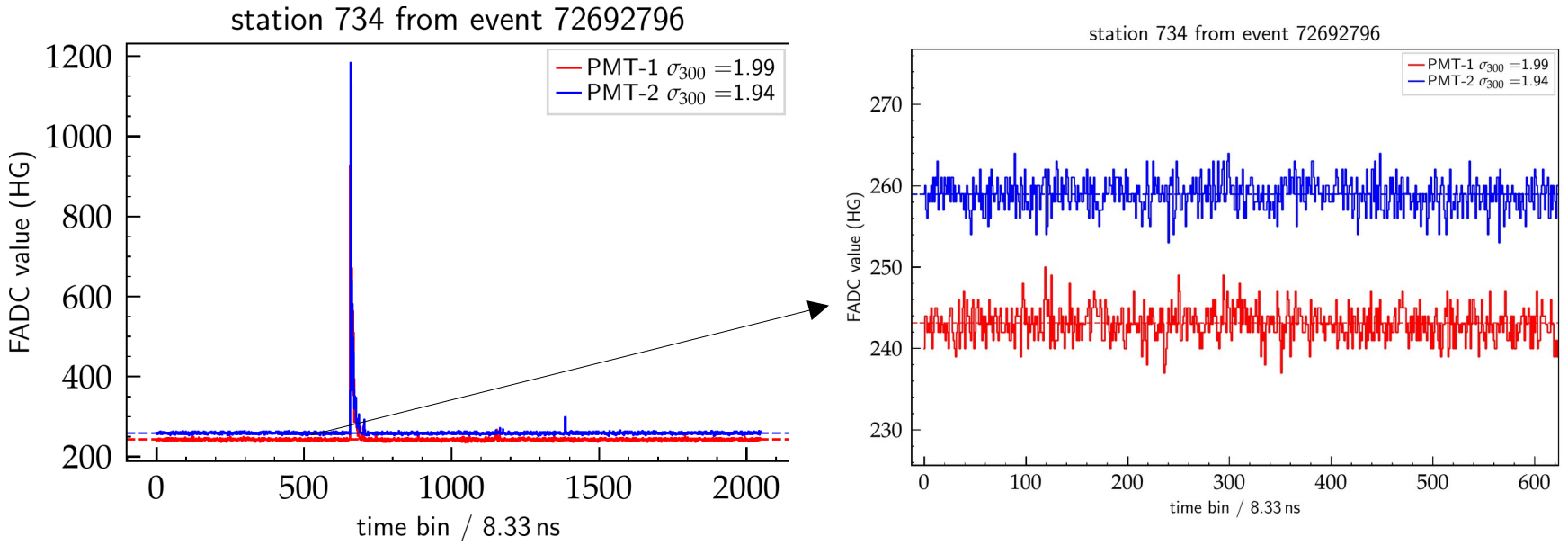
Noise?

Martin Schimassek

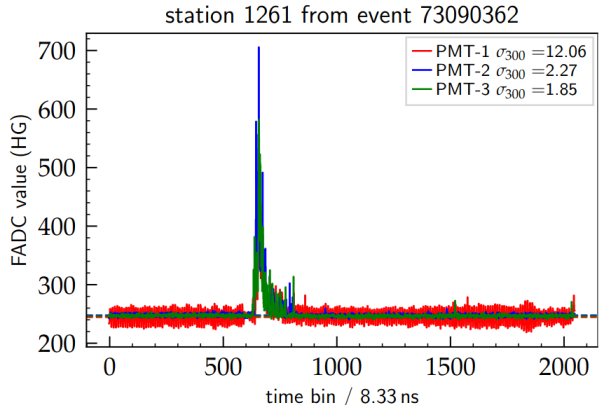
What do we mean with noise?

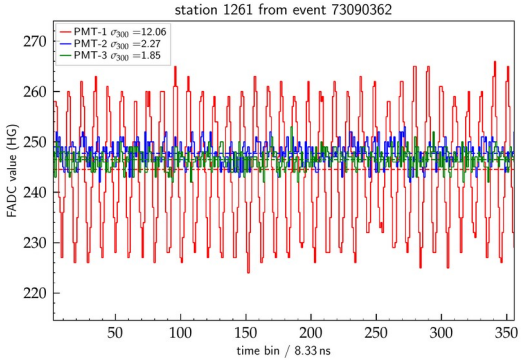
- we refer to the fluctuations of the pedestal
- we measure it in the first 300 bins of recorded traces
→ comparison with monitoring inconsistent: another topic

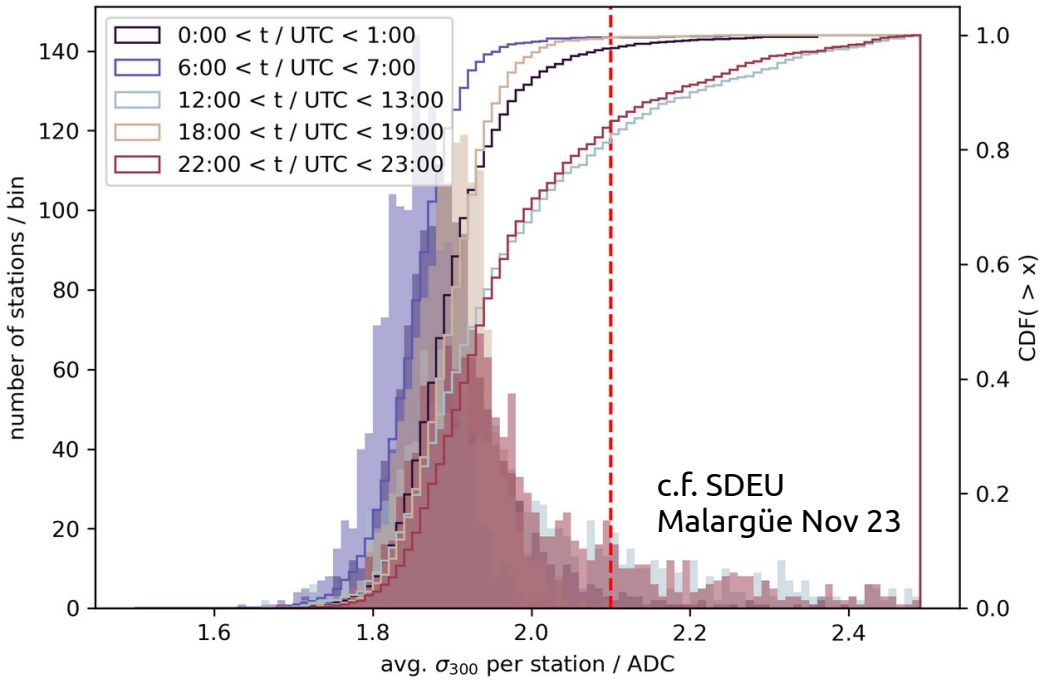


Shown before

- Observe significant tail of pedestal fluctuations in trace data affecting ~20% of PMTs

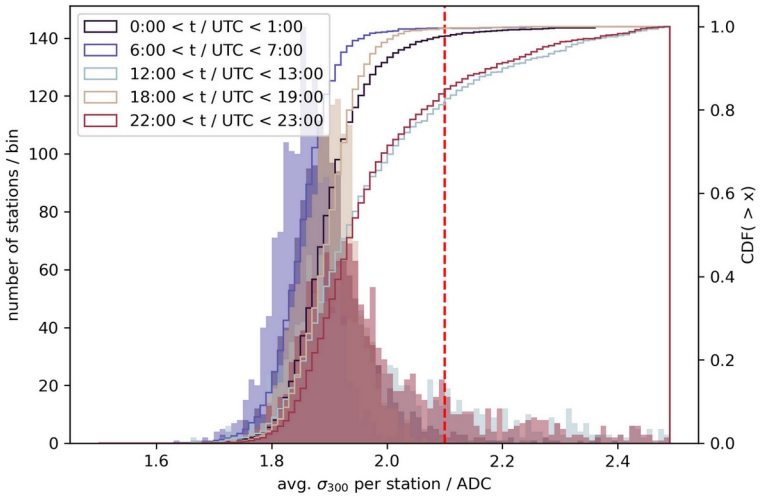


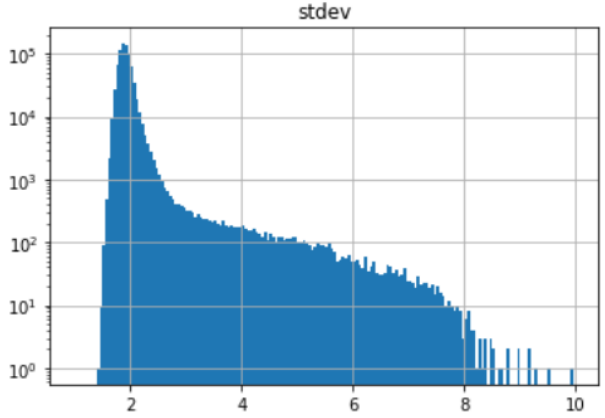


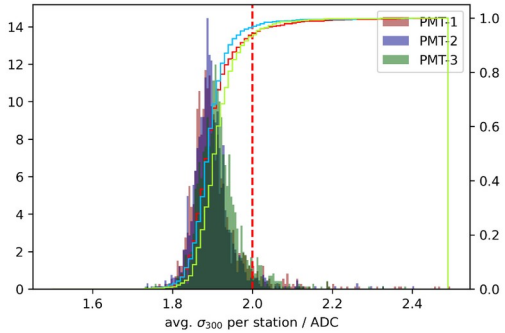


Shown before

- what does this plot compress?







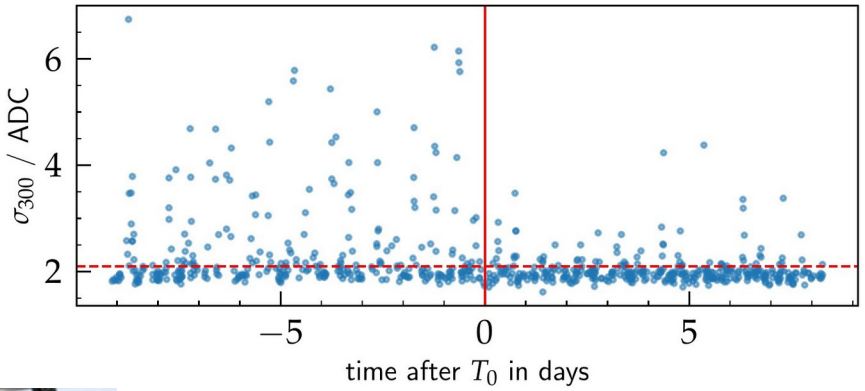
LPMTs Noise: field trip

- field campaign (Corine, Antonella, Juan Pablo, Patrick, Tiina) during Malargüe meeting: visit selected stations (1499, 1415, 1515, 1494) with PMT-1 noise to check cabling

- several problems with cabling identified

→ comparison of noise levels before / after shows clear reduction

Fixing cables is 'easy' and effective



Tiina

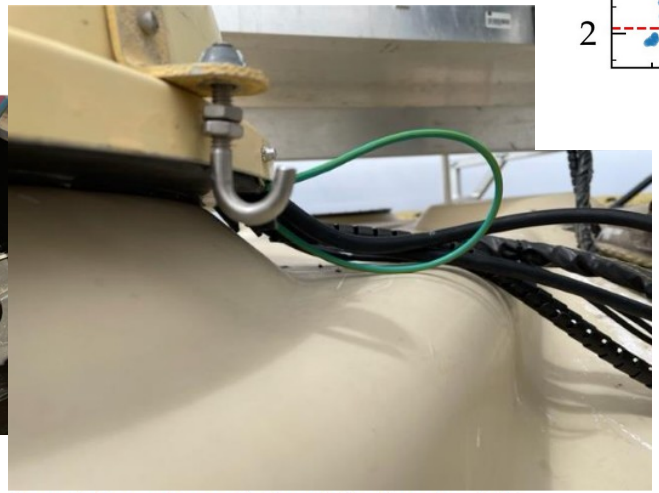
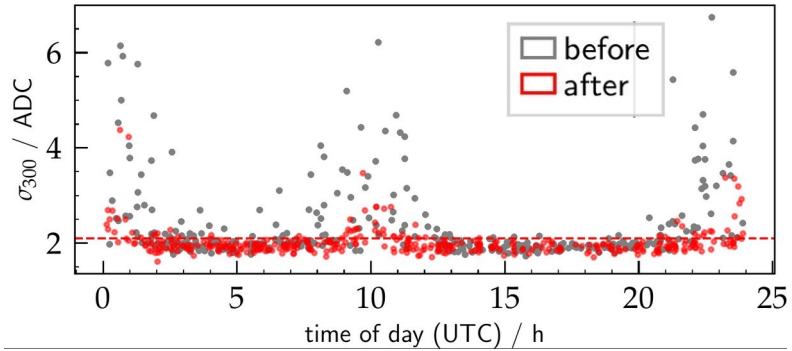


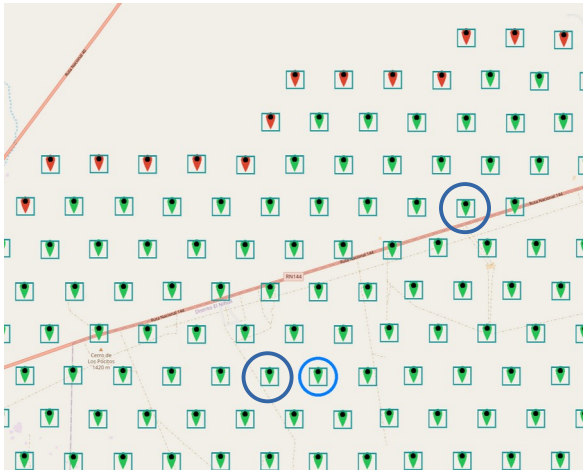
Figure 3: Grounding cable loop in The Nameless PhD



Field Trip – 17.04.2024

- see minutes (mail from Tiina 18.04.2024)

- visit: Aquiles (1090), Saturno (1093), J.W. Cronin (1097)



Aquiles (1090)
- black tank

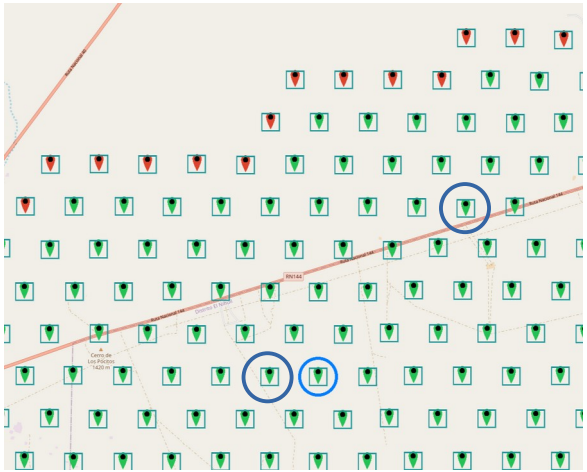
Saturno (1093)
- SSD-cable
- sPMT-cable
- grounding rod

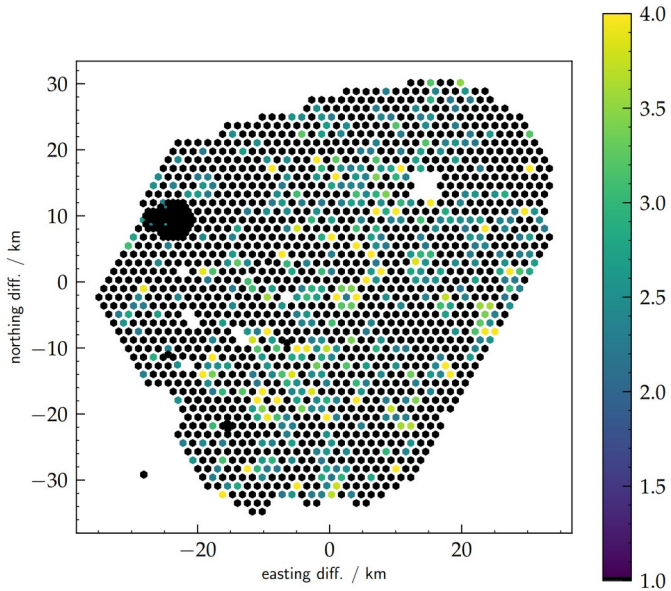
J.W. Cronin (1097)
- SSD-cable
- sPMT-cable

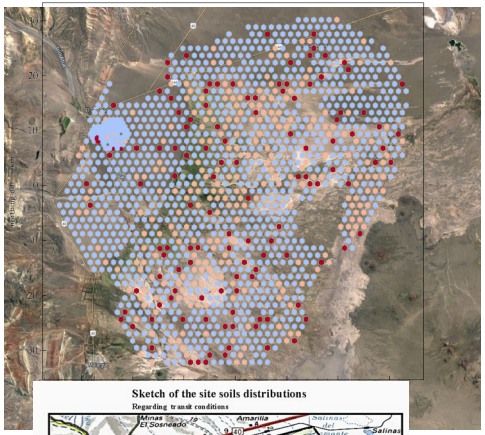
Why these tanks?

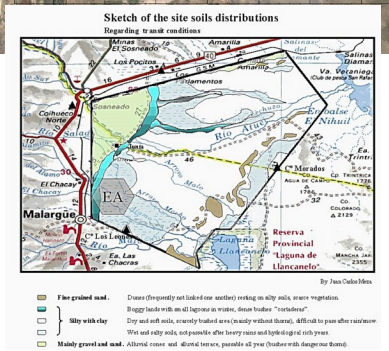
- visit: Aquiles (1090), Saturno (1093), J.W. Cronin (1097)

- select based on noise in traces of LPMT-1 in April data (plus old data from Oct ‘23)









M. Schimassek - noise overview

Saturno: Intervention

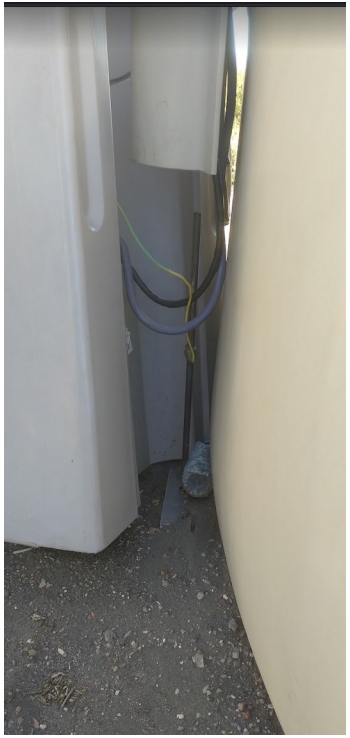
Figure 3: Grounding rod behind the battery box of Saturno.

Figure 4 : *Grounding rod in Saturno.*

Photos from Tiina

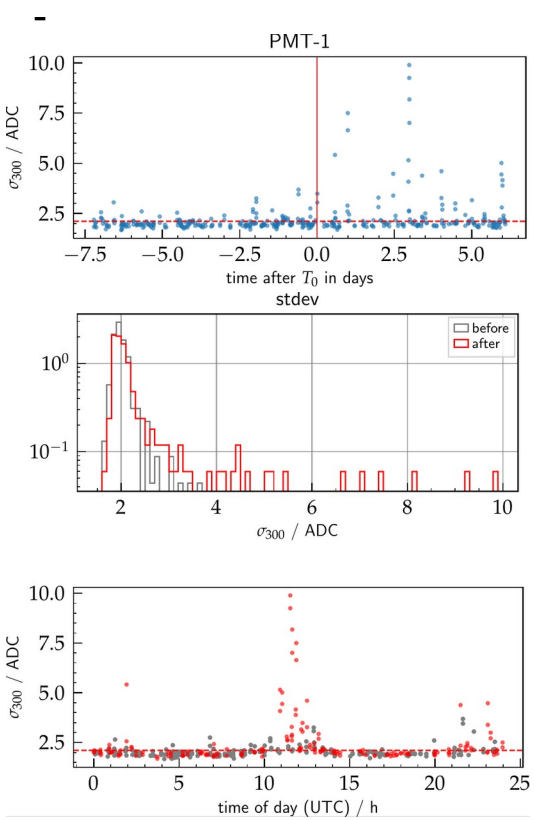
New rod @ Saturno

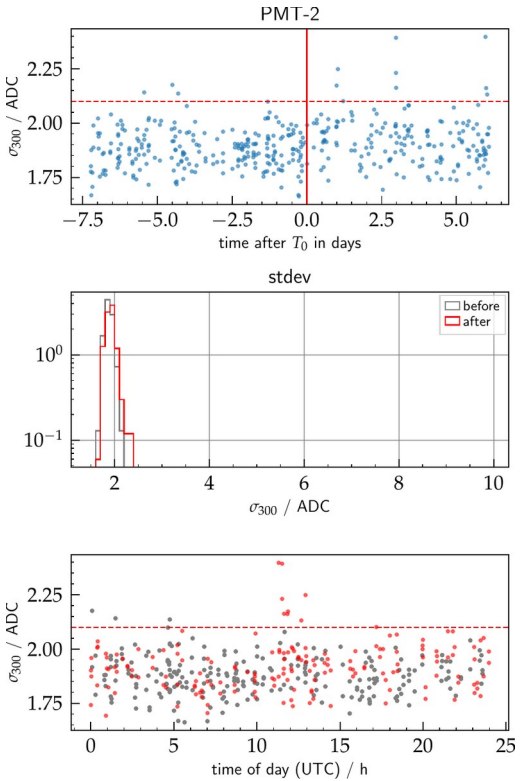
Old rod @ J.W. Cronin

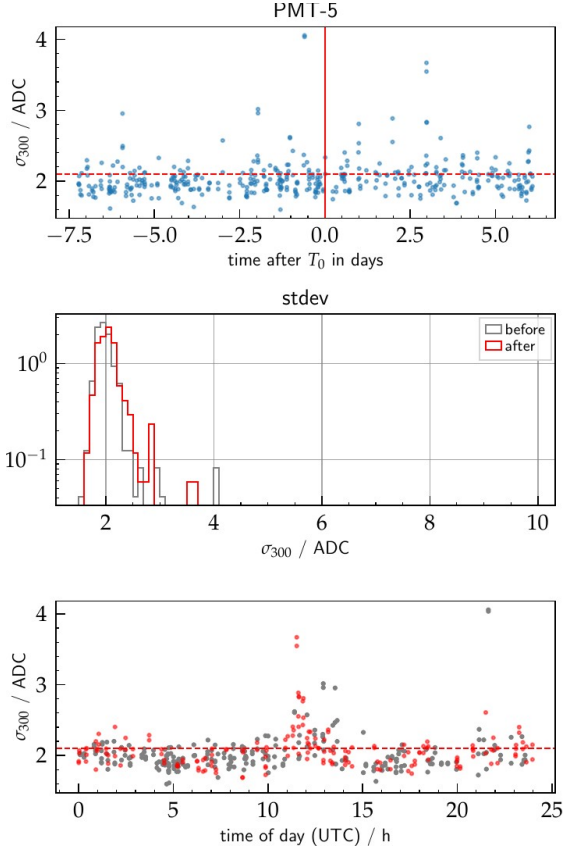


Change?

-

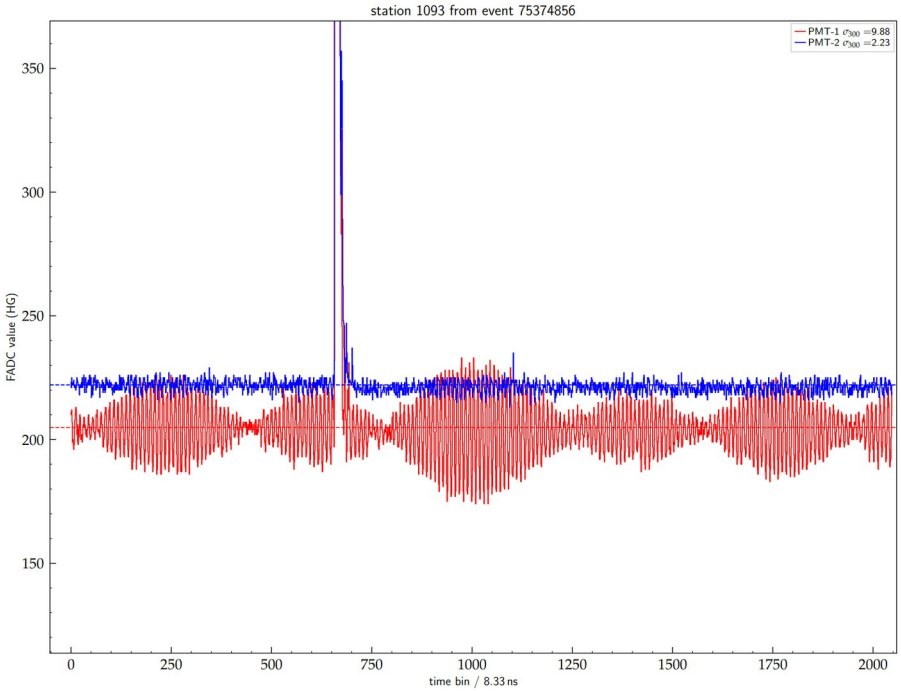

PMT-1
σ_{300} / ADC
time after T_0 in days
stdev
before
after
σ_{300} / ADC
σ_{300} / ADC
time of day (UTC) / h


PMT-2
σ_{300} / ADC
time after T_0 in days
stdev
before
after
σ_{300} / ADC
σ_{300} / ADC
time of day (UTC) / h


PMT-5
σ_{300} / ADC
time after T_0 in days
stdev
before
after
σ_{300} / ADC
σ_{300} / ADC
time of day (UTC) / h

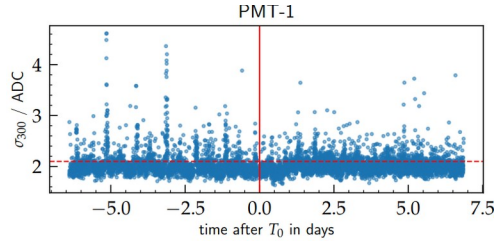
Afterwards

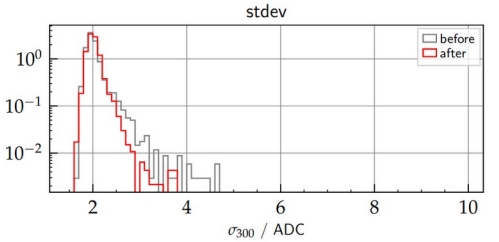
-

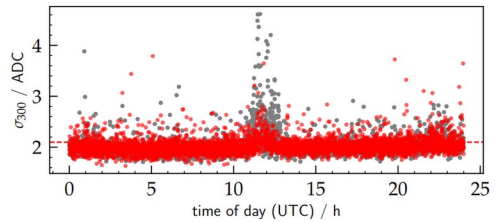

station 1093 from event 75374856
PMT-1 σ300 =9.88
PMT-2 σ300 =2.23
FADC value (HG)
350
300
250
200
150
0
250
500
750
1000
1250
1500
1750
2000
time bin / 8.33 ns

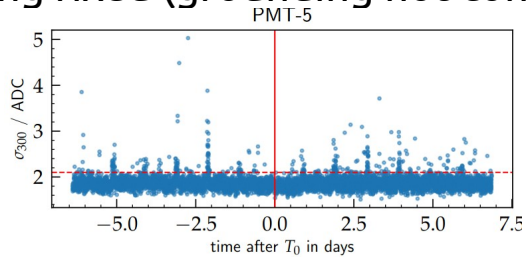
Example: Constanza

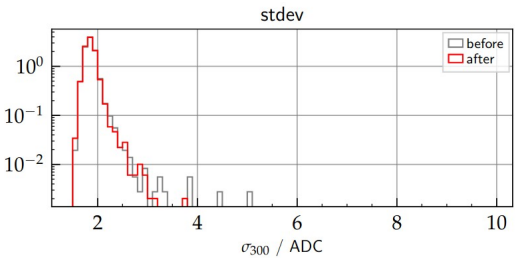
- intervention at Constanza (734) [report → Ioana]: cabling fixed (grounding not connected)

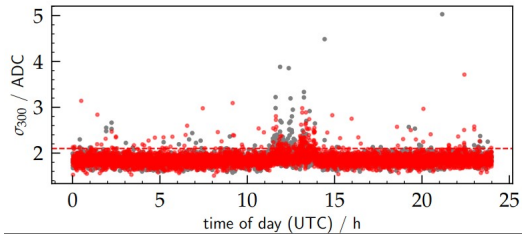






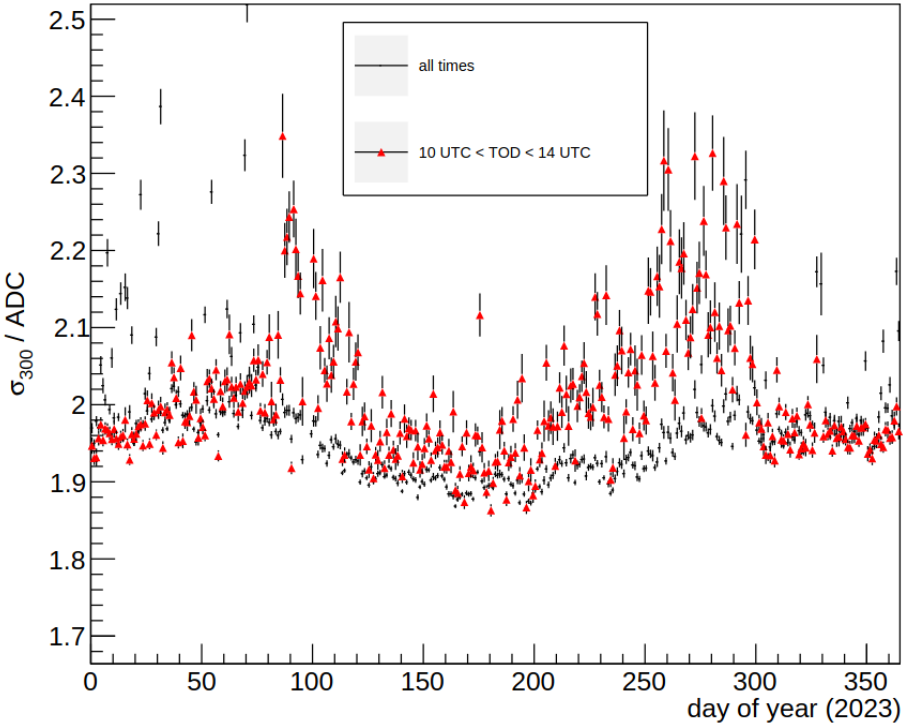


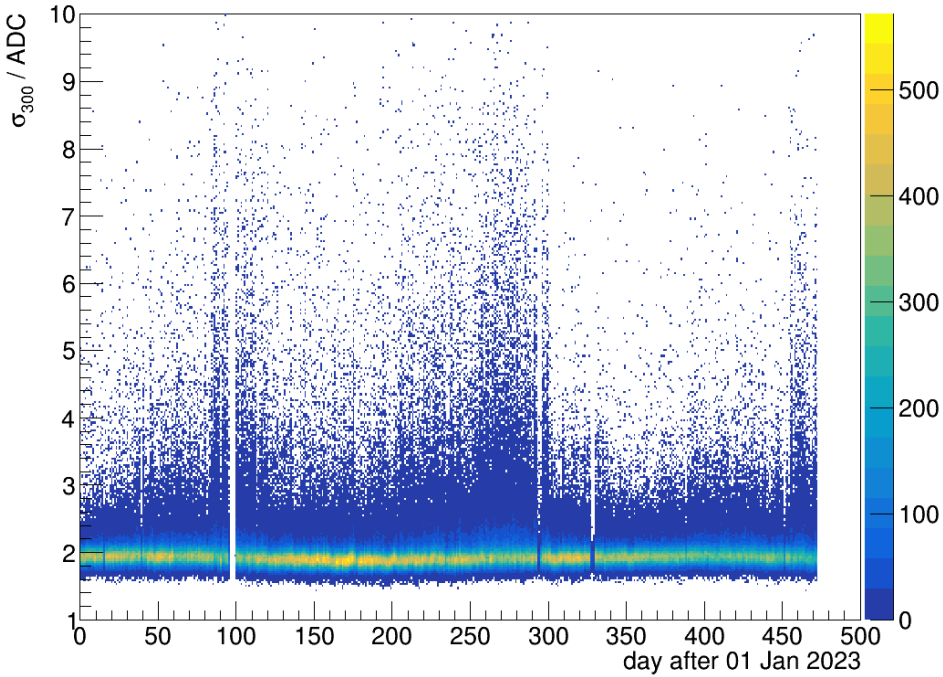




Time dependence?

- how does the noise behave on long time scales?
- do we see the seasonality we had in ToTd?





Open Questions

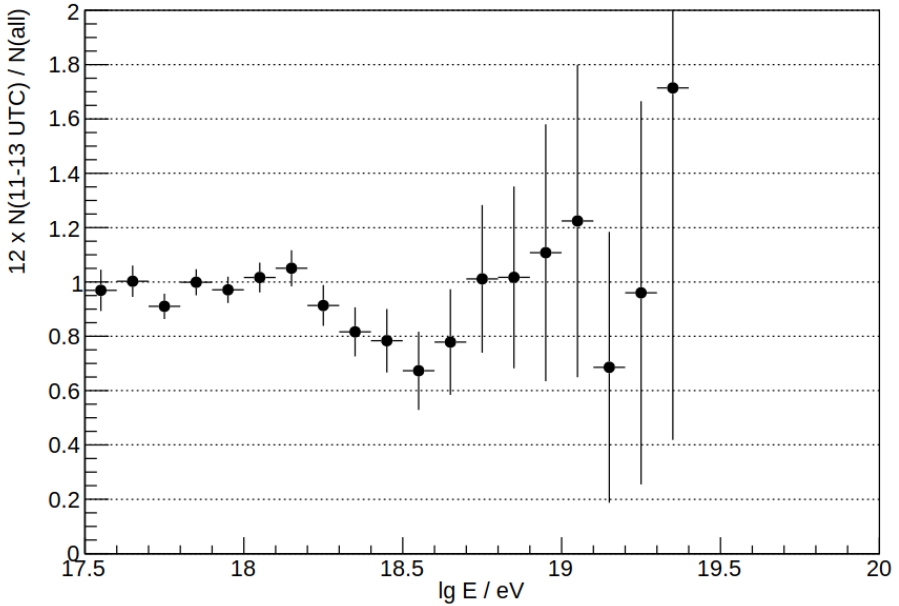
- where does the noise really come from?

- can we do something about the noise?

- how does it look like for the SSD?

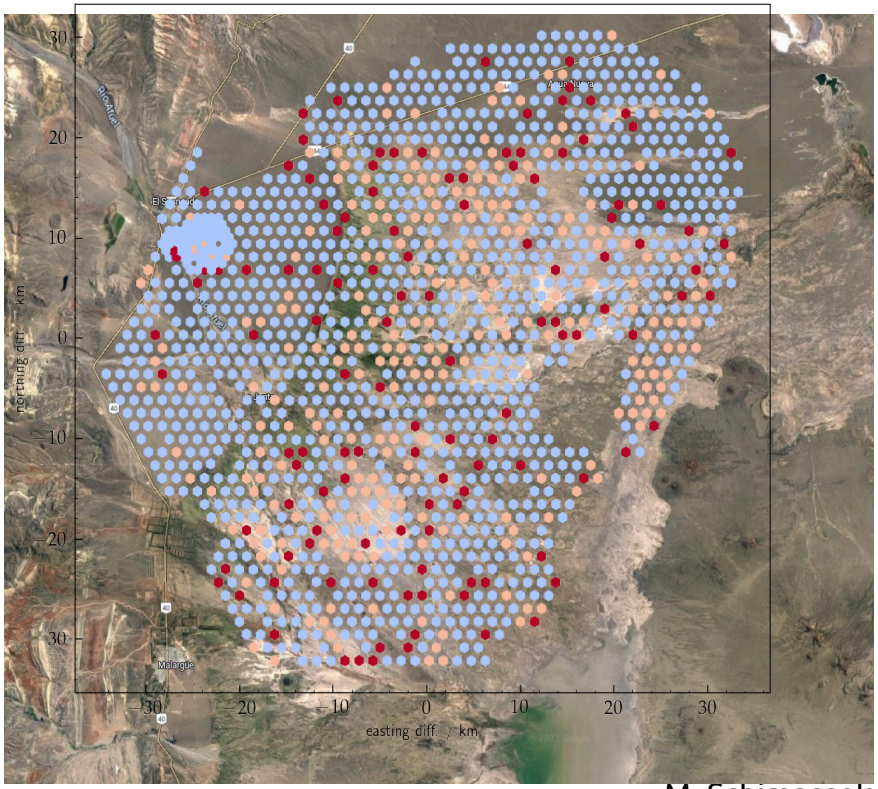
- you can (hopefully) reproduce this in the tutorial 3 of the hands-on

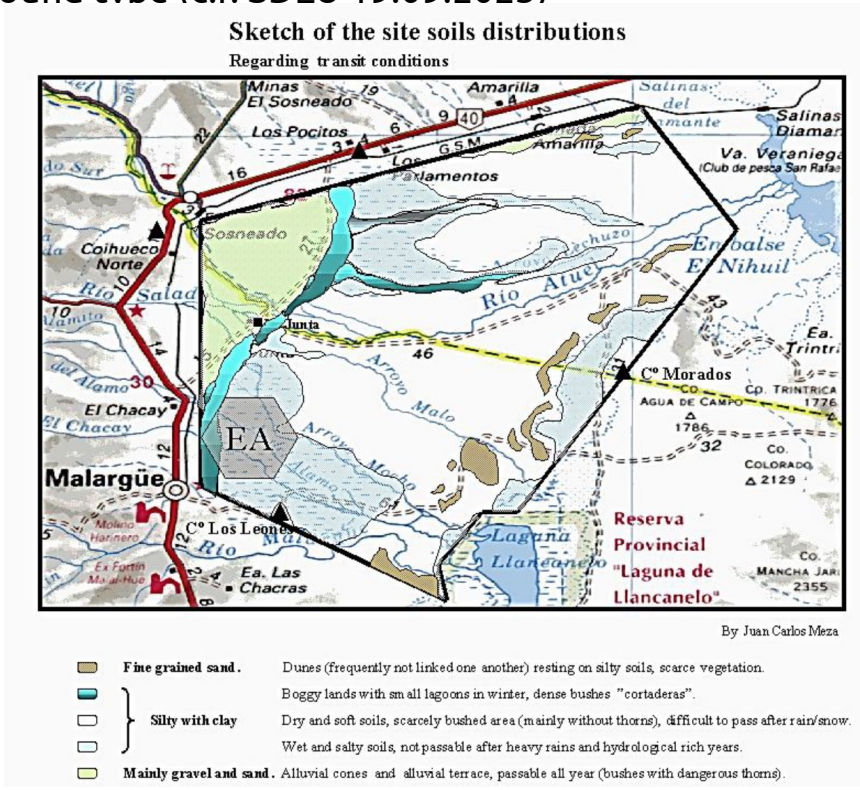
- **what are the real consequences in data?**



Hint: Grounding

- we see a ‘visual’ correlation of noise problems with ground type (c.f. SDEU 19.09.2023)

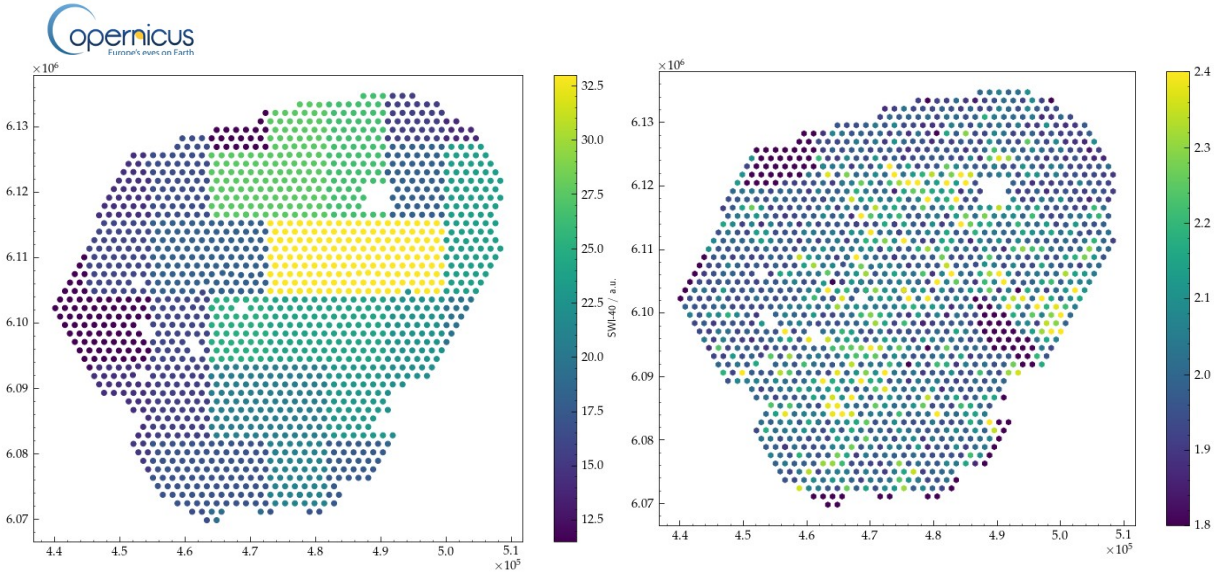




Hint: Grounding

- we see also a correlation with soil-water index (SWI) [provided by F. Frau (Instituto National del Agua)]

- in timeline the correlation is only present in parts of the year, so maybe just an accidental correlation but hinting towards grounding issues?



First look at SSD

- use May 2024 data (from the tutorial)