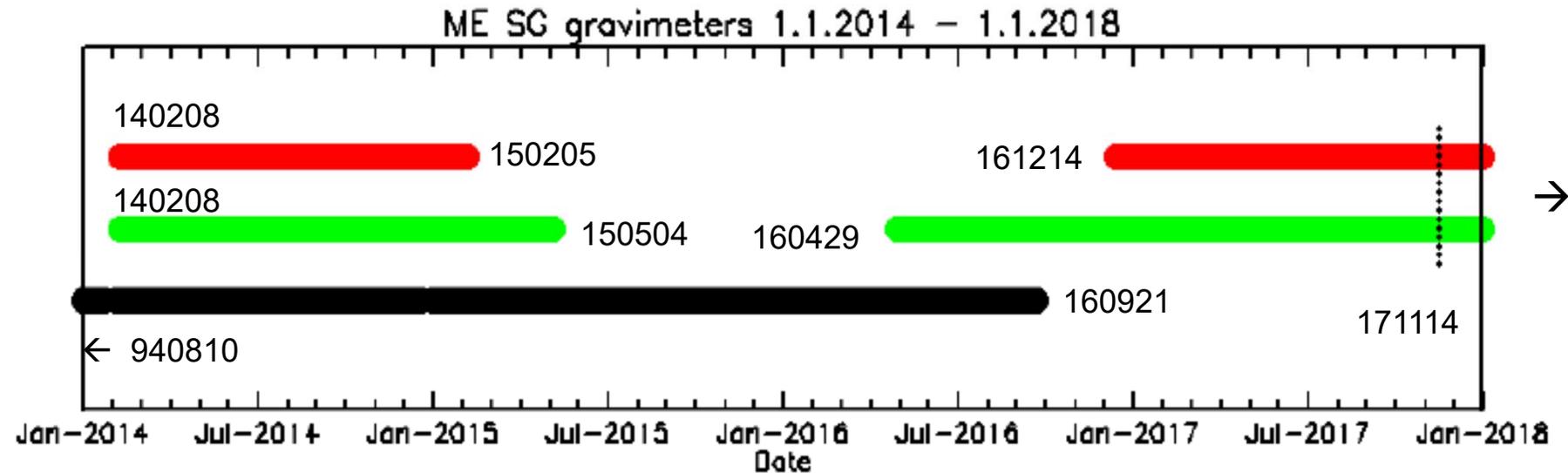


Superconducting gravimeters at Metsähovi 2014-2018

Black T020

Green iGrav-013 (OSG-073 N7)

Red iOSG-022 (OSG-073 N6)



Sensors: T020, N7 5 grams, N6 20 grams



14.12.2016 -
14.11.2017

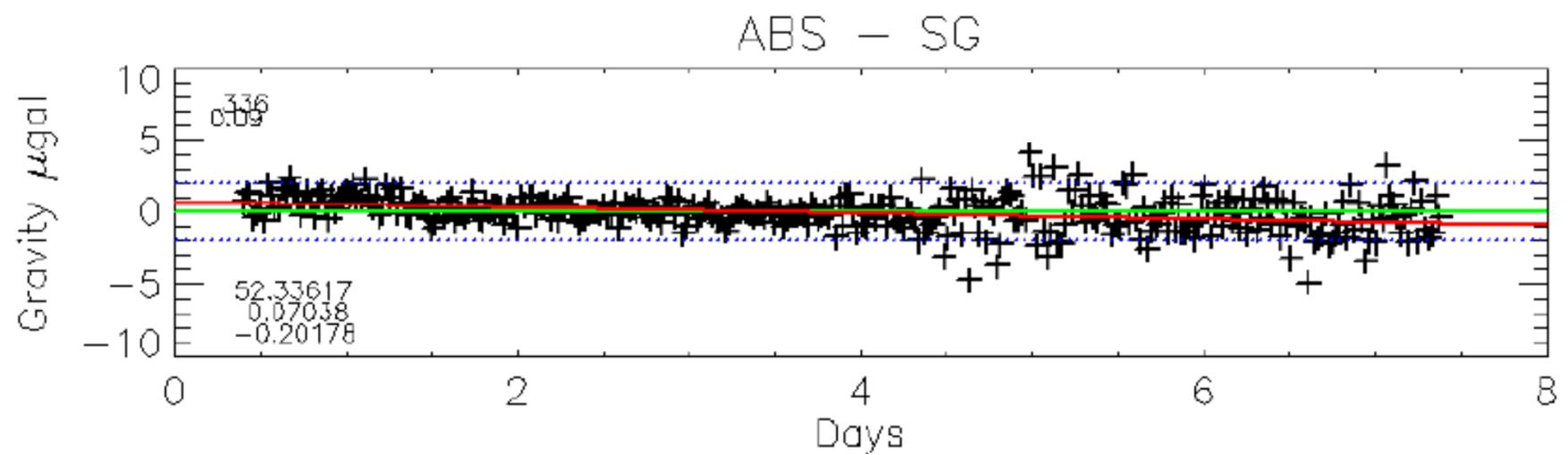
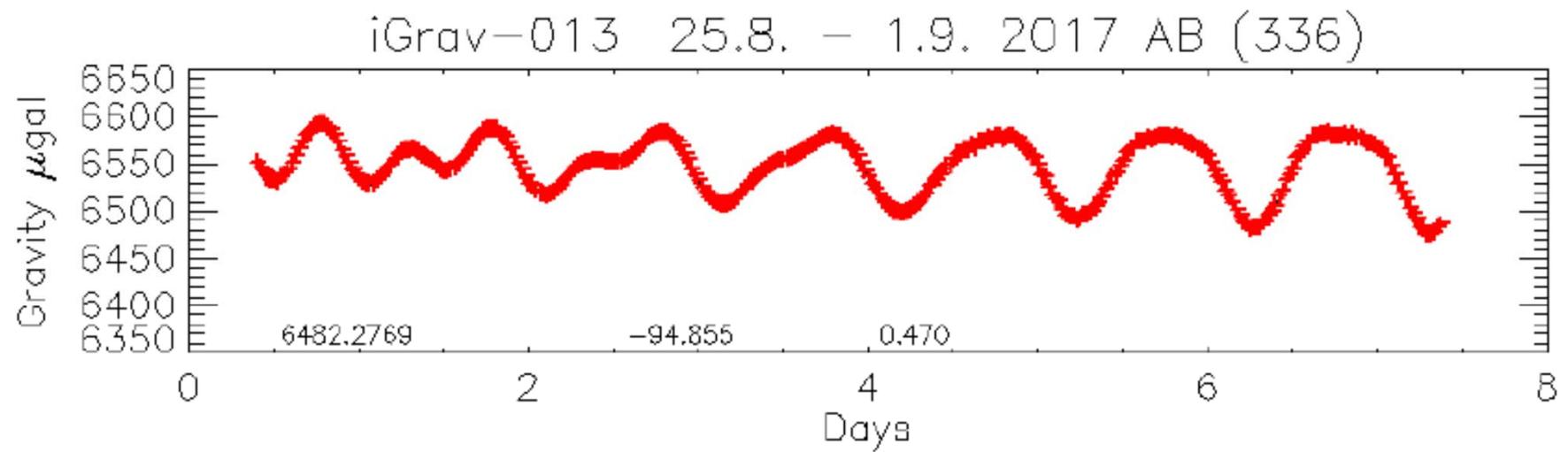
T020 ← 3 m → OSG-073

iGrav-013

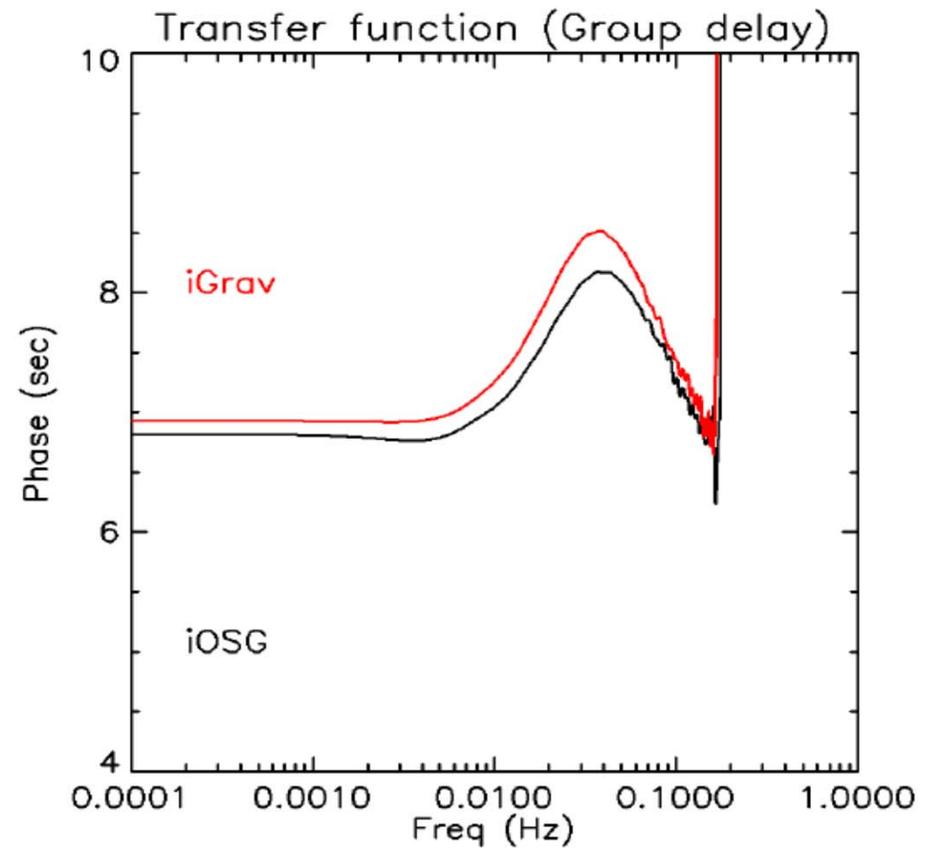
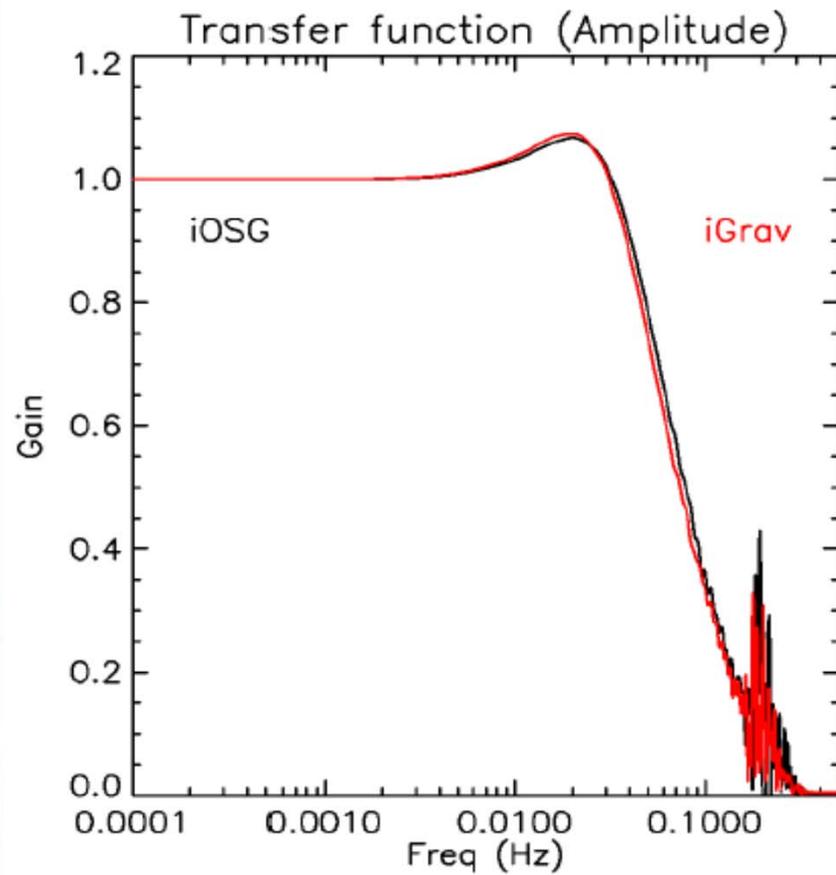


iOSG-022

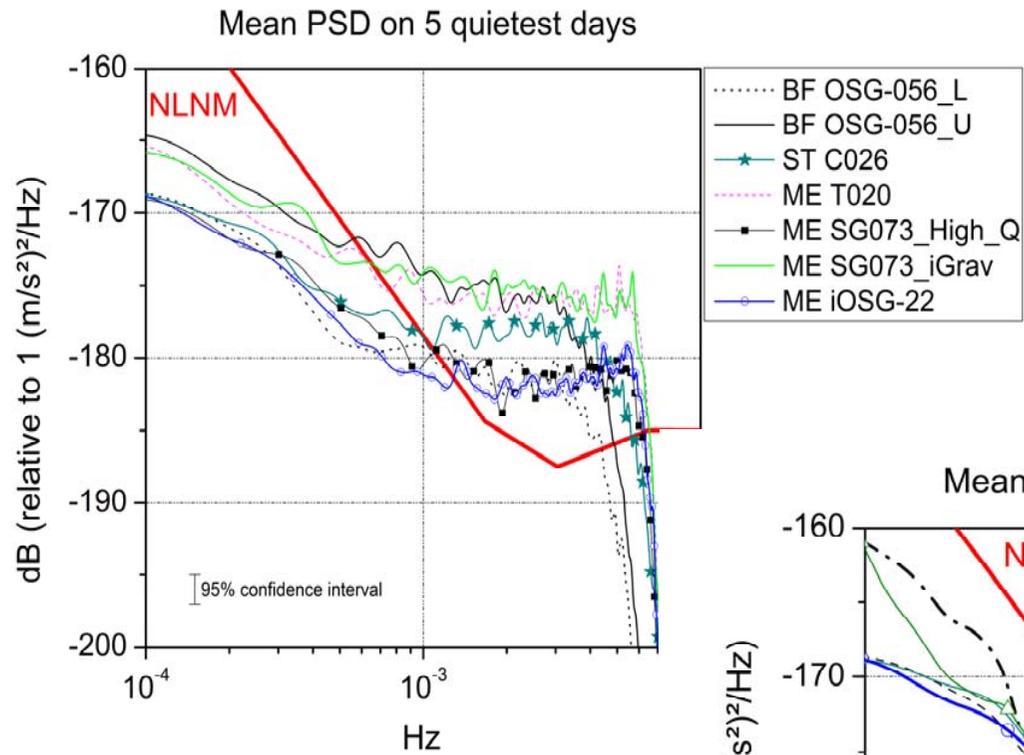
14th Nov 2017



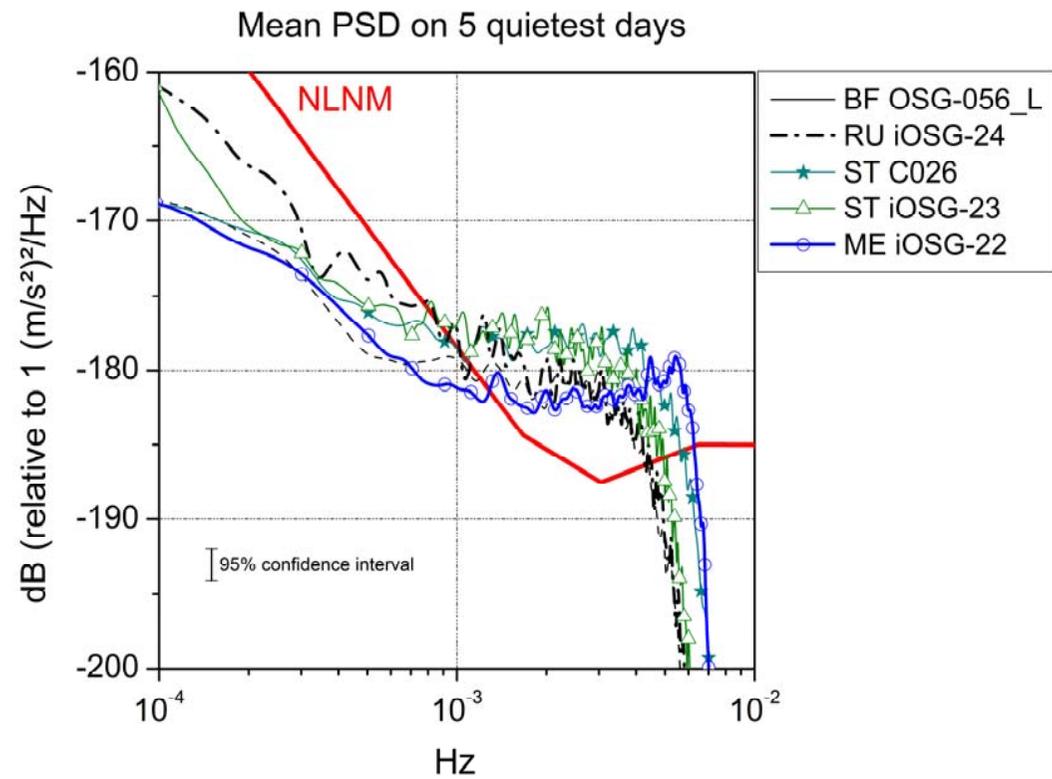
TRANSFER FUNCTIONS by steps



R. Warburton 2018

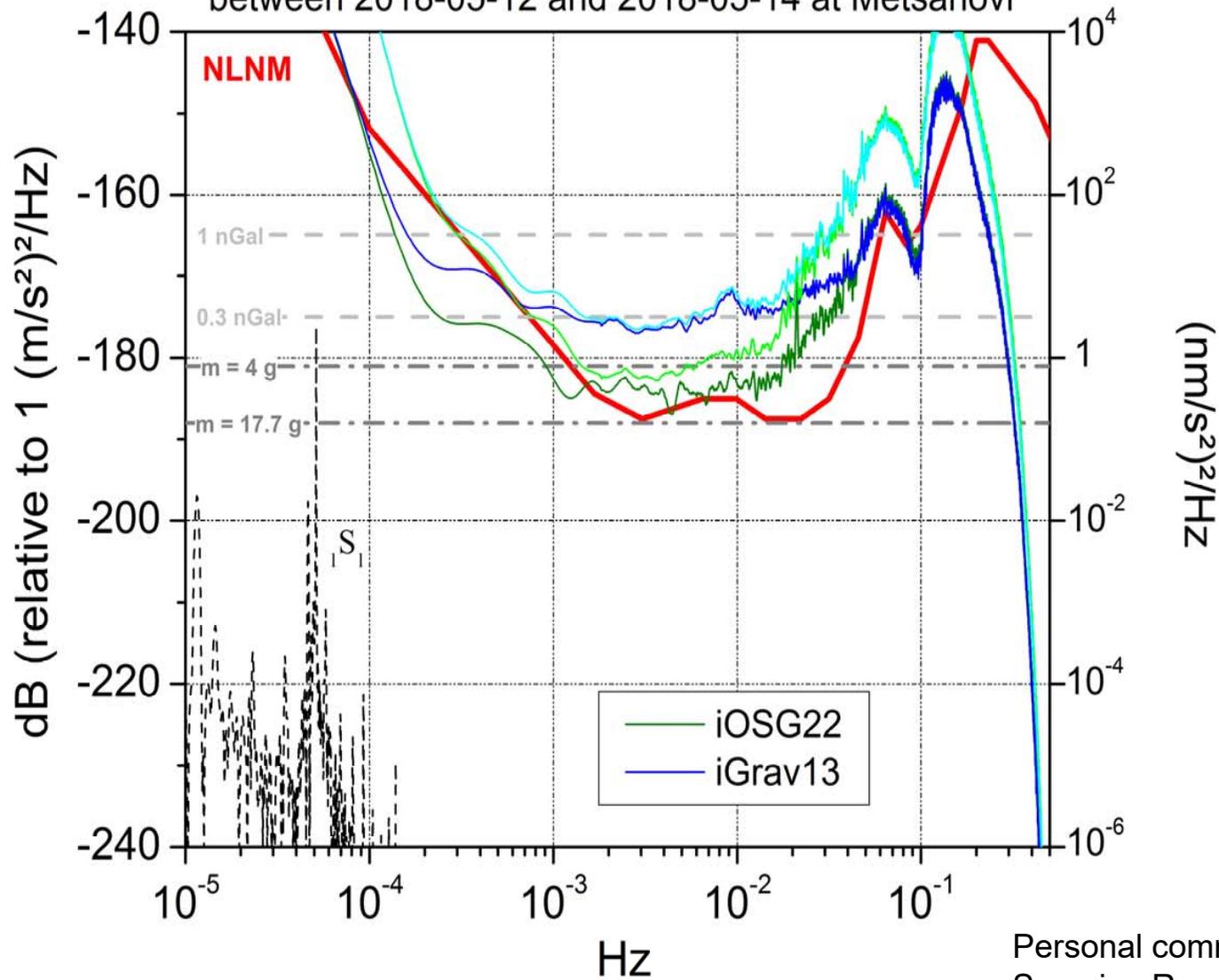


NLNM (New Low Noise Model)



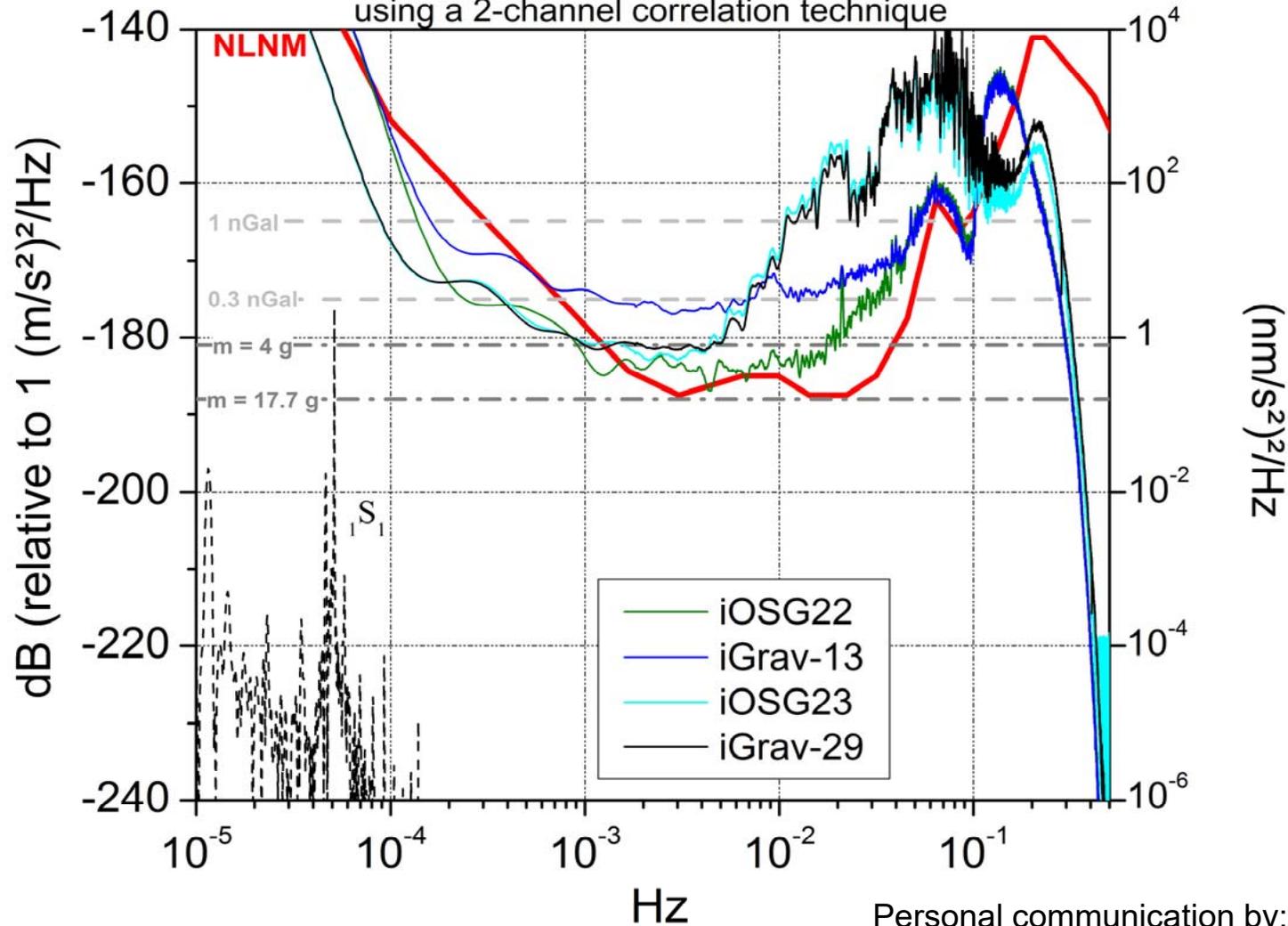
Personal communication by:
Severine Rosat, 2017

Self-Noise and Observed Noise levels
between 2018-05-12 and 2018-05-14 at Metsahovi



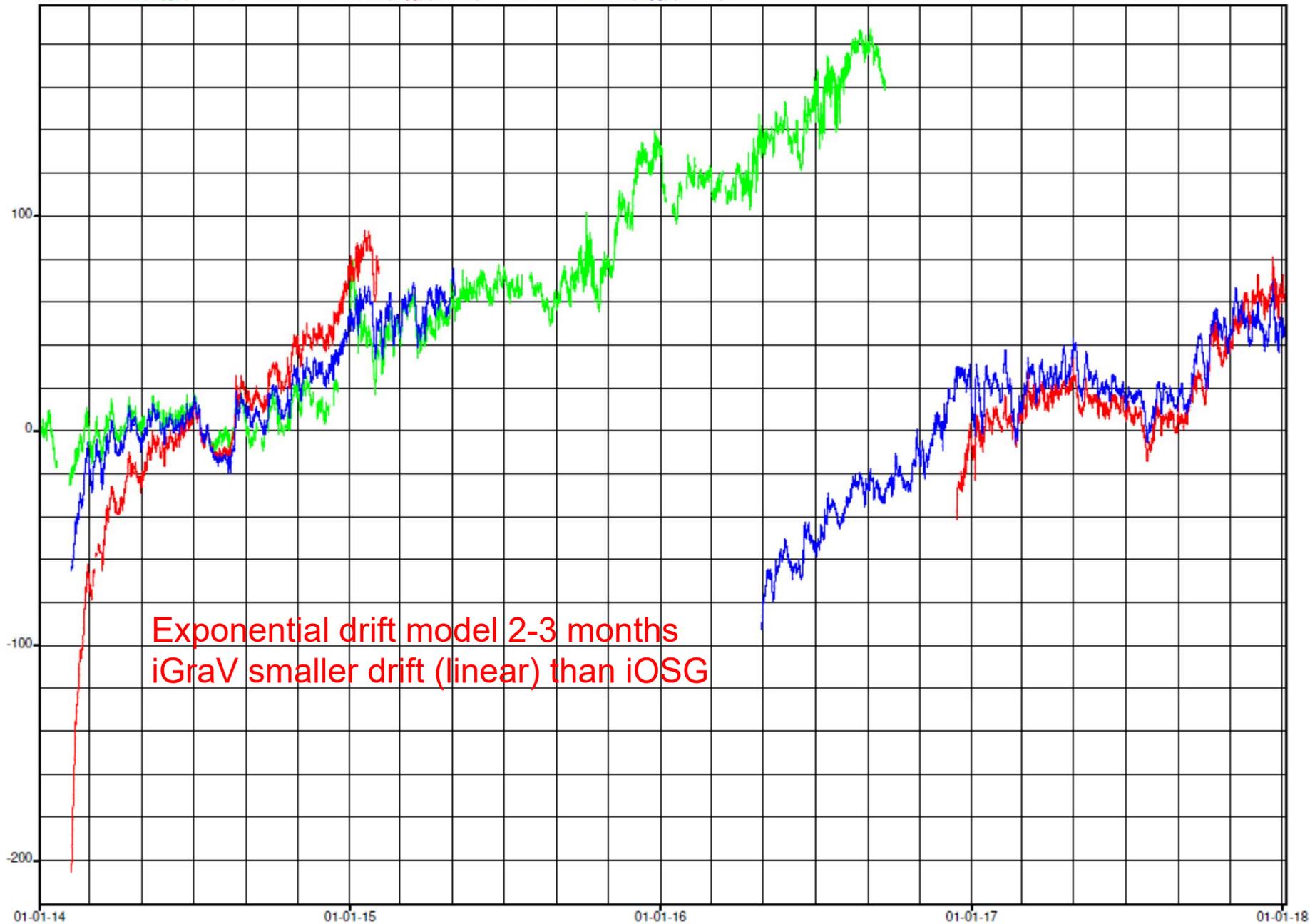
Personal communication by:
Severine Rosat, 2018

Self-Noise levels between 2018-05-12 and 2018-05-14 at Metsahovi
between 2017-08-10 and 2017-08-25 at Strasbourg
using a 2-channel correlation technique



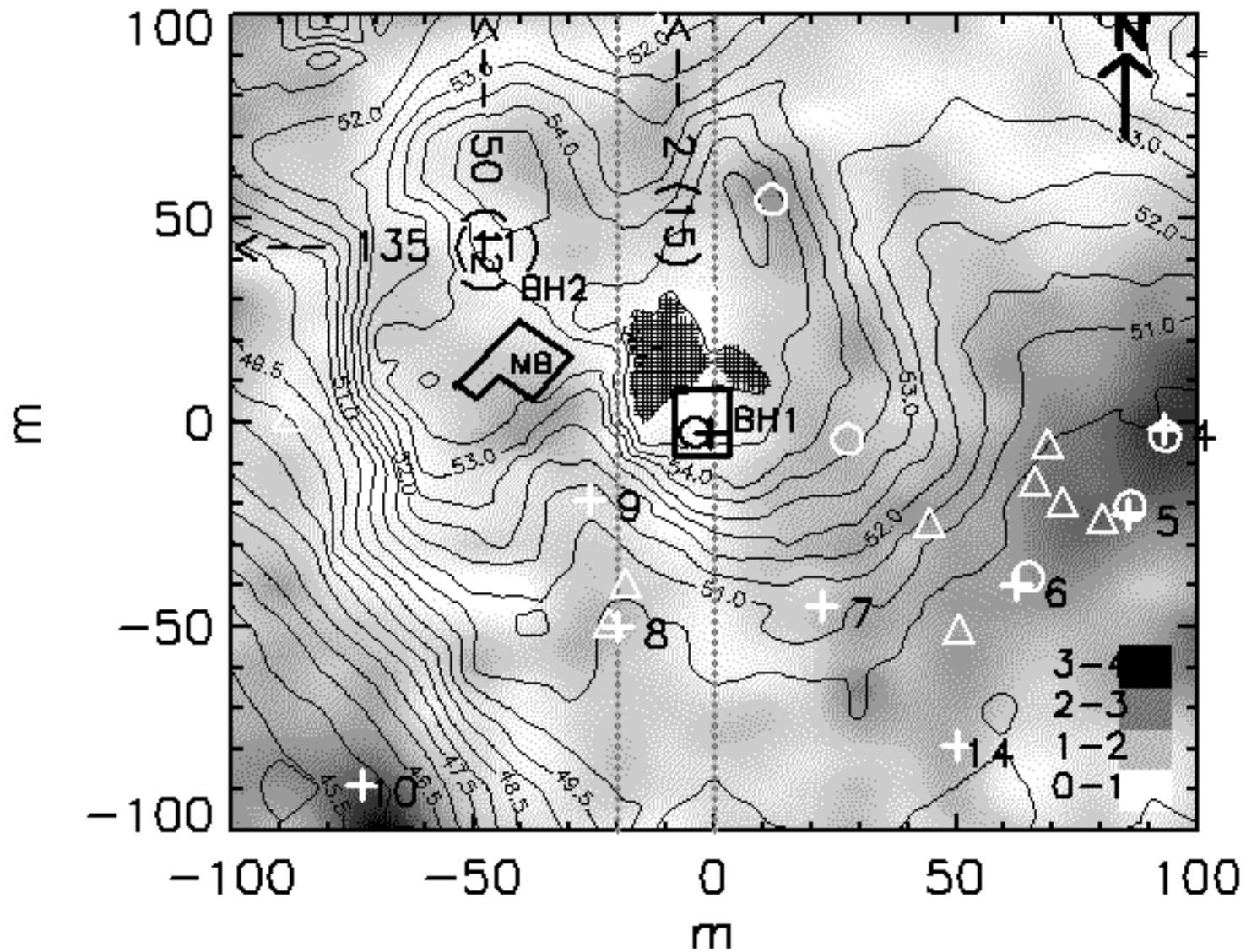
Personal communication by:
Severine Rosat, 2018

ME:T020:GR TAP(copy) (nm/s^2) ME:iOSG022:GR TAP(copy) (nm/s^2) ME:iGrav013:GR TAP(copy) (nm/s^2)



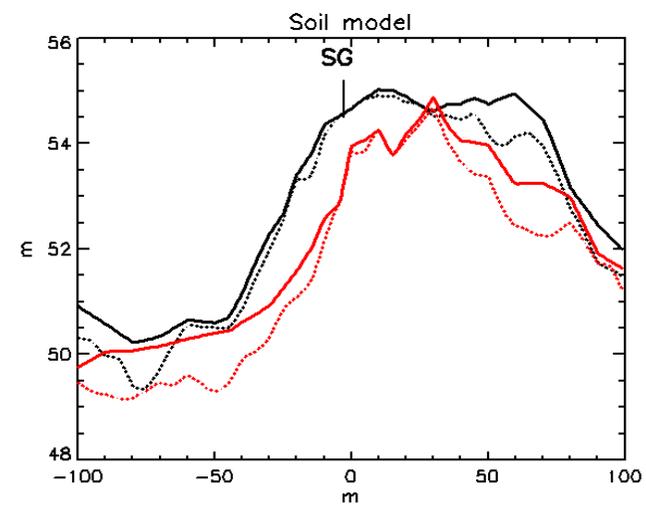
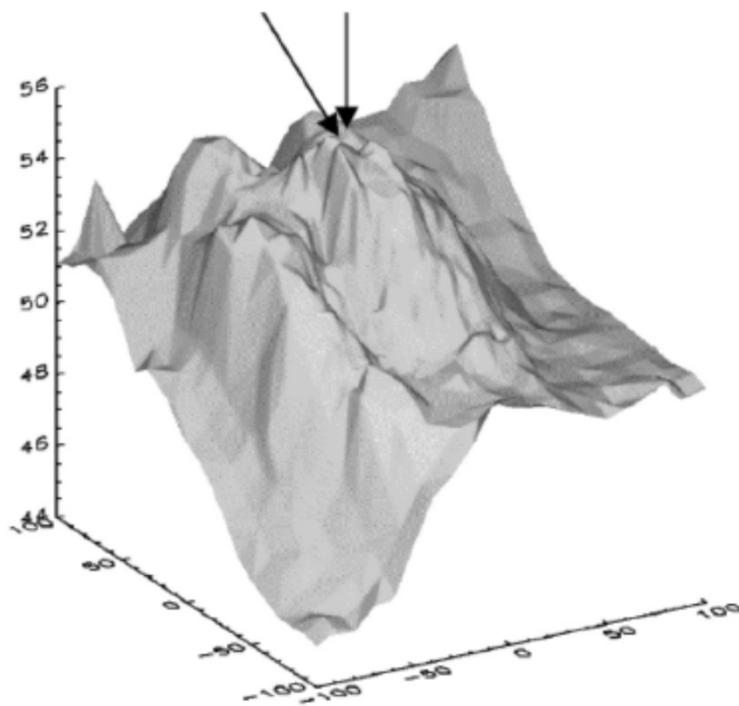
Exponential drift model 2-3 months
iGraV smaller drift (linear) than iOSG

Metsähovi

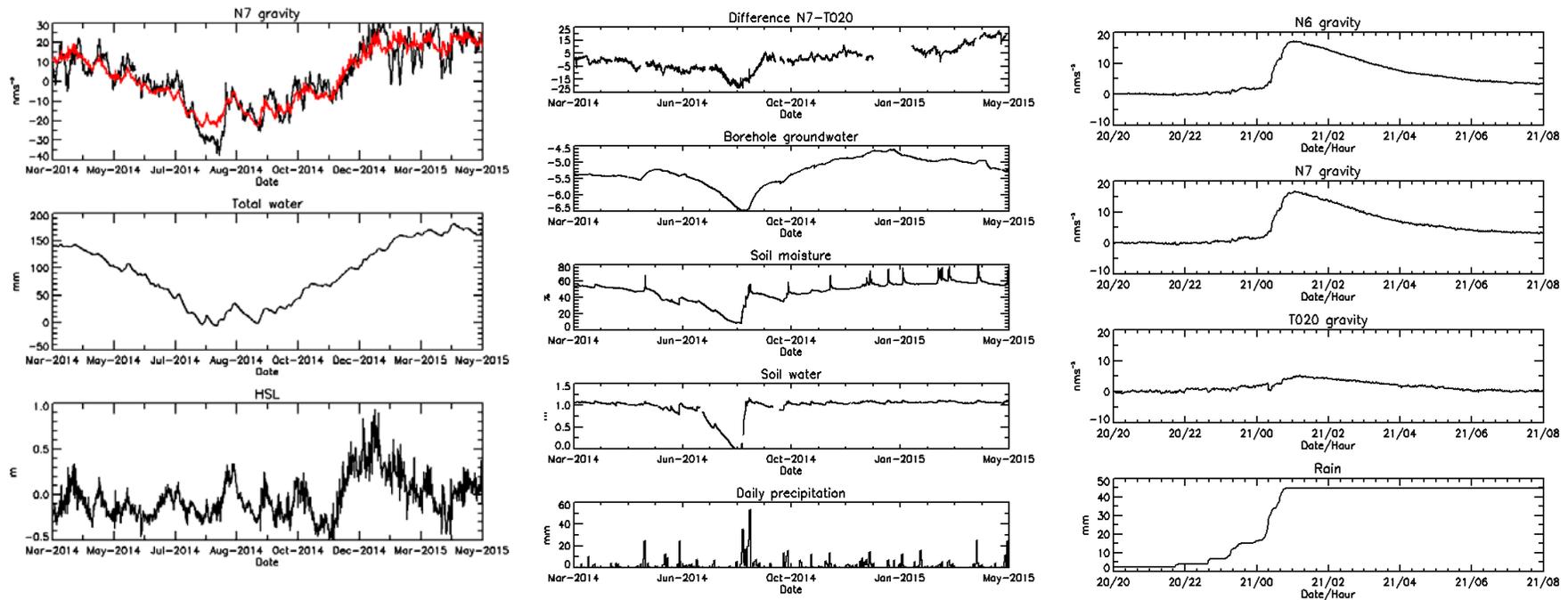


iOSG-022

iGrav-013

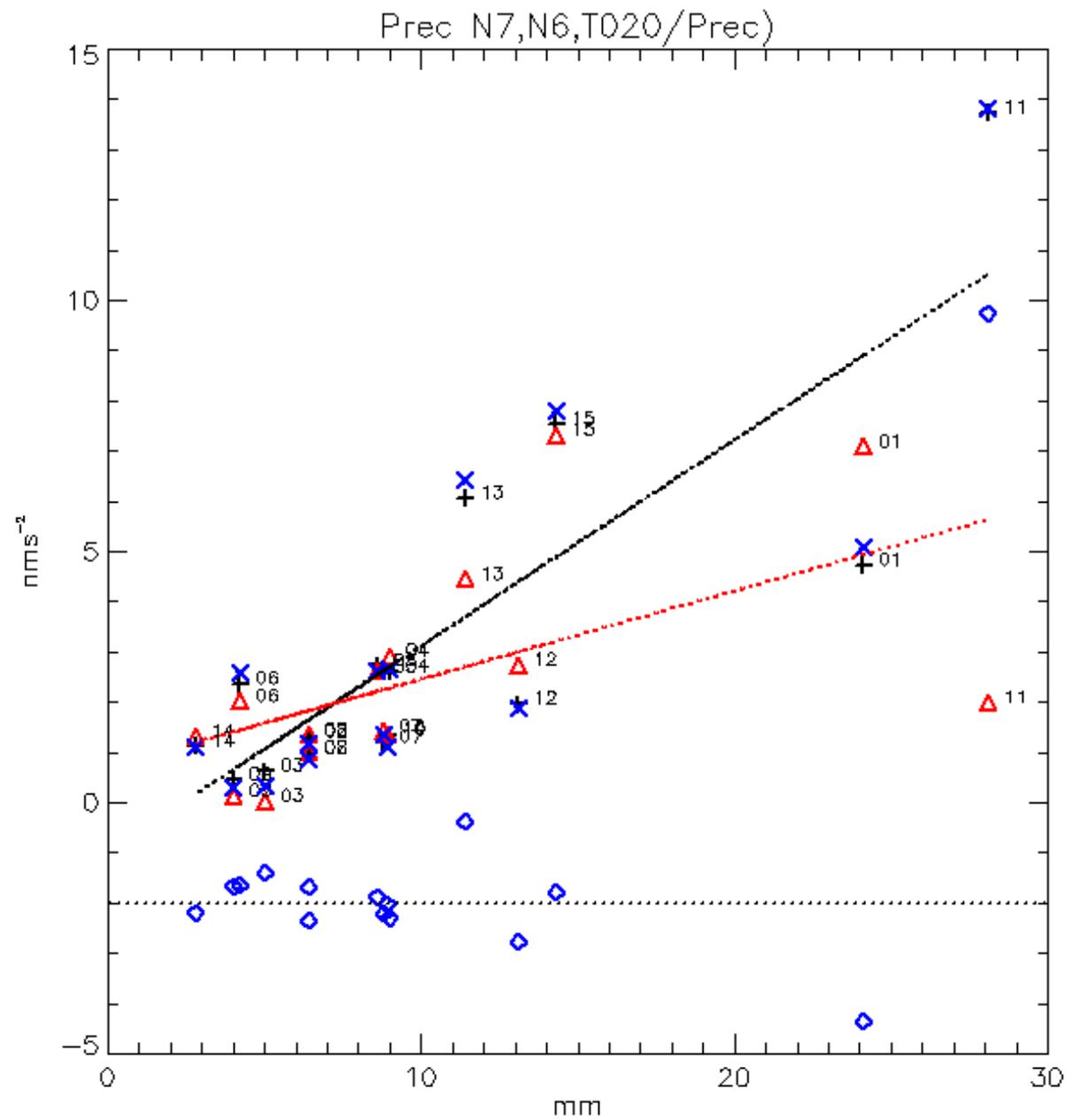


iOSG-073 (N6, N7) and T020 1.3 2014 – 1.5. 2015 at Metsähovi



20.08.14

Virtanen, Heikki and Arttu Raja-Halli, 2017. Parallel Observations with Three Superconducting Gravity Sensors During 2014-2015 at Metsähovi Geodetic Research Station, Finland. **Pure and Applied Geophysics**. DOI: <https://doi.org/10.1007/s0024-017-1719-3>



SG's and Baltic Sea 1.5. – 31.8. 2017

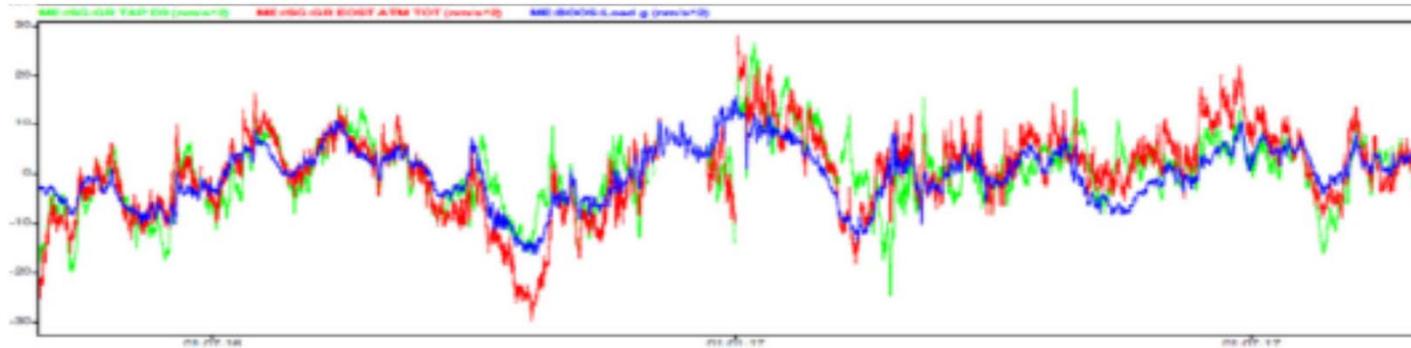


Fig 6. Top: Airpressure (ME) [hPa]. Bottom: iSG gravity residual by local airpressure ($3.1 \text{ nms}^{-2}/\text{hPa}$) (green) [nms^{-2}], iSG corrected by EOST (red) [nms^{-2}] and BOOS load g (blue) [nms^{-2}].

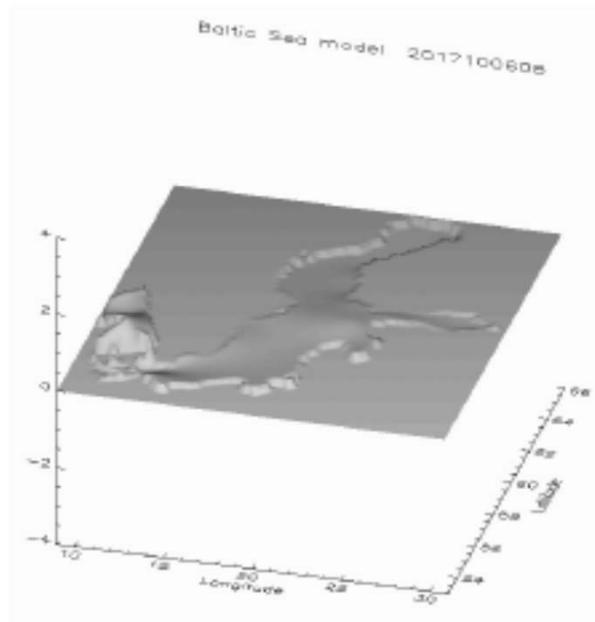
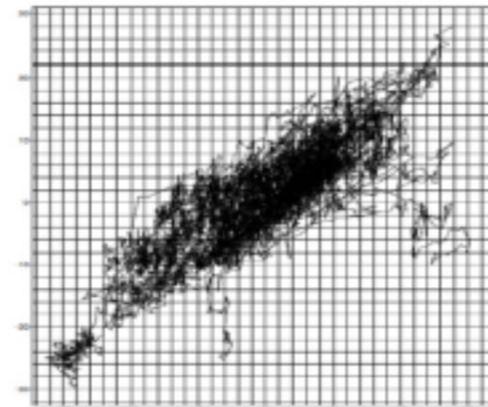


Fig. 4. Modelled surface of the Baltic Sea.

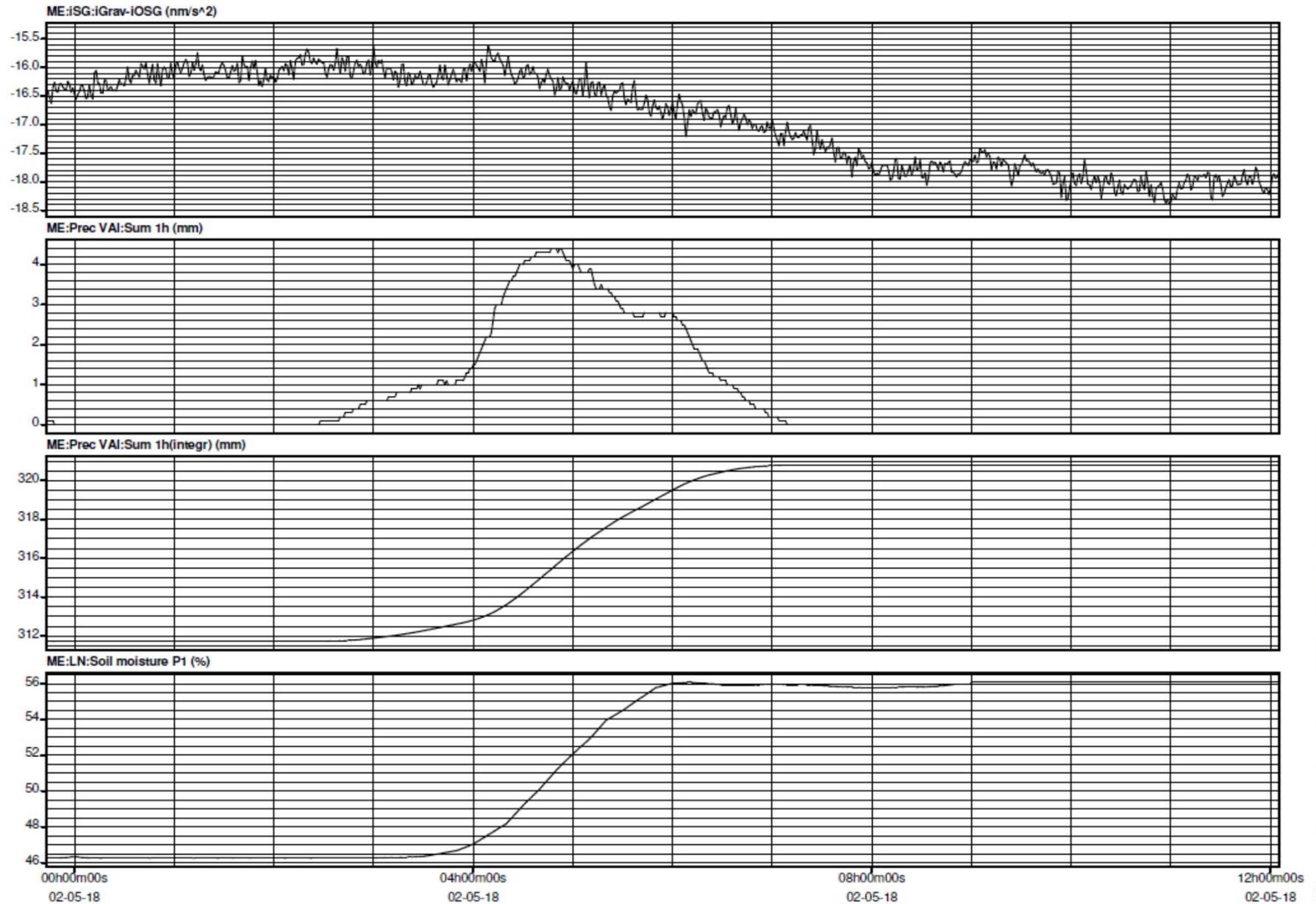
Fig. 7. (Bottom) BOOS load gravity / iSG gravity residual [nm/s^2]





Practical work with snow sampler in winter

Precipitation effect 180502

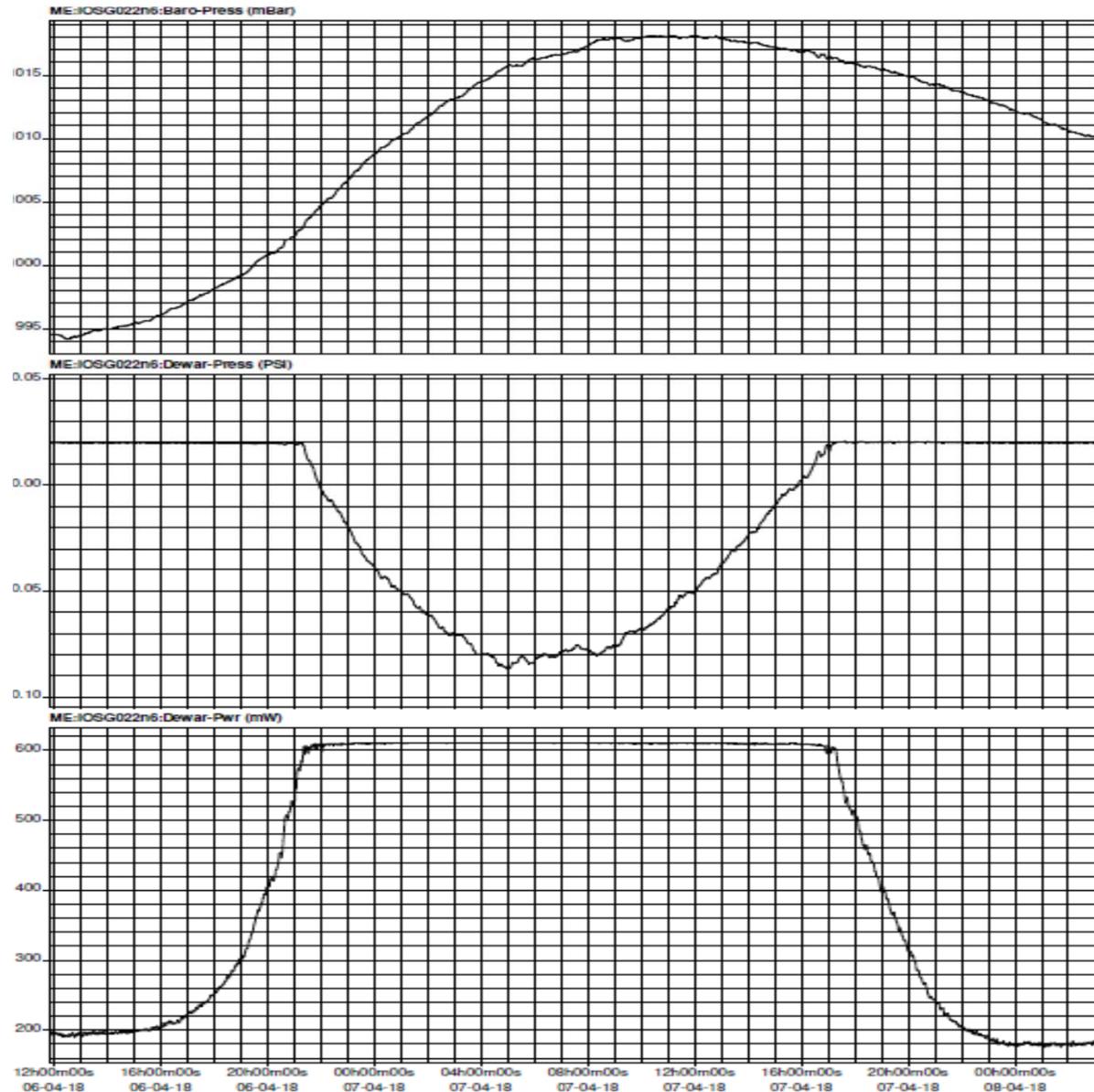


Problems I: Negative Dewar pressure, a few/y, sucking air 1/y

**Airpressure
increasing 1.5
hPa/h**

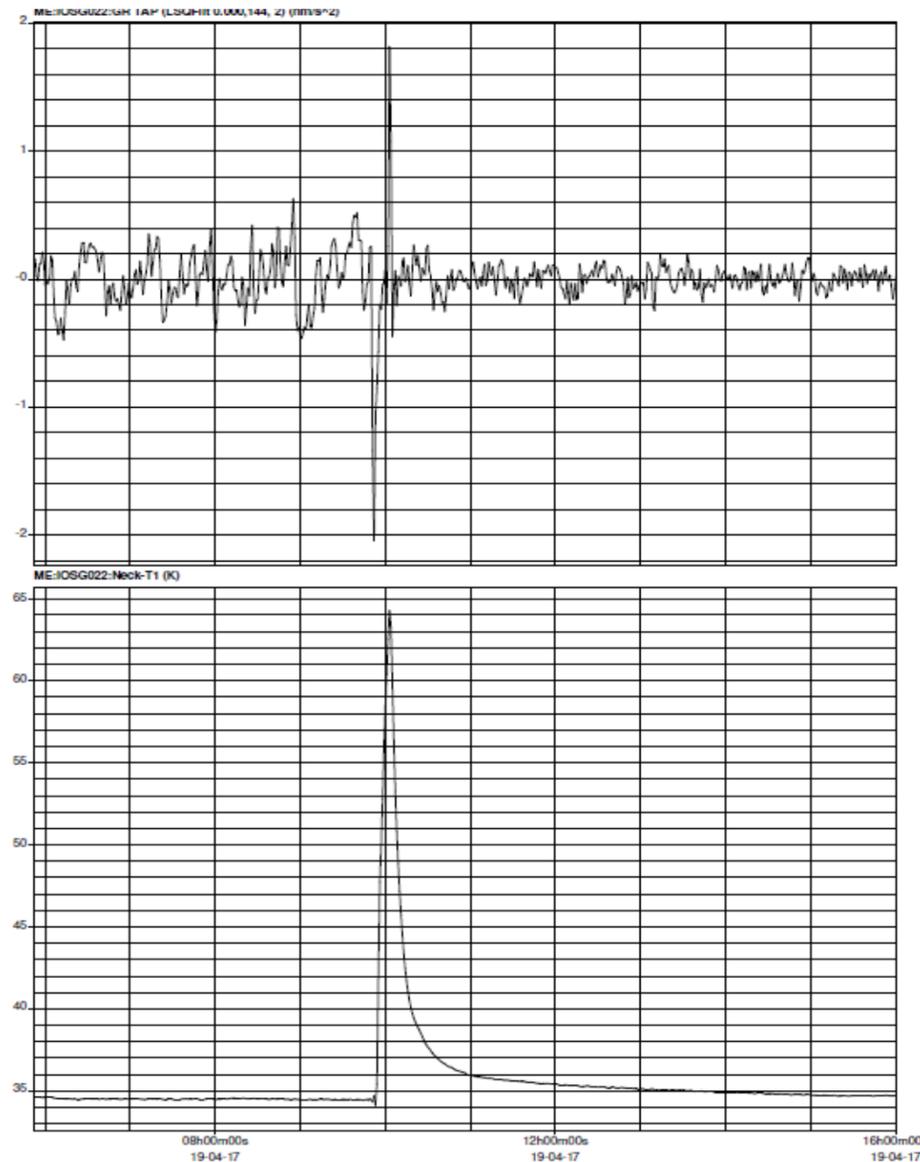
**causes negative
Dewar pressure
(20h)**

**Dewar heating
resistor is too small**



**Problem II:
The tension of diaphragm
Is critical for noise level**

**Temperature (Neck-T1) 34-64 K
Pressure 0.02 -0.22 psi**



10 min

Work plan 2018 (e.g.)

- **Snow**
- **Different signals: Snow melting, soil moisture**
- **Rainfall and local hydrology**
- **Big earthquakes (free oscillation below 1 mHz)**
- **Reducing noise level with two SG**
- **Co-operation with GWR**
- **Slichter modes**
- **Baltic sea loading + different atmospheric corrections**
- **New tidal model for Metsähovi**
- **IGETS**
- **Papers of topics above**

Thanks for your attention

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