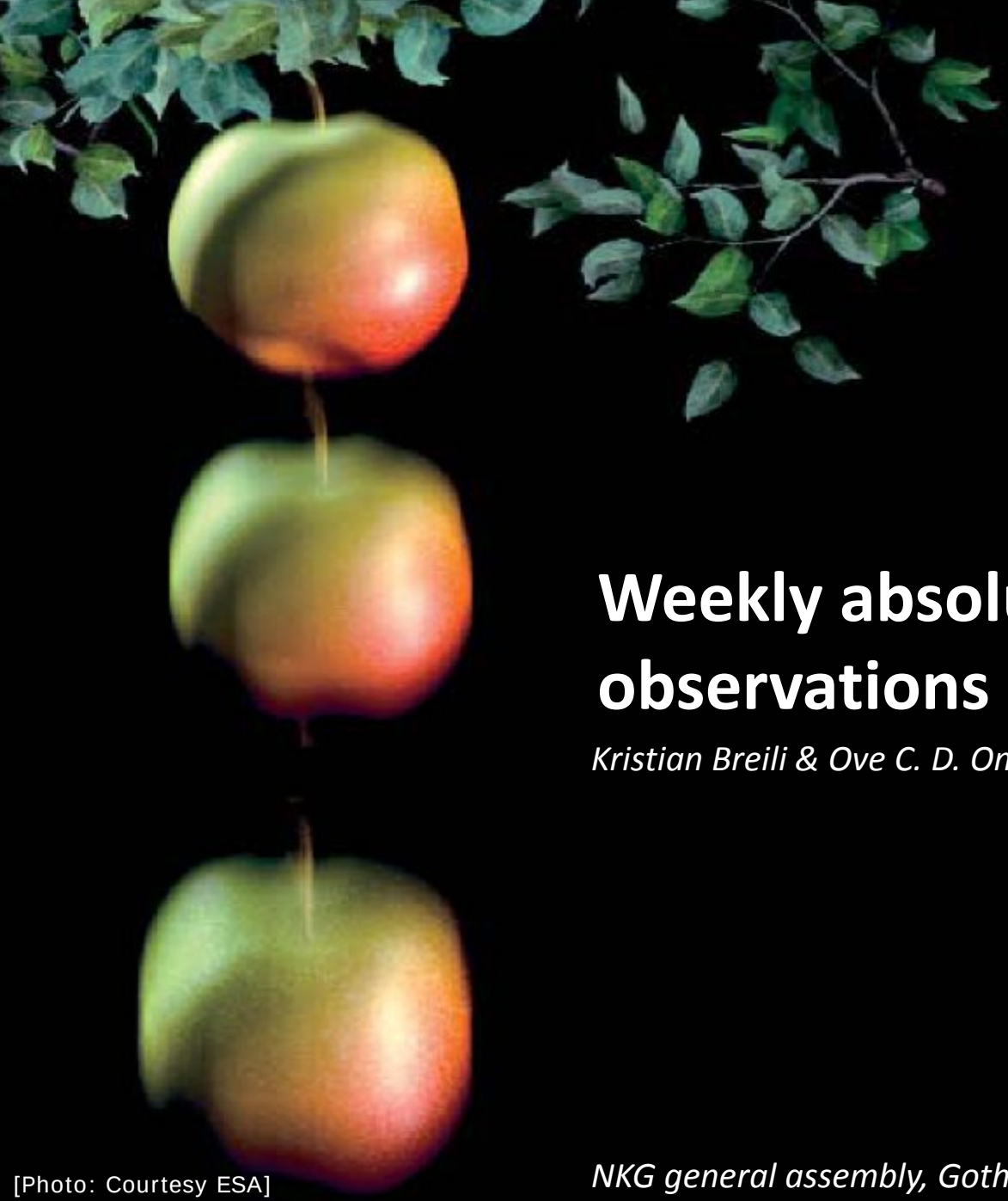

Kartverket

Weekly absolute gravity observations in Ny-Ålesund

Kristian Breili & Ove C. D. Omang

[Photo: Courtesy ESA]

NKG general assembly, Gothenburg 2. September 2014

This work has been a joint cooperation between the Norwegian University of Life Sciences (NMBU) and the Norwegian Mapping Authority (NMA)

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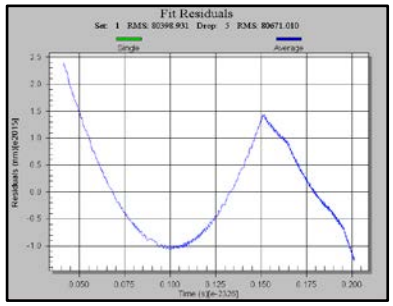
This presentation focuses on weekly AG measurements from Ny-Ålesund, and the challenges we met when conducting the measurements

Background, motivation, and results

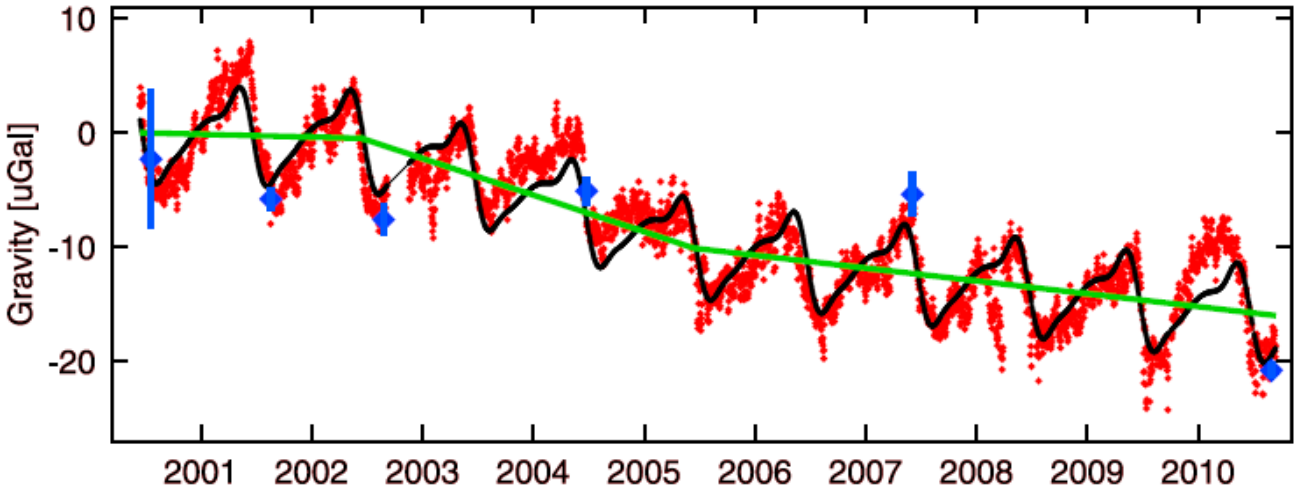


The effect of reducing the stop-time

The effect of a helium contaminated rubidium cell

Kartverket

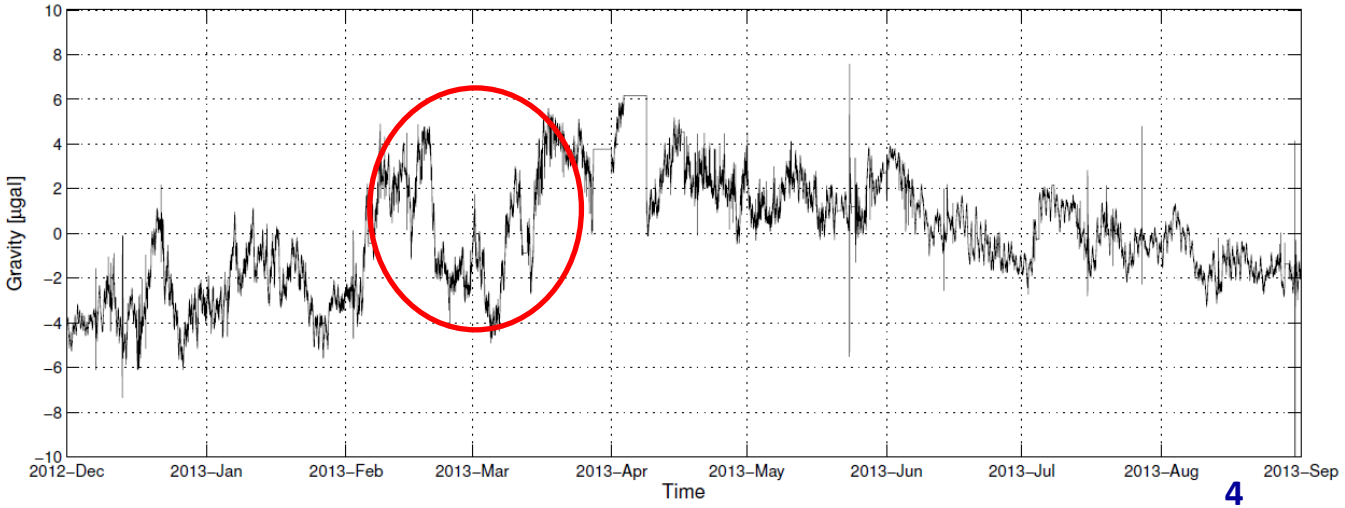
The main motivation for conducting weekly AG-campaigns was to investigate the variation seen in the SG-time series



The seasonal signal is about 10 µgal peak to peak.

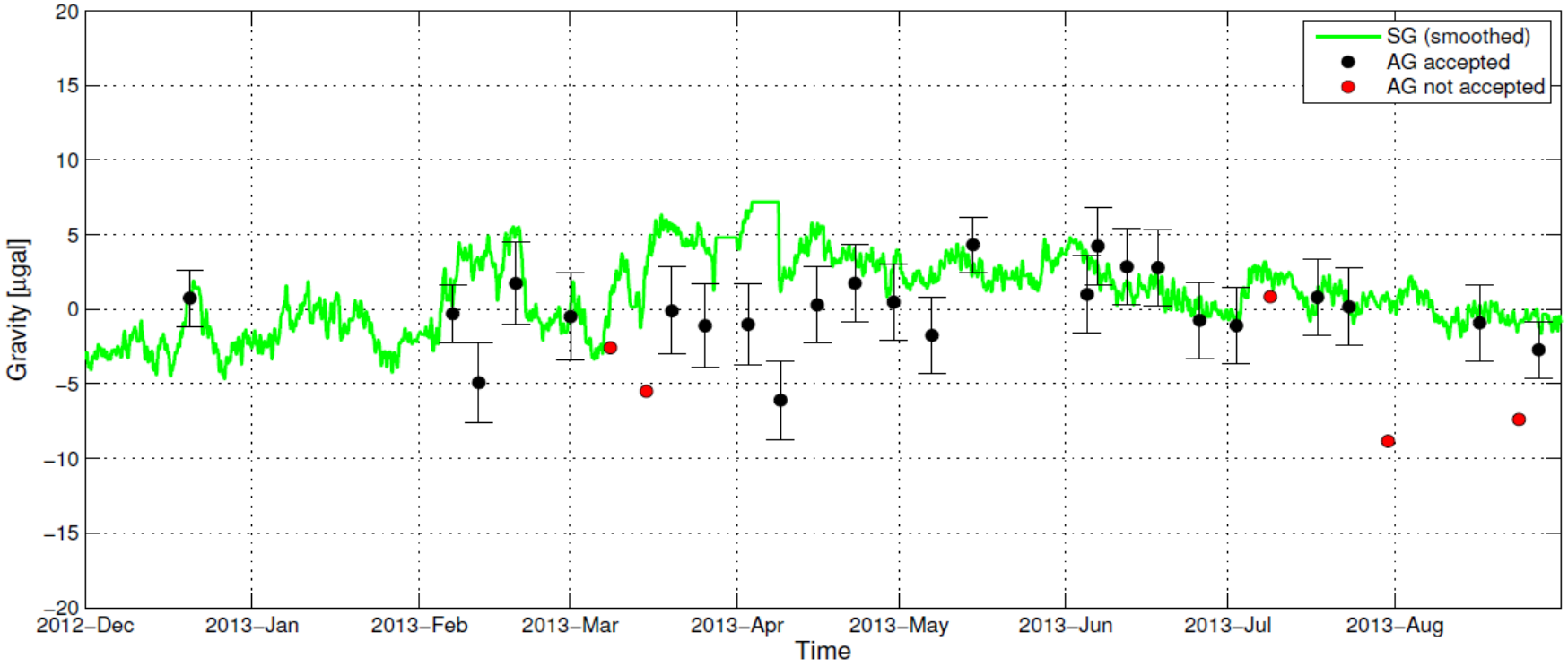
[Omang and Kierulf 2011]

In the SG-data, gravity changes time to time significantly within a few days – why?



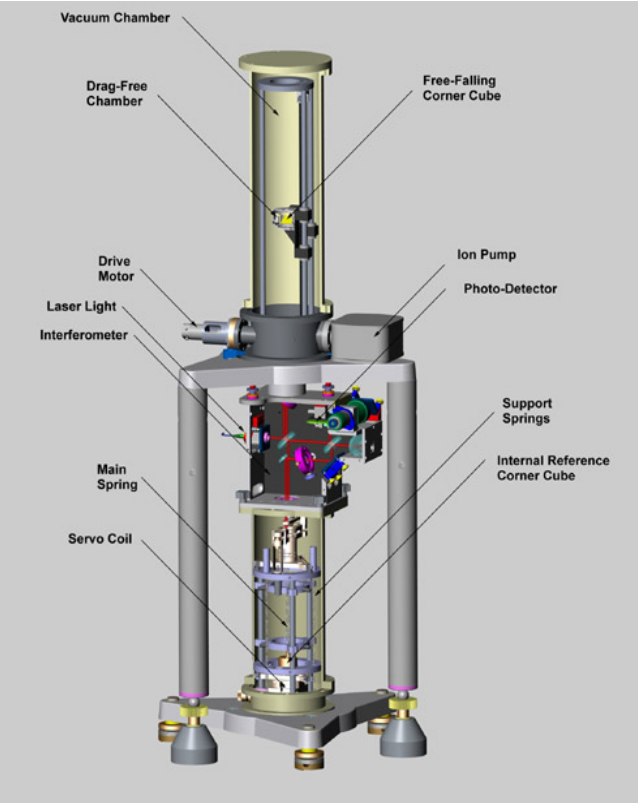
Kartverket

The AG-campaigns do not confirm all temporal variation in the SG-data!

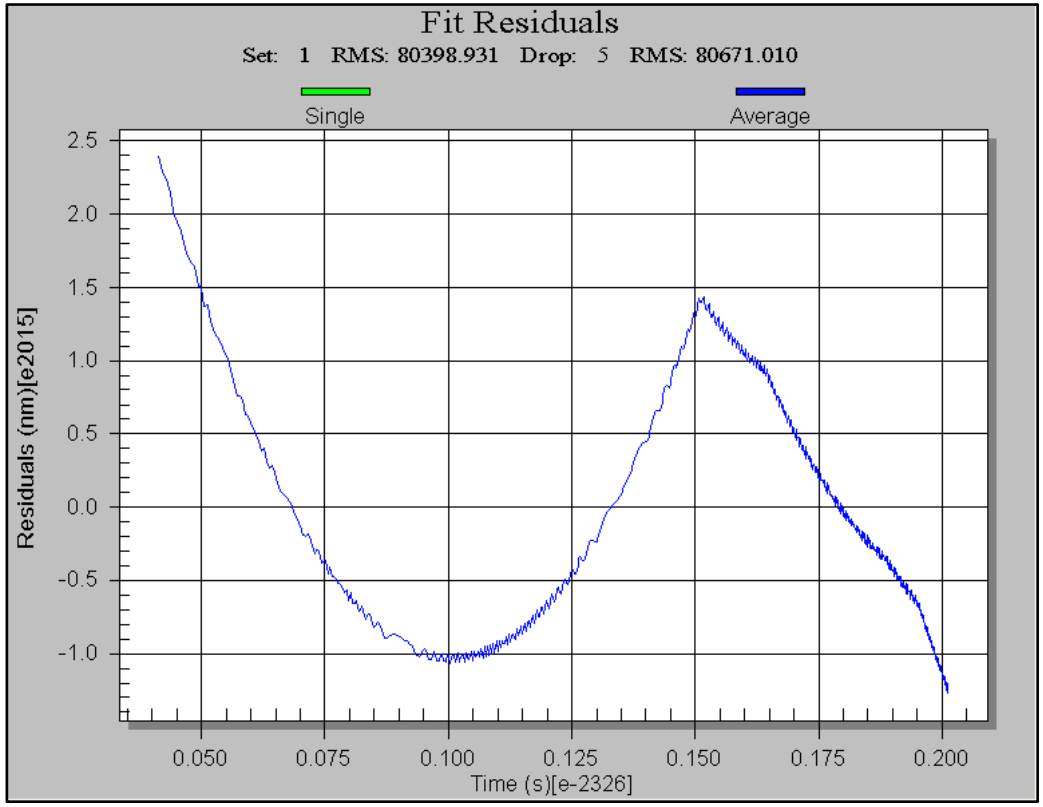


(1 µgal = 10^{-8} m/s^2)

A mechanical problem inside the vacuum chamber reduced the length of many of the drops

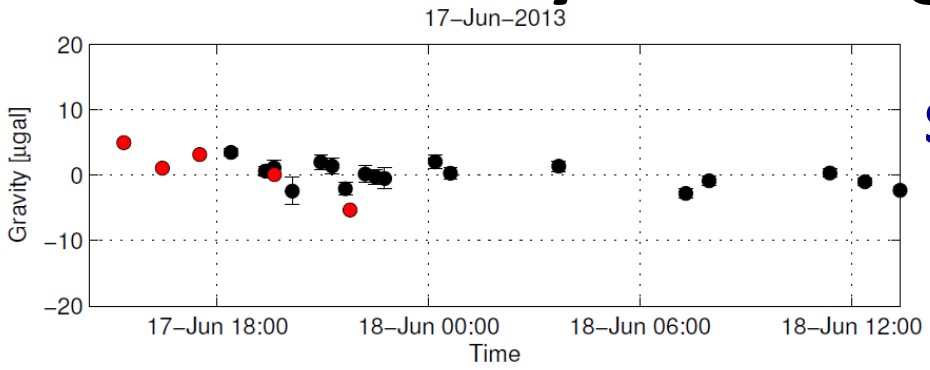


[Photo: www.microglacoste.com]

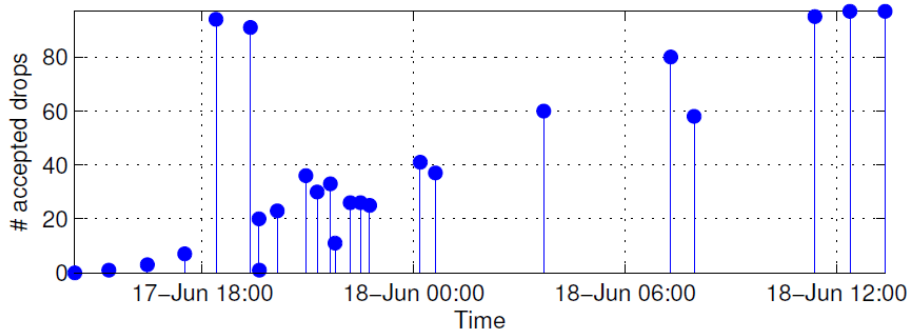


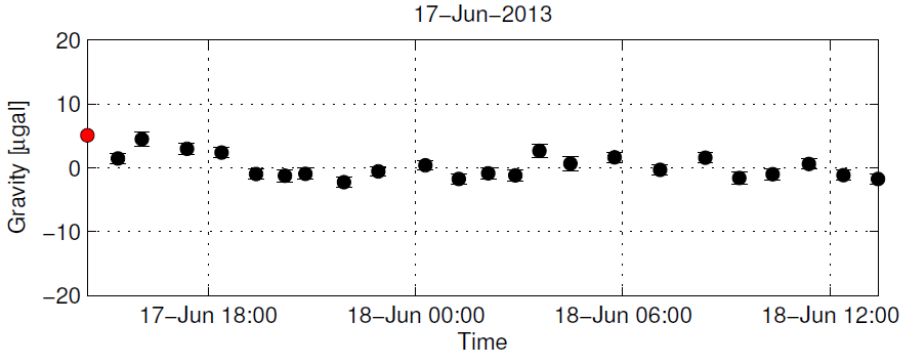
[Screenshot from the g6 software]

Data otherwise not possible to process, may be rescued by reducing the stop-time

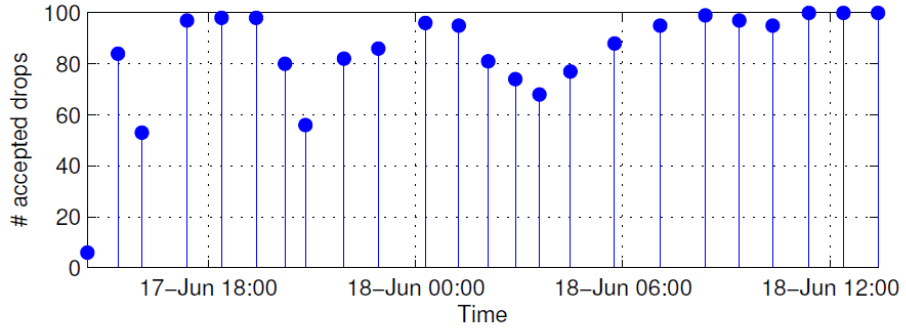


Stop time 180 ms



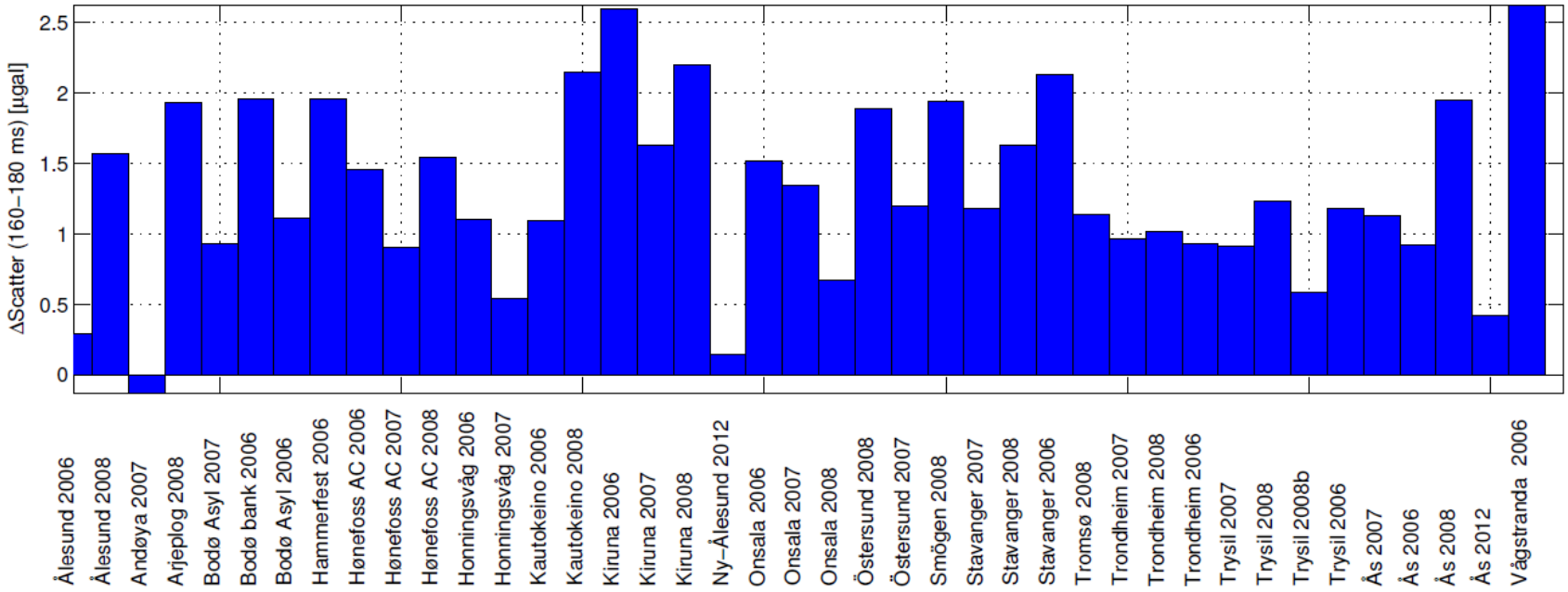


Stop time 160 ms



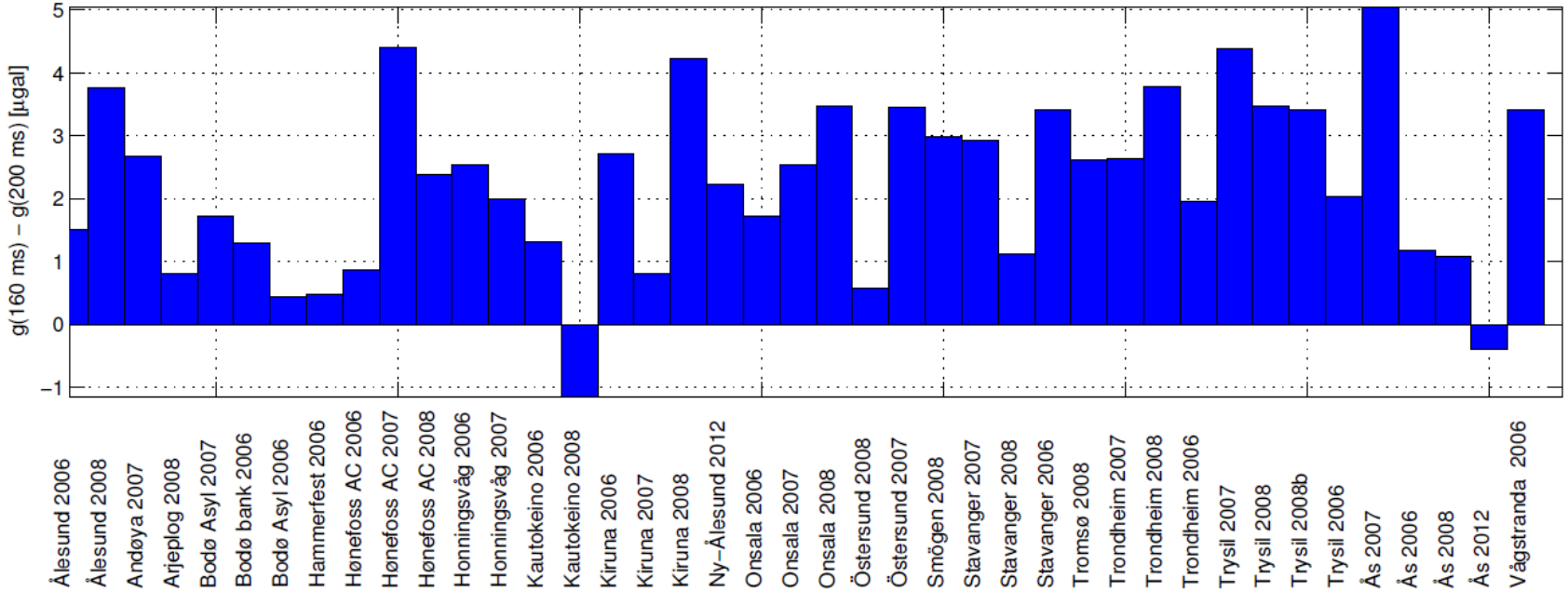
Kartverket

At all but one, the set scatter increased when reducing the stop time from 200 to 160 ms

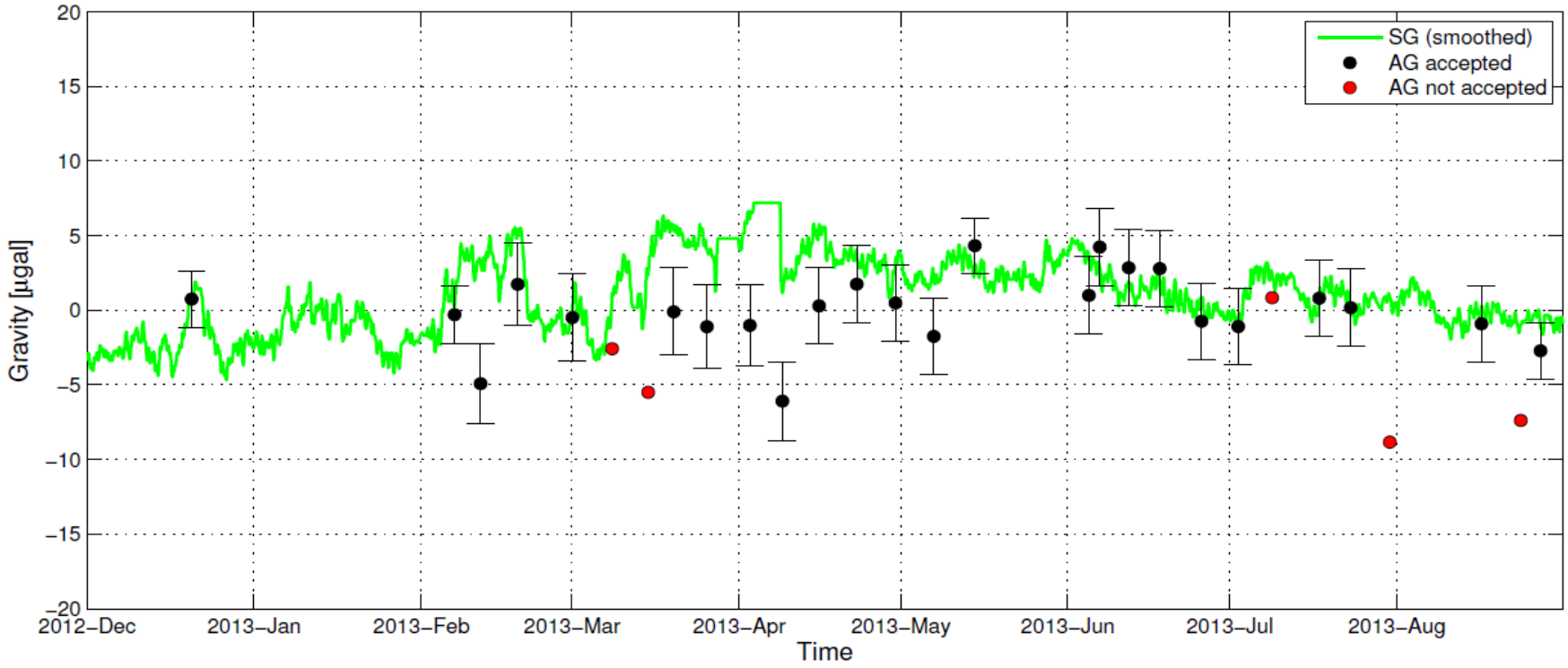


Note: Lower precision may be compensated by increasing the number of measurements

For 39 of 41 campaigns, gravity was largest when the stop time was reduced from 200 to 160 ms



The mechanical problem was most prominent during the spring and summer months

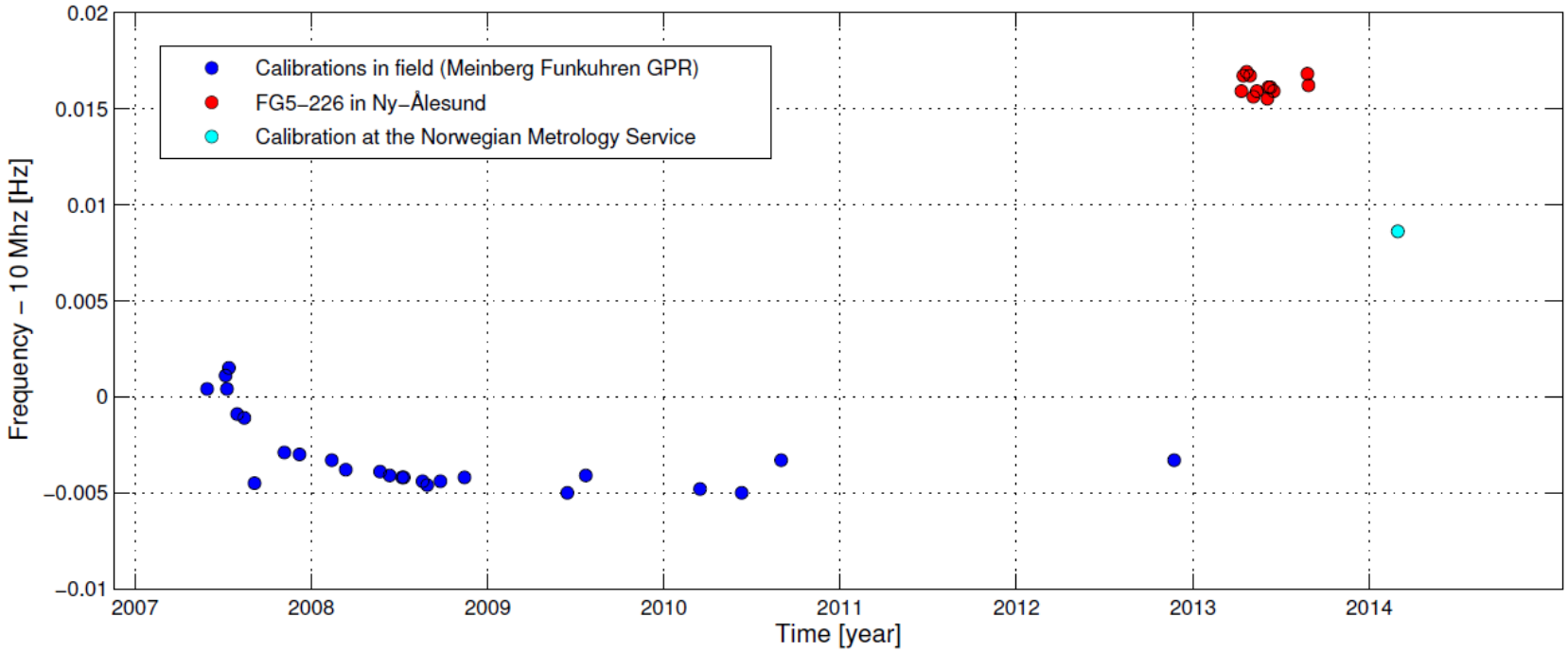


(1 µgal = 10^{-8} m/s^2)

Helium molecules penetrated the rubidium cell and changed the frequency of the FG5-clock

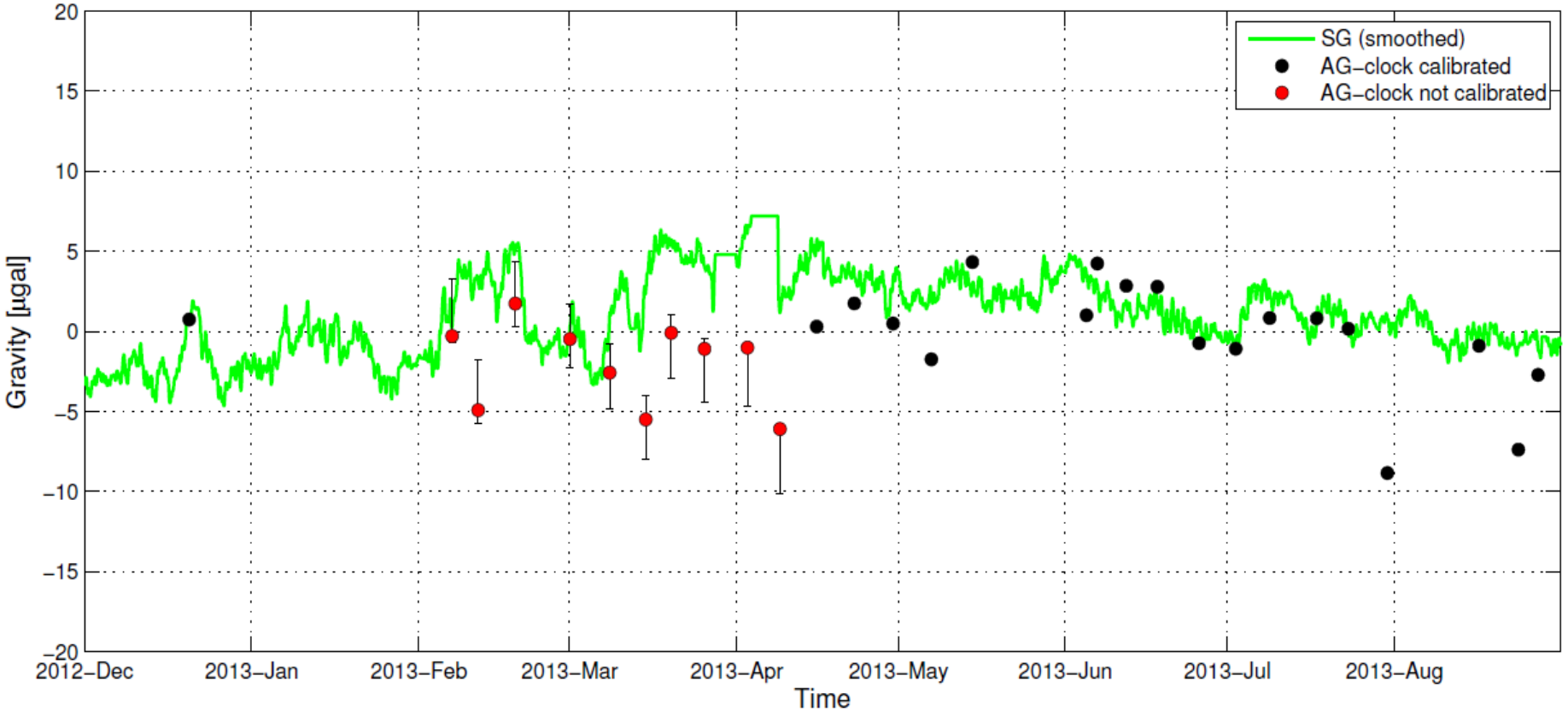
Kartverket

The frequency of the AG-clock changed by about 0.02 Hz during the first three months in Ny-Ålesund. This corresponds to 4 µgal



Kartverket

The lack of clock-calibrations does not explain the differences between AG and SG seen in March and April



In summary, the origin of the day-to-day variation in the SG-data is still an open question

The *stop time* was reduced to 160 ms for all campaigns.

Helium changed the FG5-clock by 0.02 Hz corresponding to 4 µgal