Apache Point Station Report 2016-2018

D. Crossley IGETS Workshop, June 2018

“Sorry I could not come to Potsdam due to my summer schedule

I am sure you will have many productive discussions

Many thanks to Jacques for showing the slides”

David

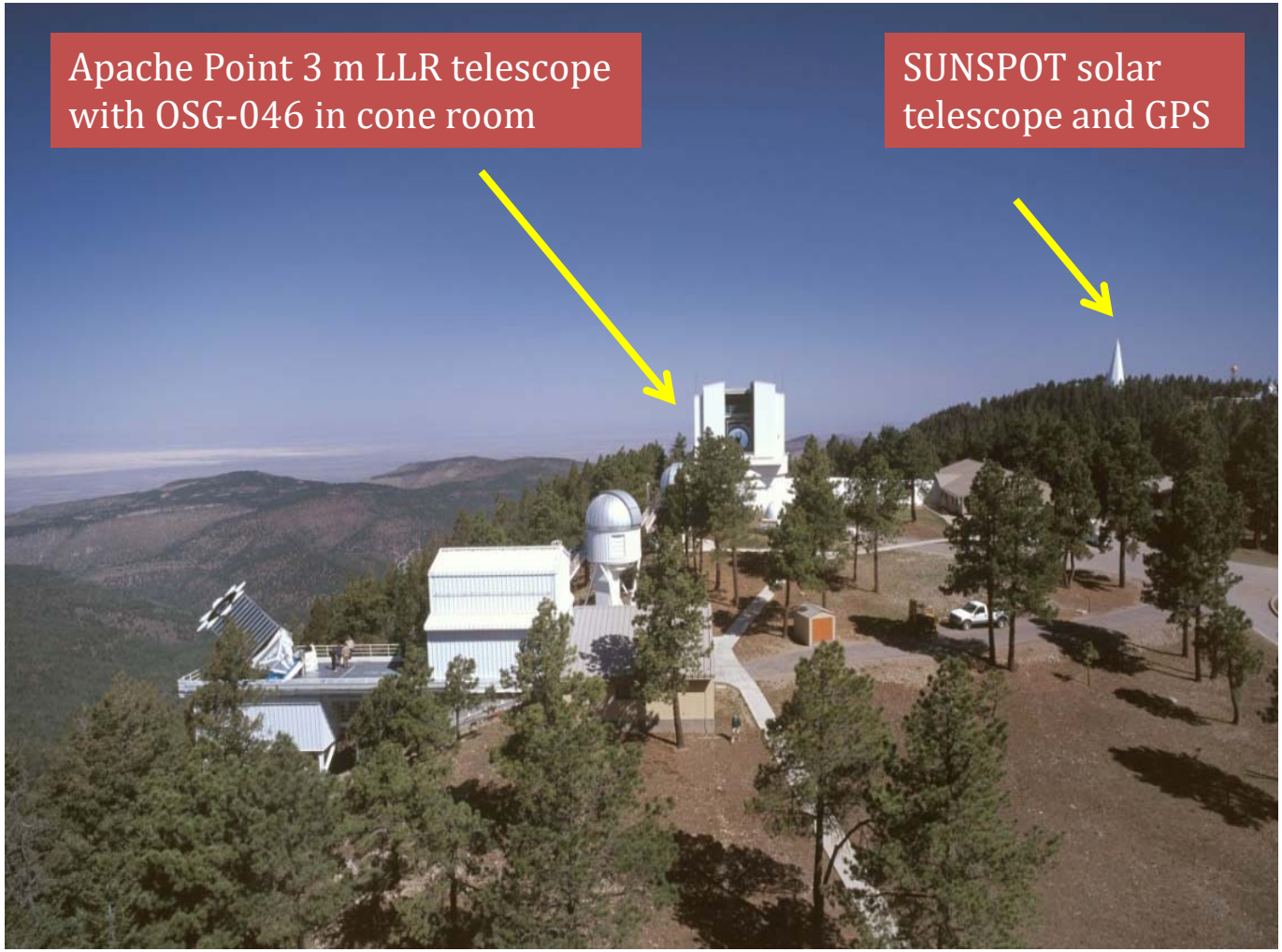
The APOLLO program, multi-institutional, PI: Tom Murphy UCSD

Lunar Laser Ranging (Earth-Moon orbital separation) for various tests of general relativity

Reminder of the AP Site at 2788 m

the current LLR accuracy is about 1 cm, limited by many factors

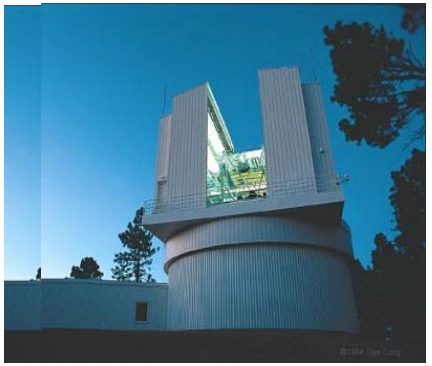
local deformation is only one contribution



The purpose of co-locating an SG with the 3.5 m LLR telescope is:

(a) provide accurate crustal elastic parameters from tidal analysis (especially at monthly periods), and

(b) improve estimates of vertical deformation, adding information to GPS data



OSG-046 was installed in the cone room beneath the telescope in 2009

The SG is 2 m above ground level at the base of the telescope on a very solid and stable pier.

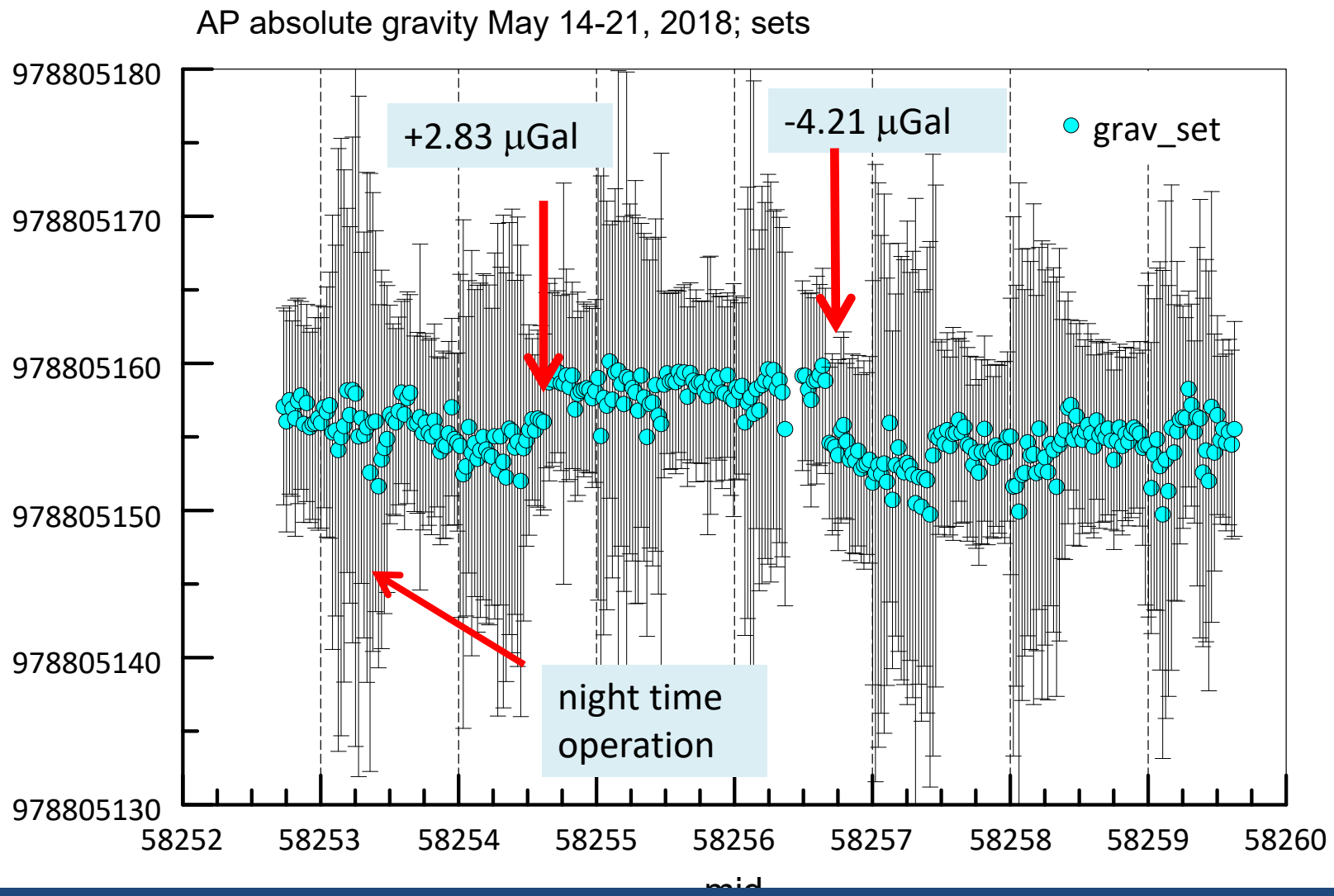
FG5-107 is installed in the cone room for the infrequent (yearly) SG-AG drift and calibration experiments.

Recently, SG suffered two periods of data interruptions

2017-10-21 to 2017-12-03 (43 days)
2018-03-25 to 2018-04-27 (33 days)

due to power supply problems. Important to check for size of estimated offsets and to check calibration.

Most recent measurements were done by D. Wheeler, (NGA) May 14-21, 2018.



Merged Spot value

sets:	978805156.142 ± 1.989 µGal	(used)
drops:	978805156.094 ± 0.123 µGal	(not used)

Combining SG and AG values

Option 1: find the SG drift independently of the AG values, so the two series have their own secular terms

SG	y = A*(1-exp(-B*t))+ C*t + D	(initial exp + linear)
AG	y = E*t + F	

gives

SG linear drift:	C = 7.195 ± 0.001	μGal/yr
AG trend:	E = -0.498 ± 0.201	μGal/yr

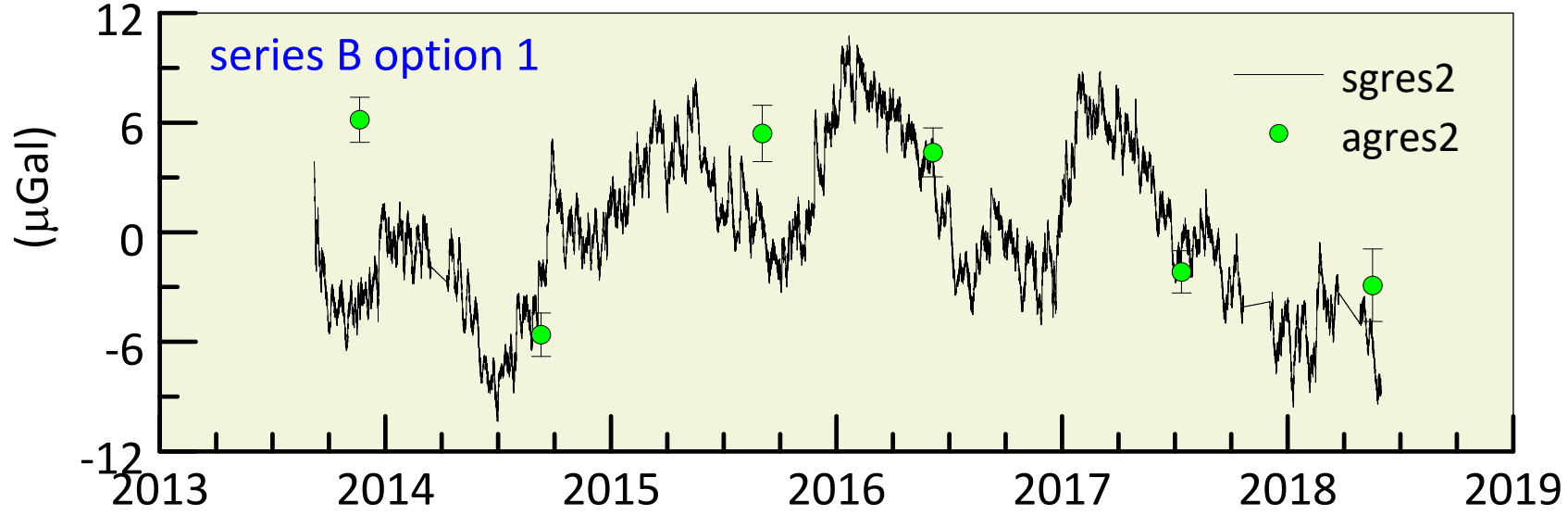
Option 2: link the SG drift to the AG values, so the SG has the AG trend plus its own drift. This is technically the better solution

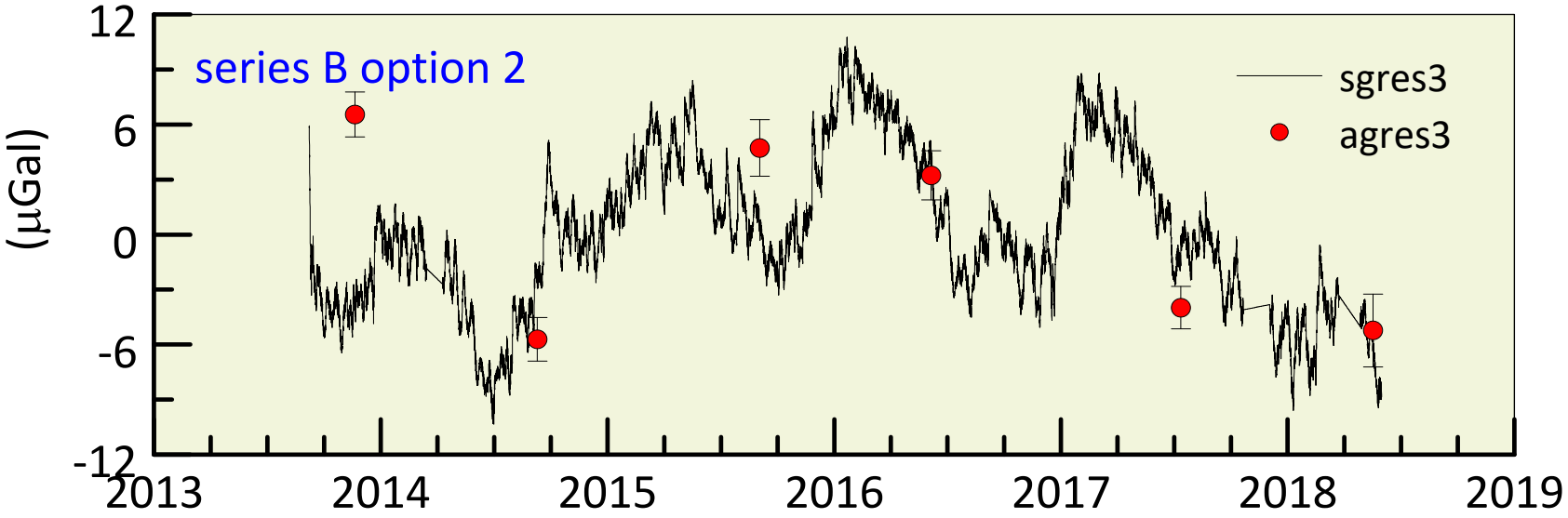
SG	y = A*(1-exp(-B*t))+ C*t + D + E*t
AG	y = E*t + F

gives

SG linear drift:	C = 7.100 ± 0.201	μGal/yr
AG trend:	E = 0.106 ± 0.201	μGal/yr

Best fit residuals, after removal of tides, local pressure and polar motion (for AG only!)





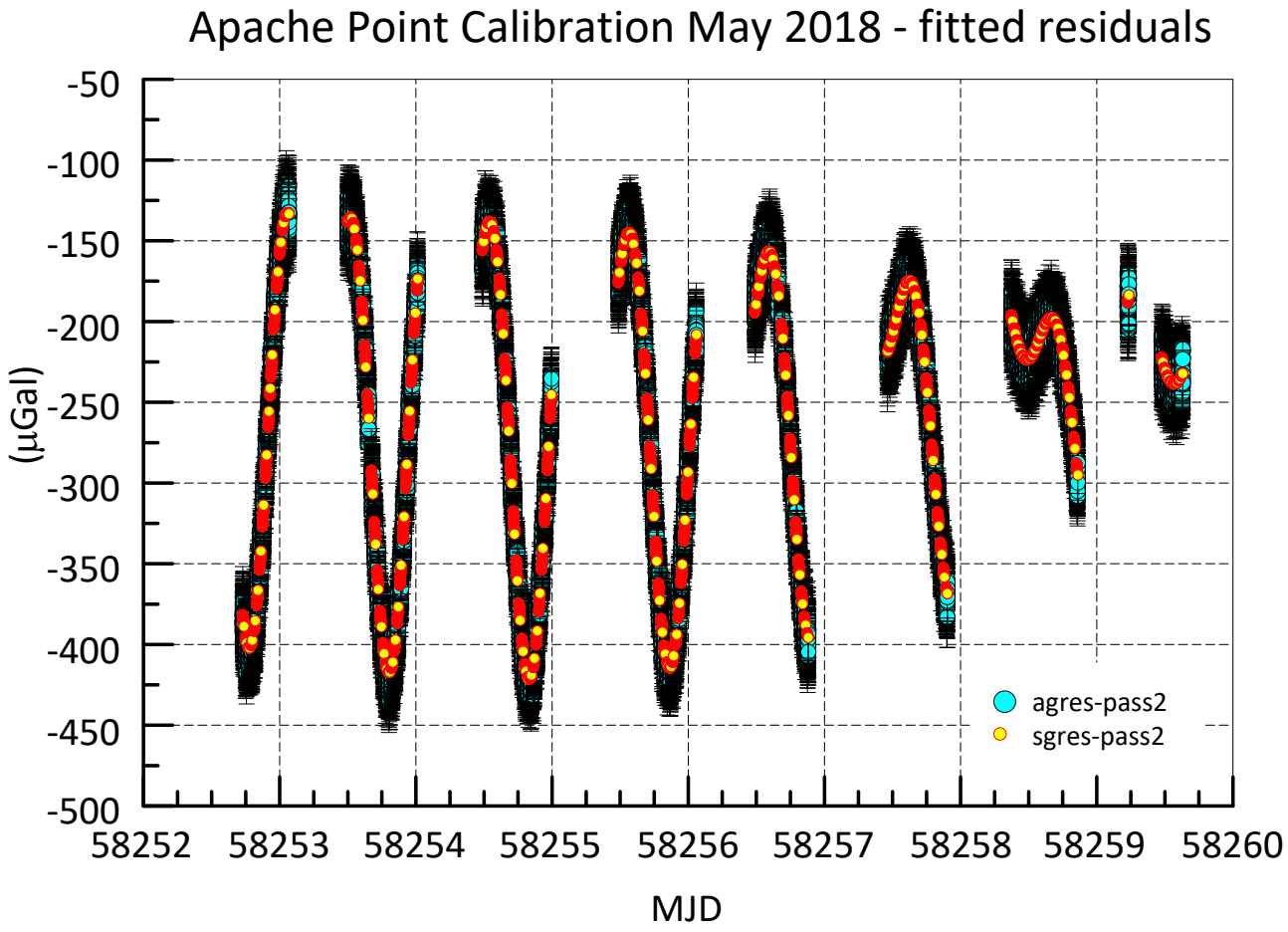
SG Calibration Constant

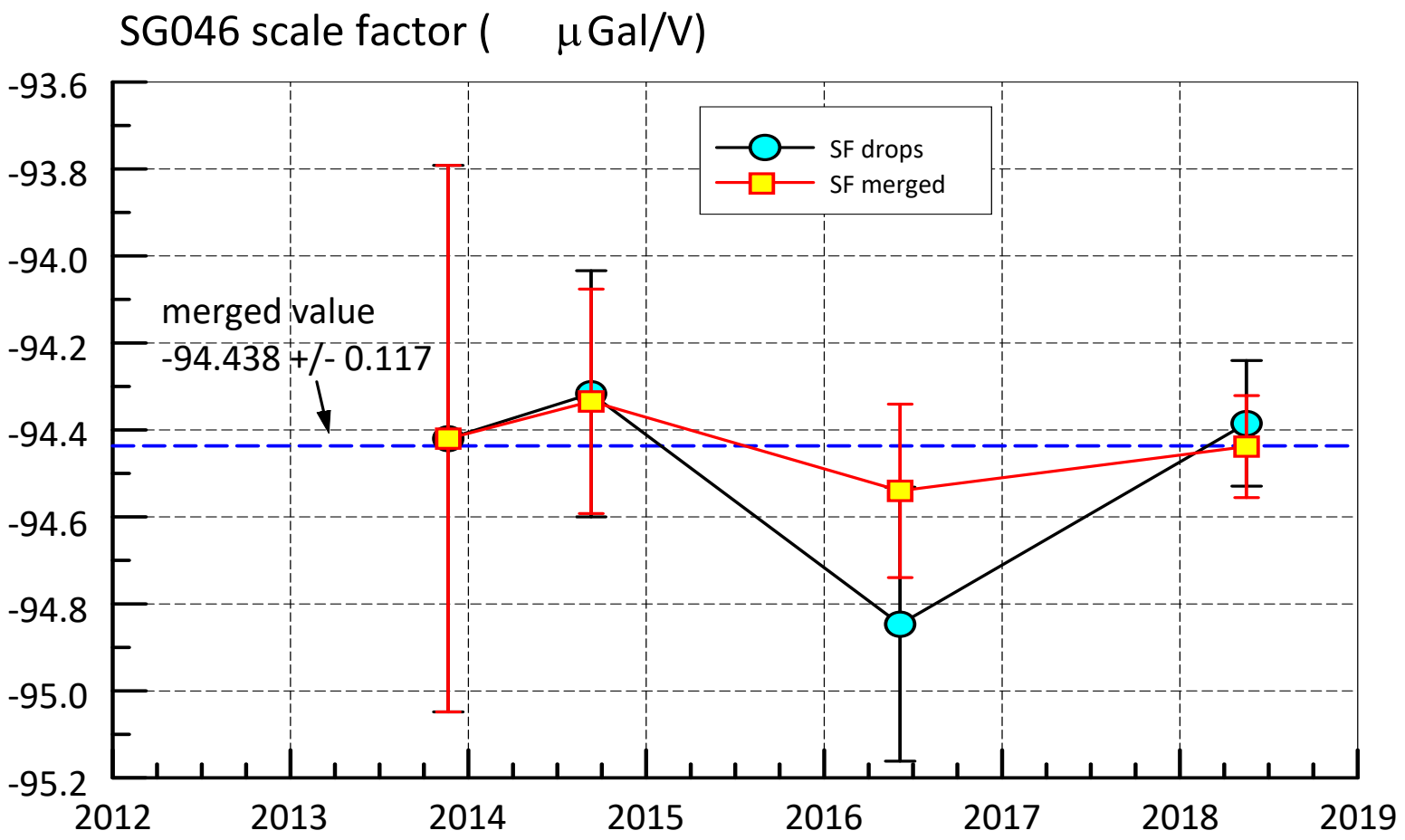
For this we use the uncorrected AG and SG data. As in Crossley et al. (2018), the preferred method is to fit the SG values to AG drops, to select accepted drops based on the corrected AG data (co), to use 3-sigma rejection of drops, and use SG 1 sec data filtered with parzen 101 point filter, cut-off period 30 sec. The fitted data is shown below for pass 2 – after first fit outliers are rejected.

AG data are rejected during the night time when the telescope is active

120 drops / set

39,120 drops accepted
= 51% of those recorded





new 2018 scale factor: -94.3849 ± 0.1446 μGal/volt

merged (conflated) value: -94.4383 ± 0.1171 μGal/volt (0.12%)

which is added to the AP calibration file sent to IGETS

THAT'S ALL!