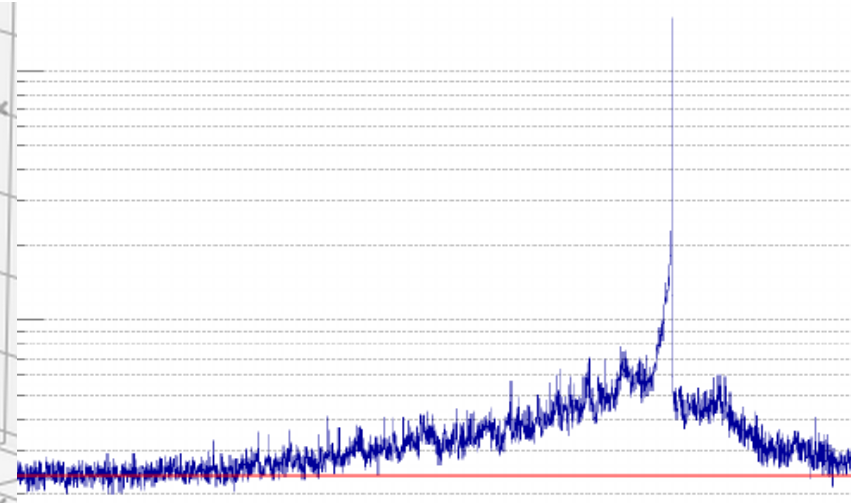
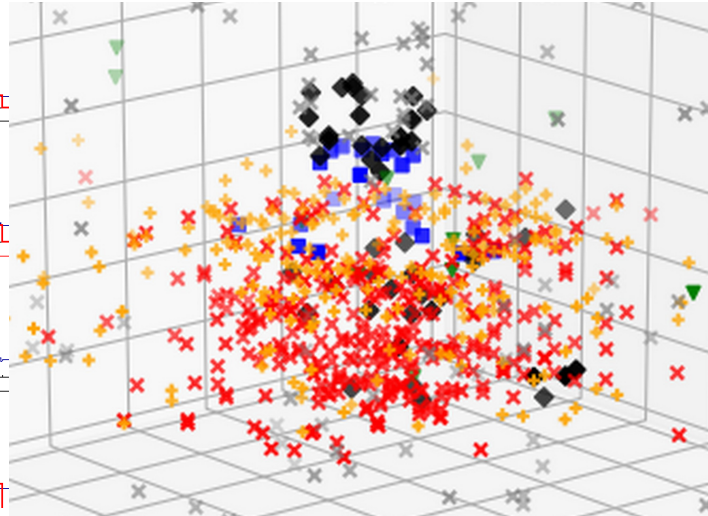
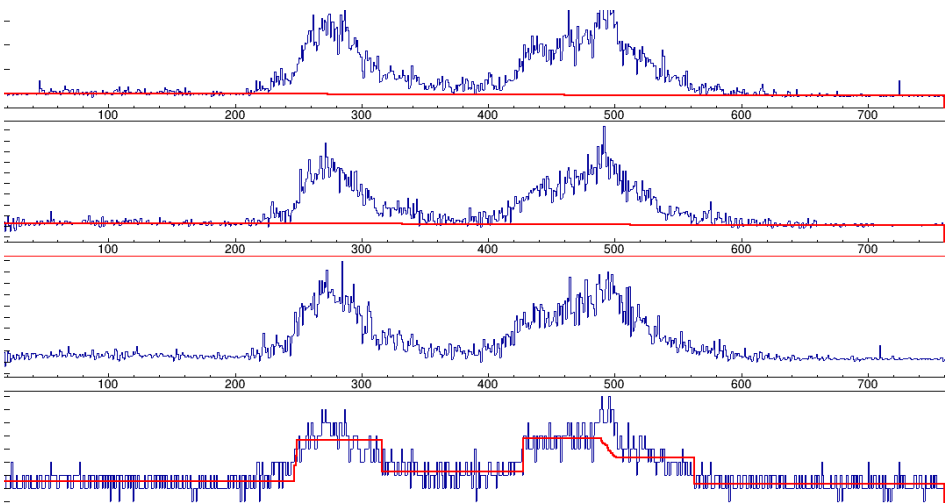


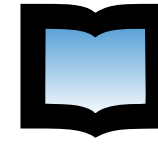
SD Trigger Studies

Statistics, Features, Insights

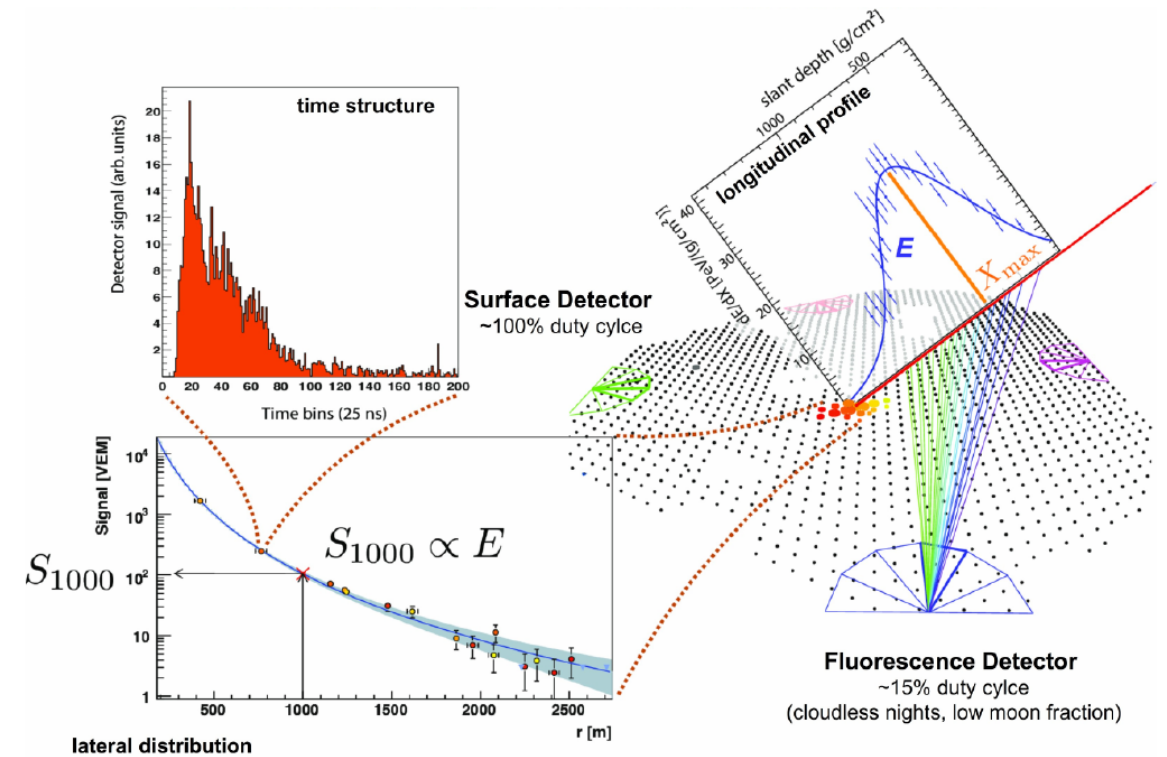
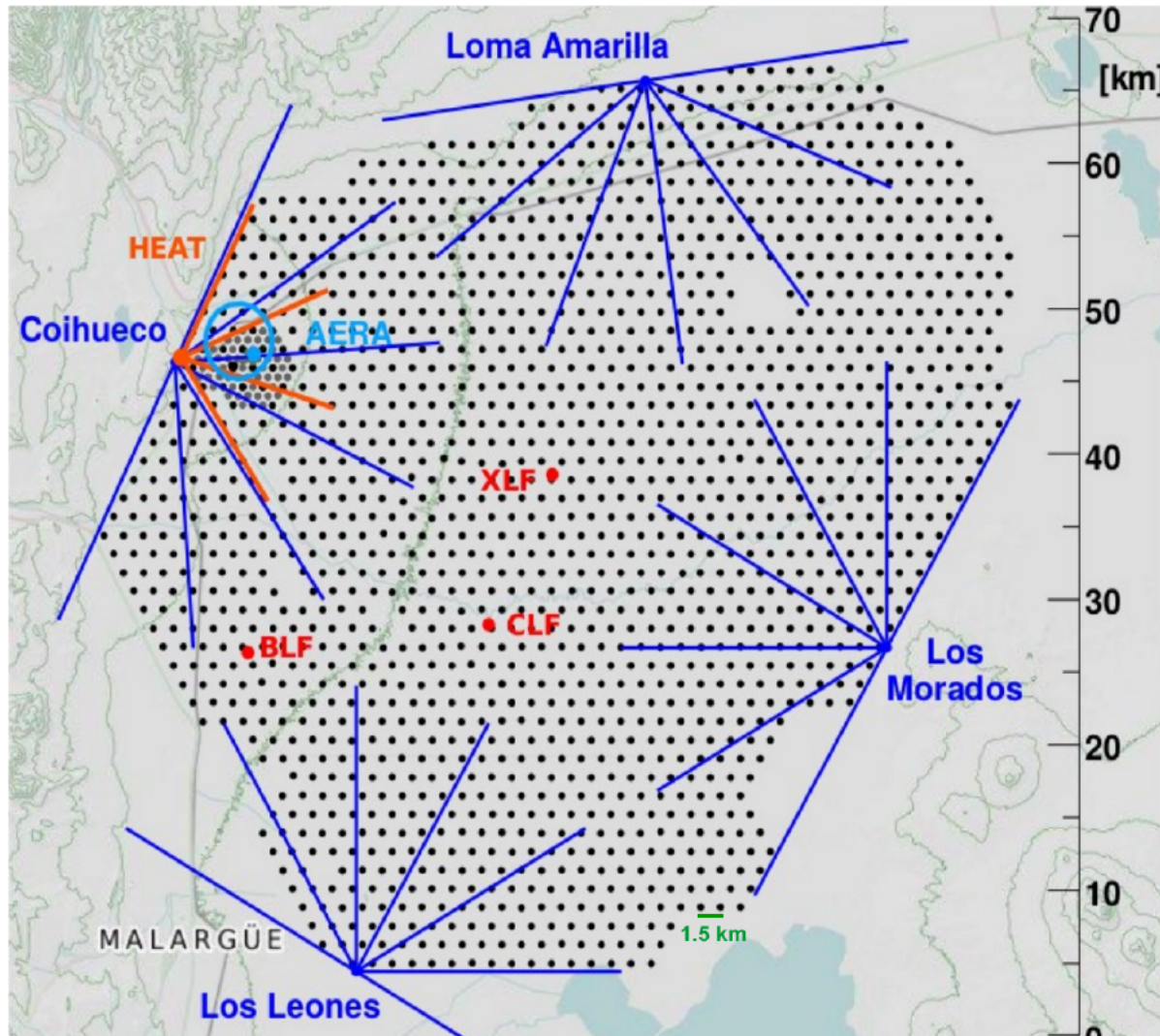
Martin Schimassek, Darko Veberič, Ralph Engel, Xavier Bertou



Introduction – Auger SD



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‘Normally’: reconstruction / high-level data
Here: What are the (SD) triggers good for?

Introduction – Auger SD

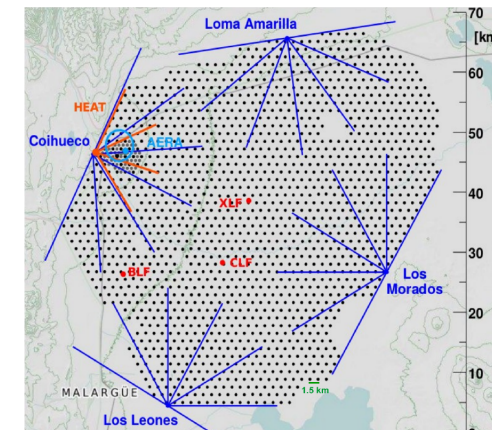
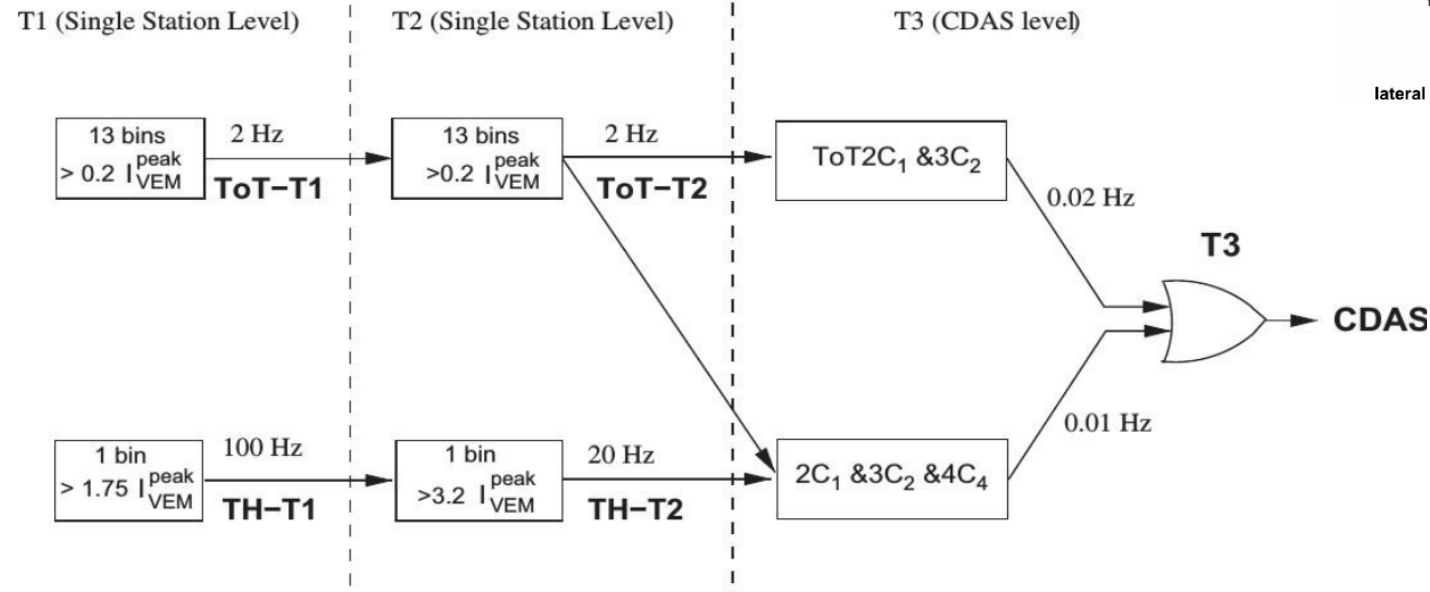
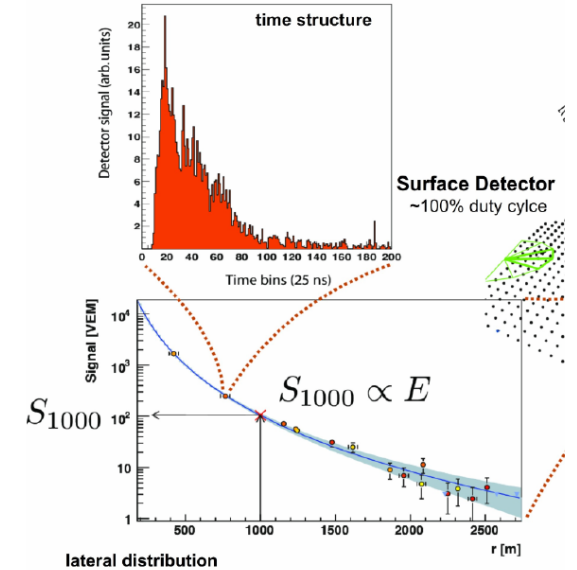


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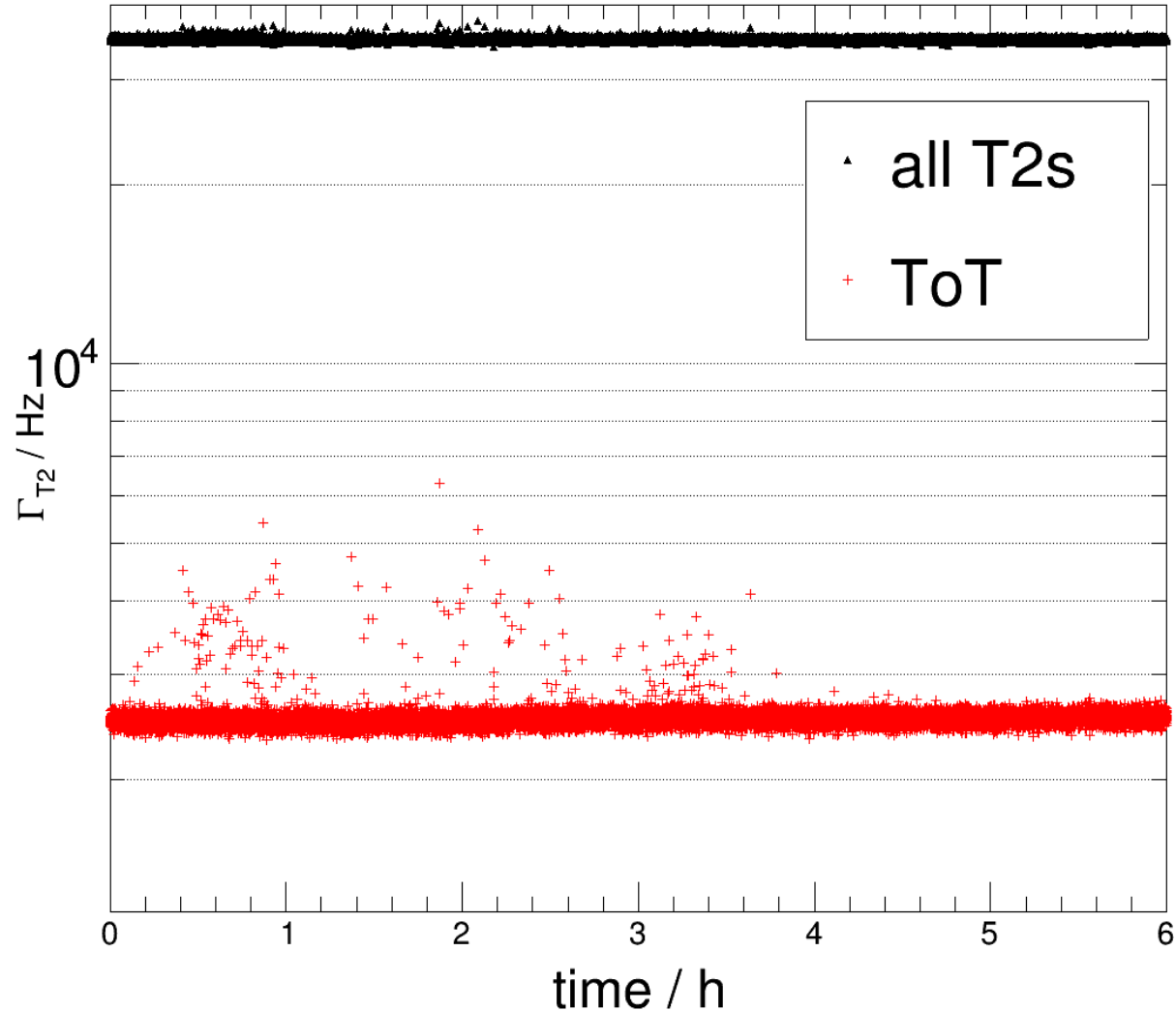


Now also:

- single trigger information stored
- check of the pre-T3-level data possible



Introduction – Data Set



T2Dumps:

- store μs , station id and type of all SD-T2s at CDAS

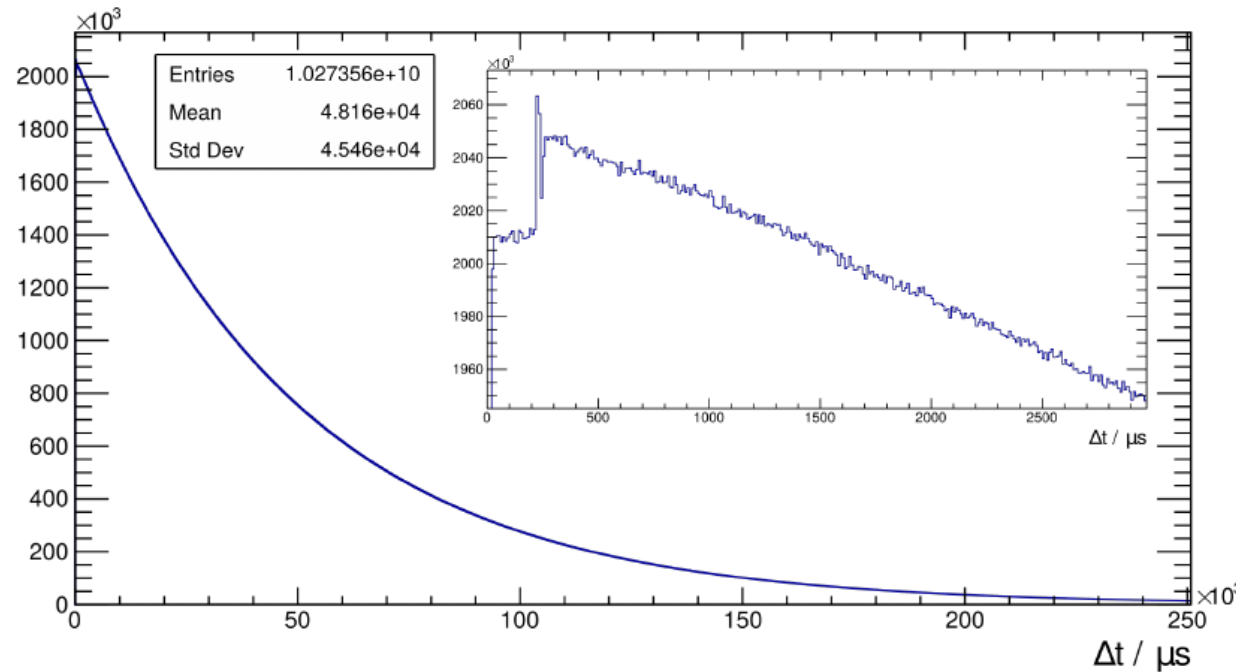
→ about 34 000 triggers per second (whole array)

(→ ~500MB / h as zipped binary)

Data Quality

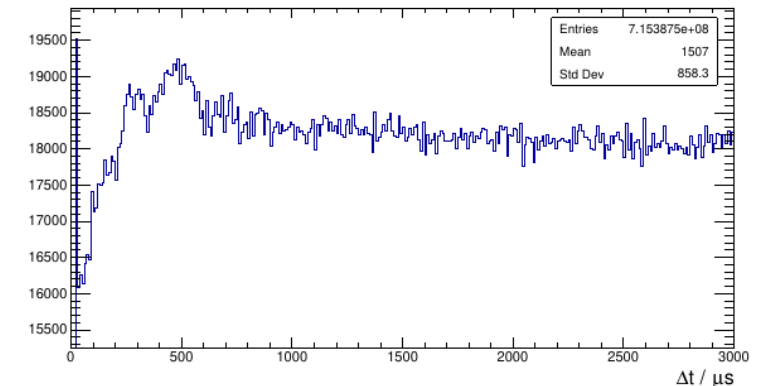
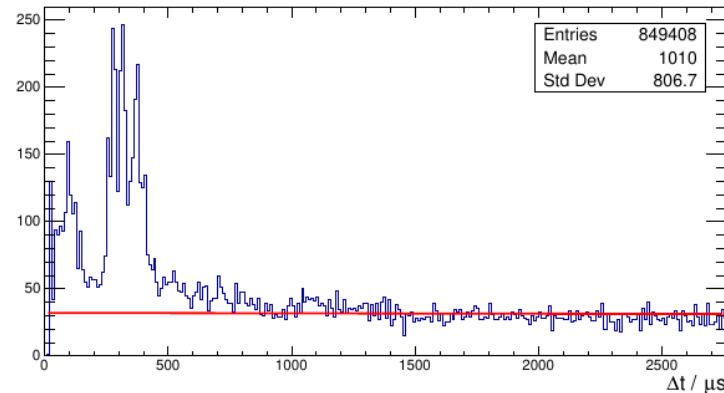
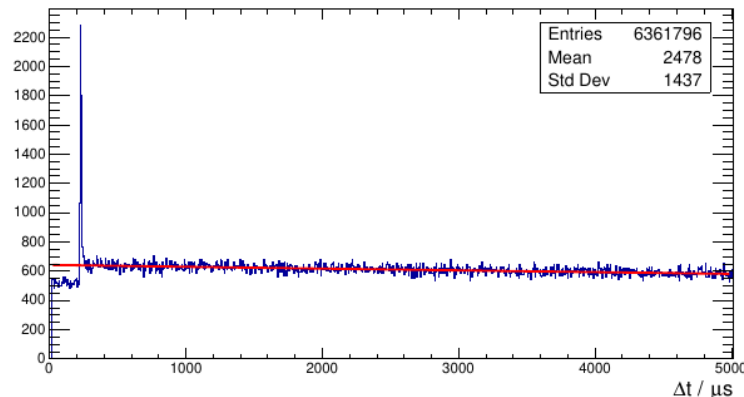


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Do the triggers behave as expected?

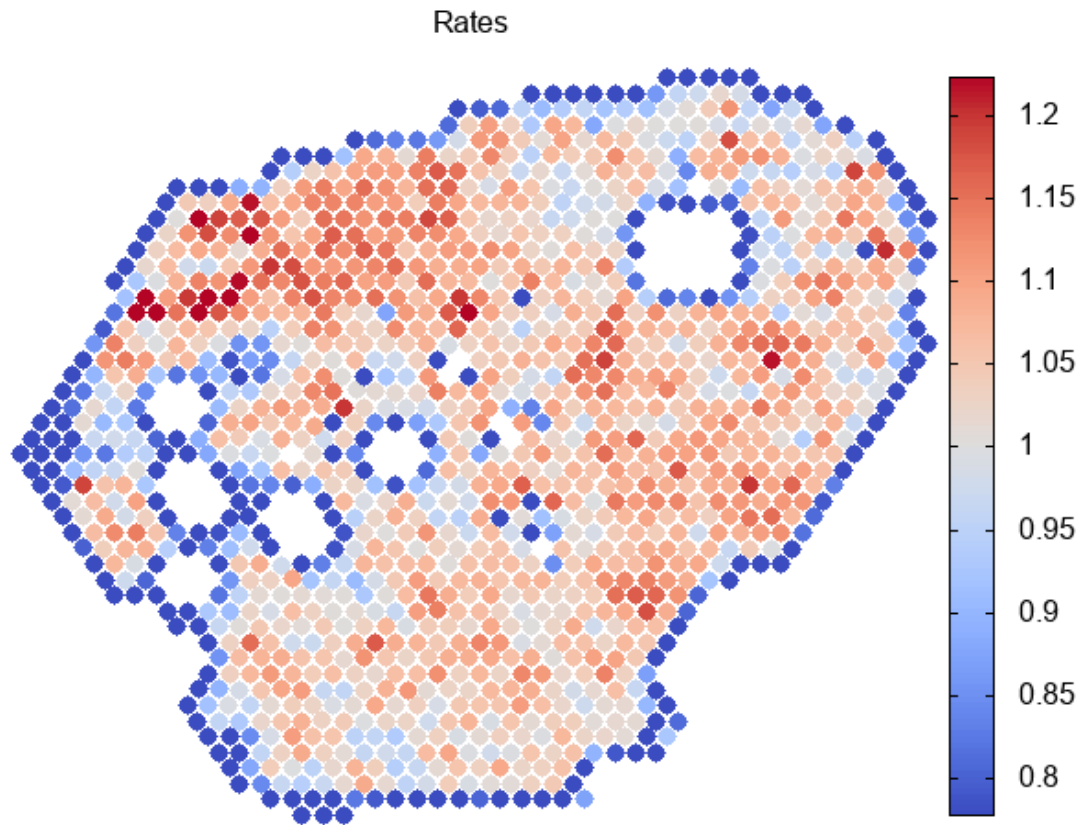
- about 20 Hz of threshold triggers
- about 1-2 Hz of ToTs (incl. ToTd/MoPS)
- Poissonian, exponential time between triggers: mostly yes (GAP-2020-042)



Data Quality – Effects on DAQ?



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X. Bertou

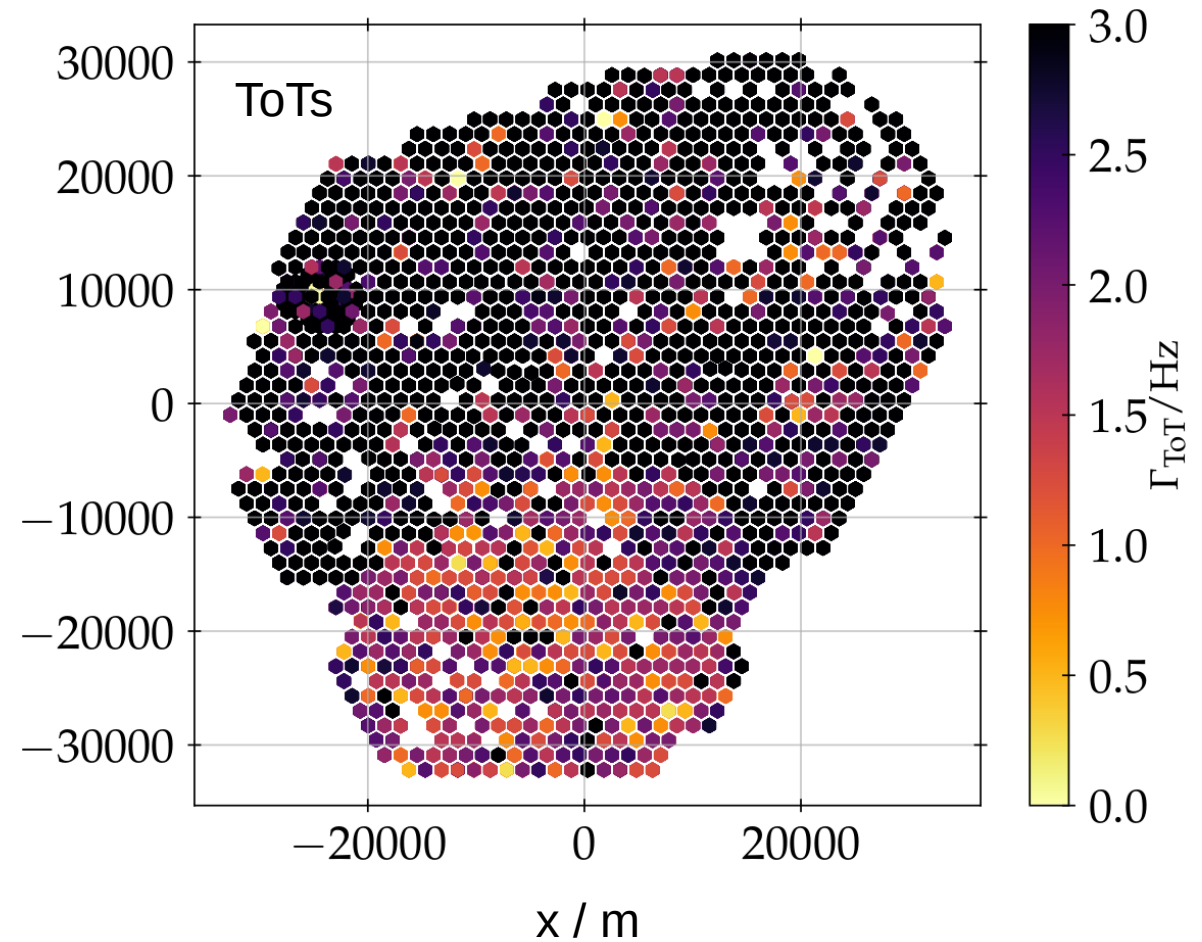
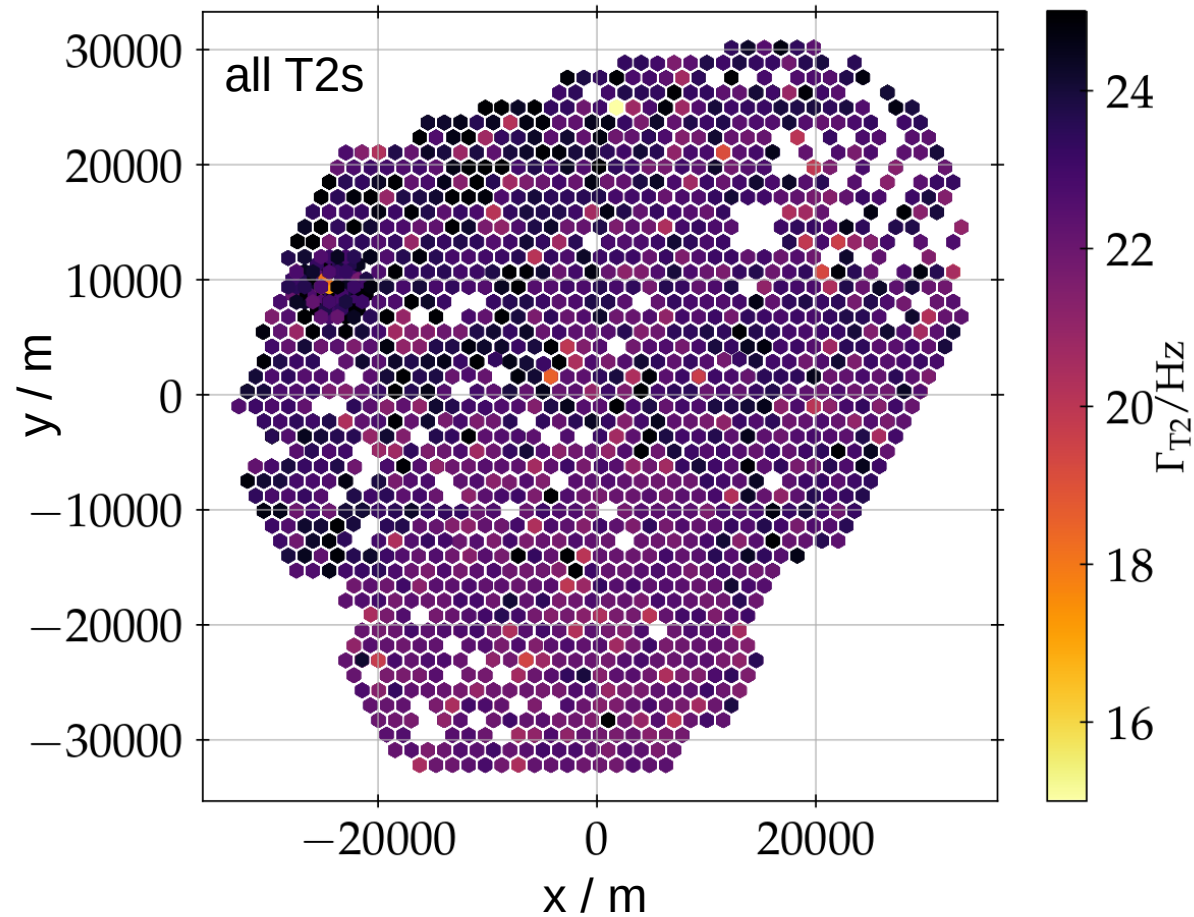
How uniform is the event rate?

- do stations differ?
- altitude effects?
- efficiency issues?
- station aging?

Data Quality – Effects on DAQ?

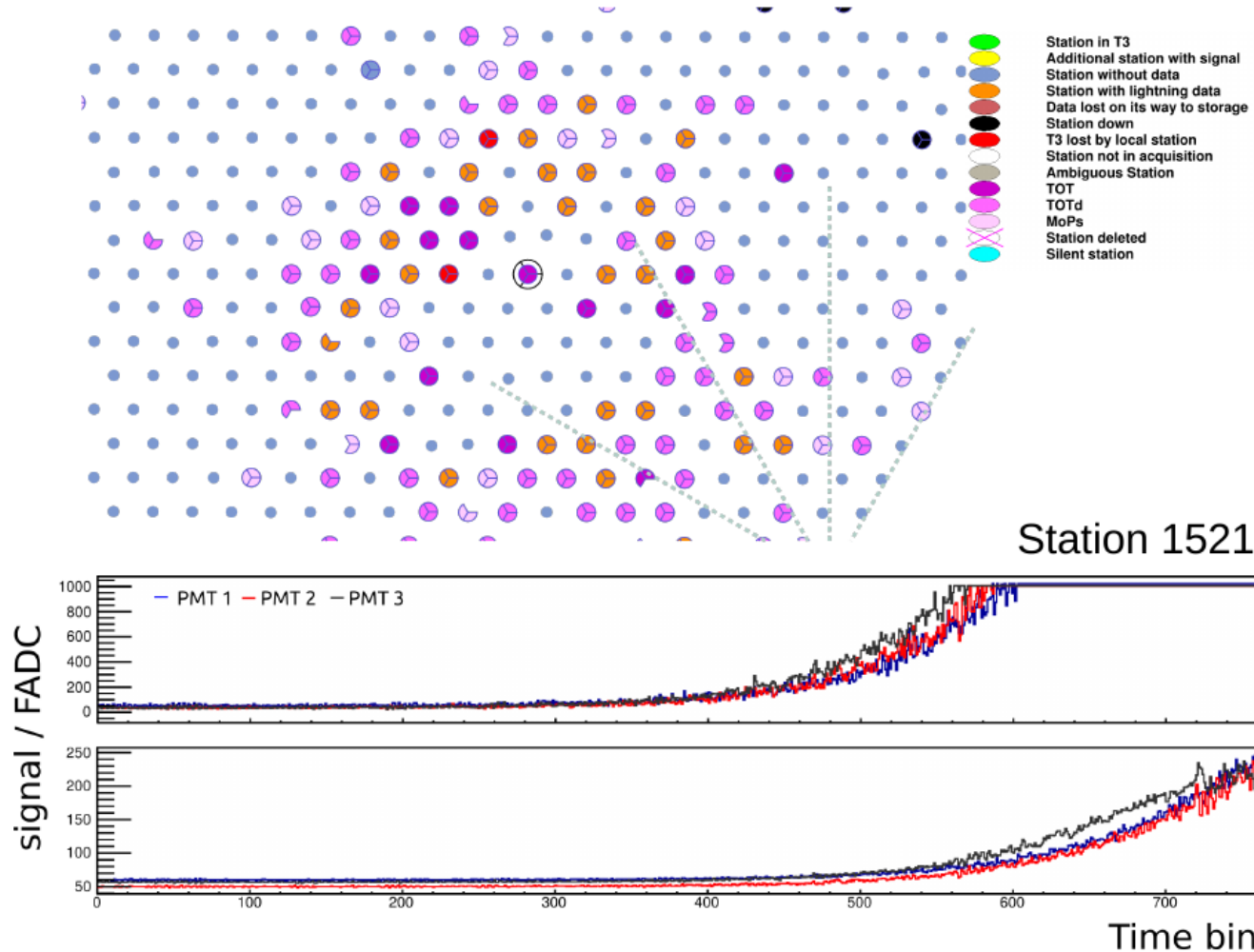


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Probably effects of aging stations (ToT rate dropping)

DAQ in extreme conditions

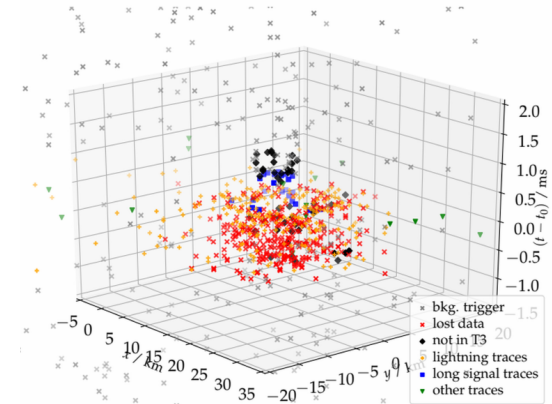
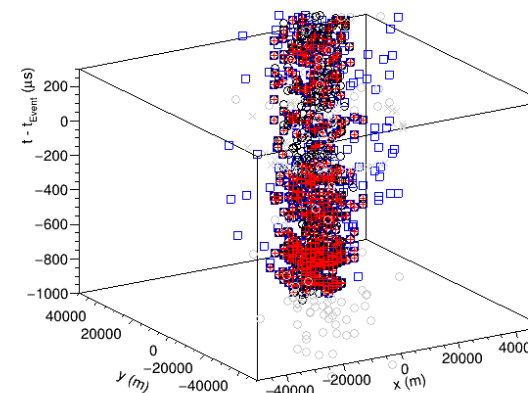


What happens in 'SD-Rings'?

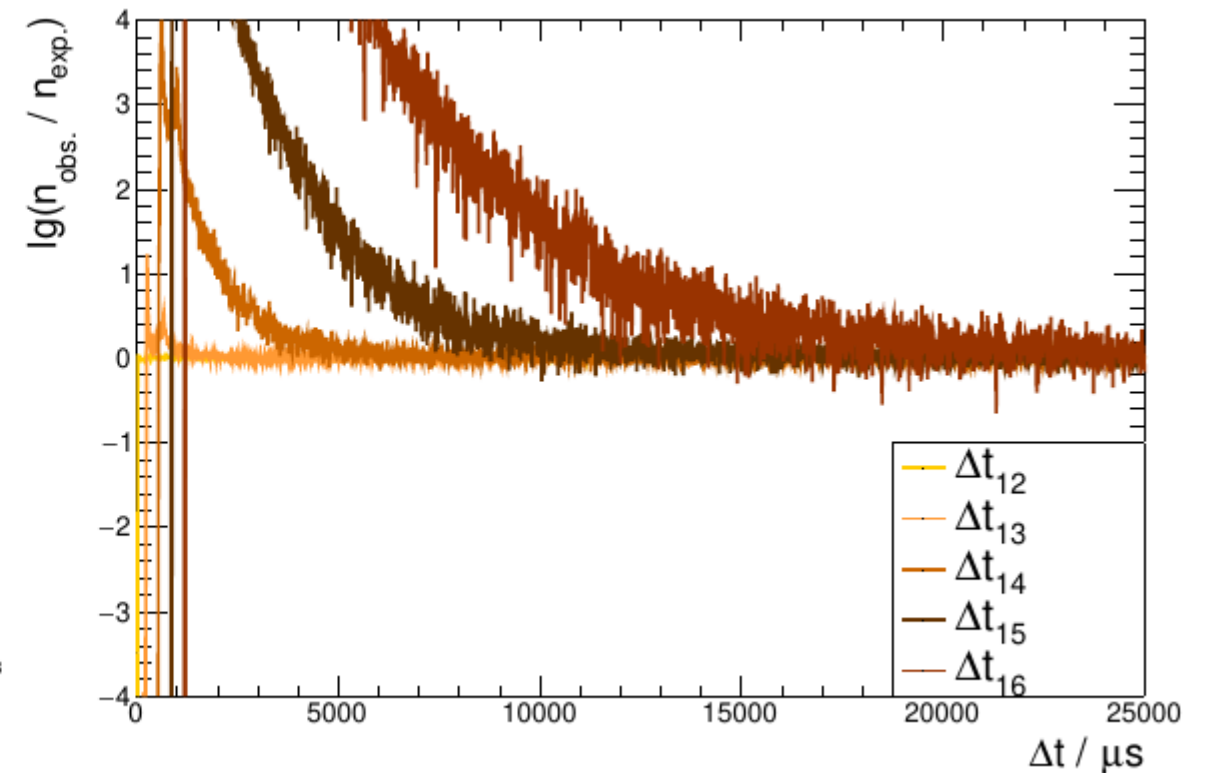
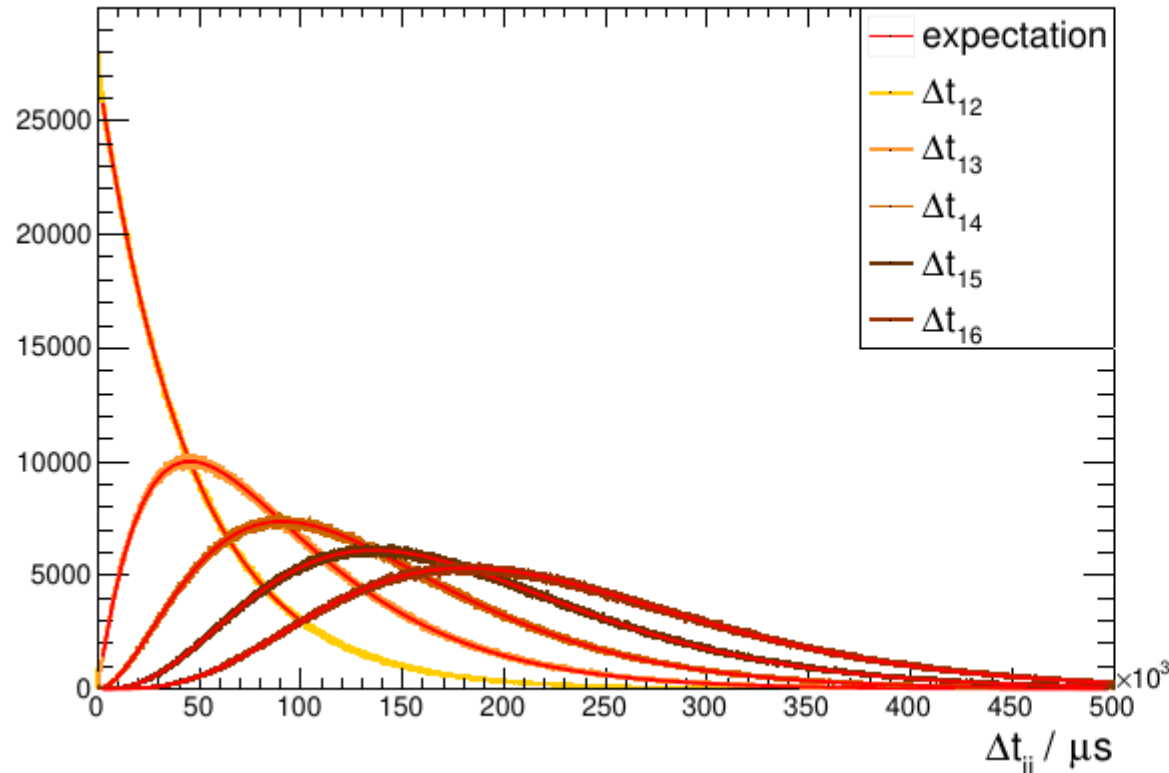
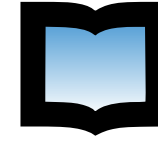
- very large signals

- lightning noise and many T2s

→ many T3s ($> 10 / s$)



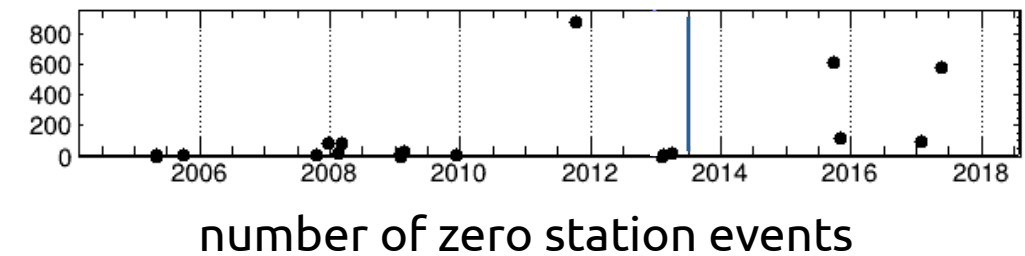
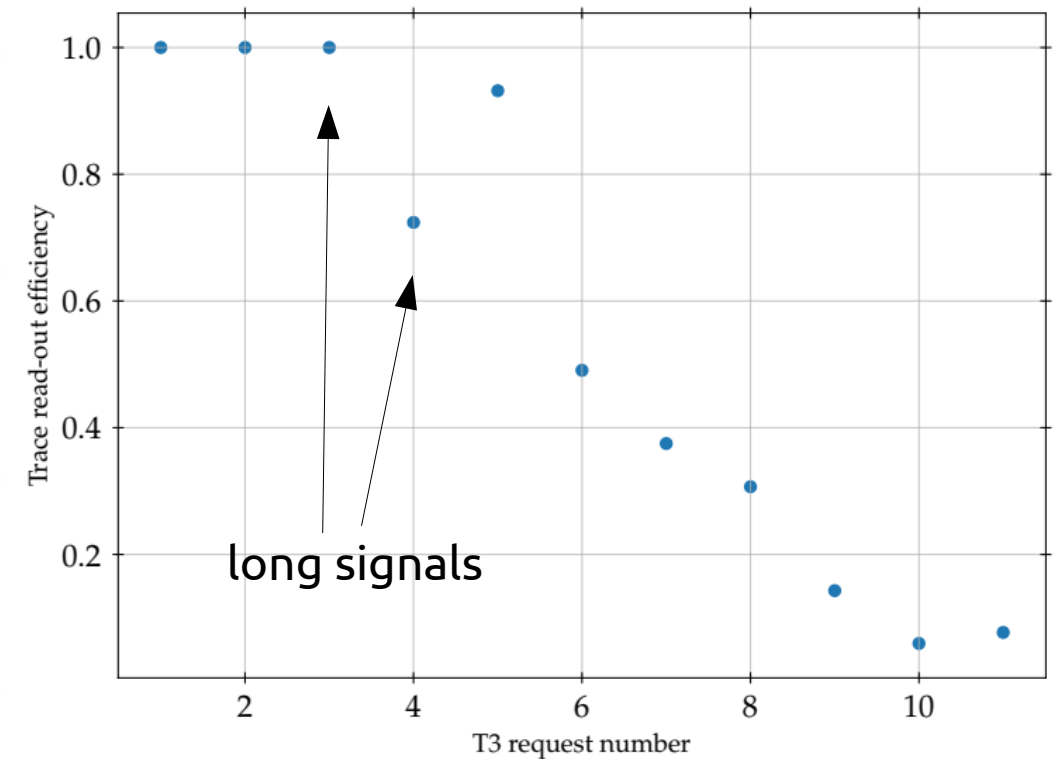
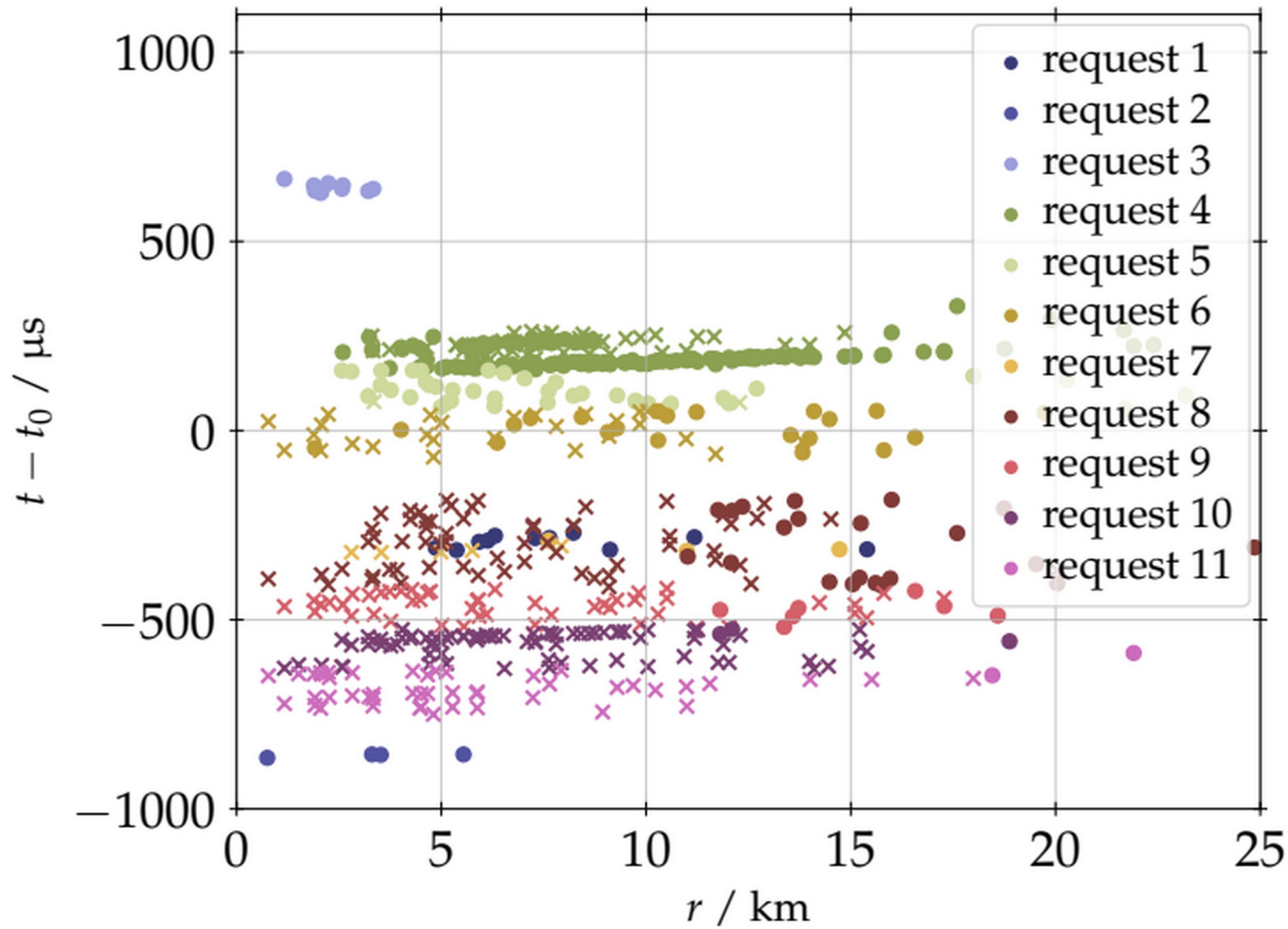
Effect 1: Dead-time



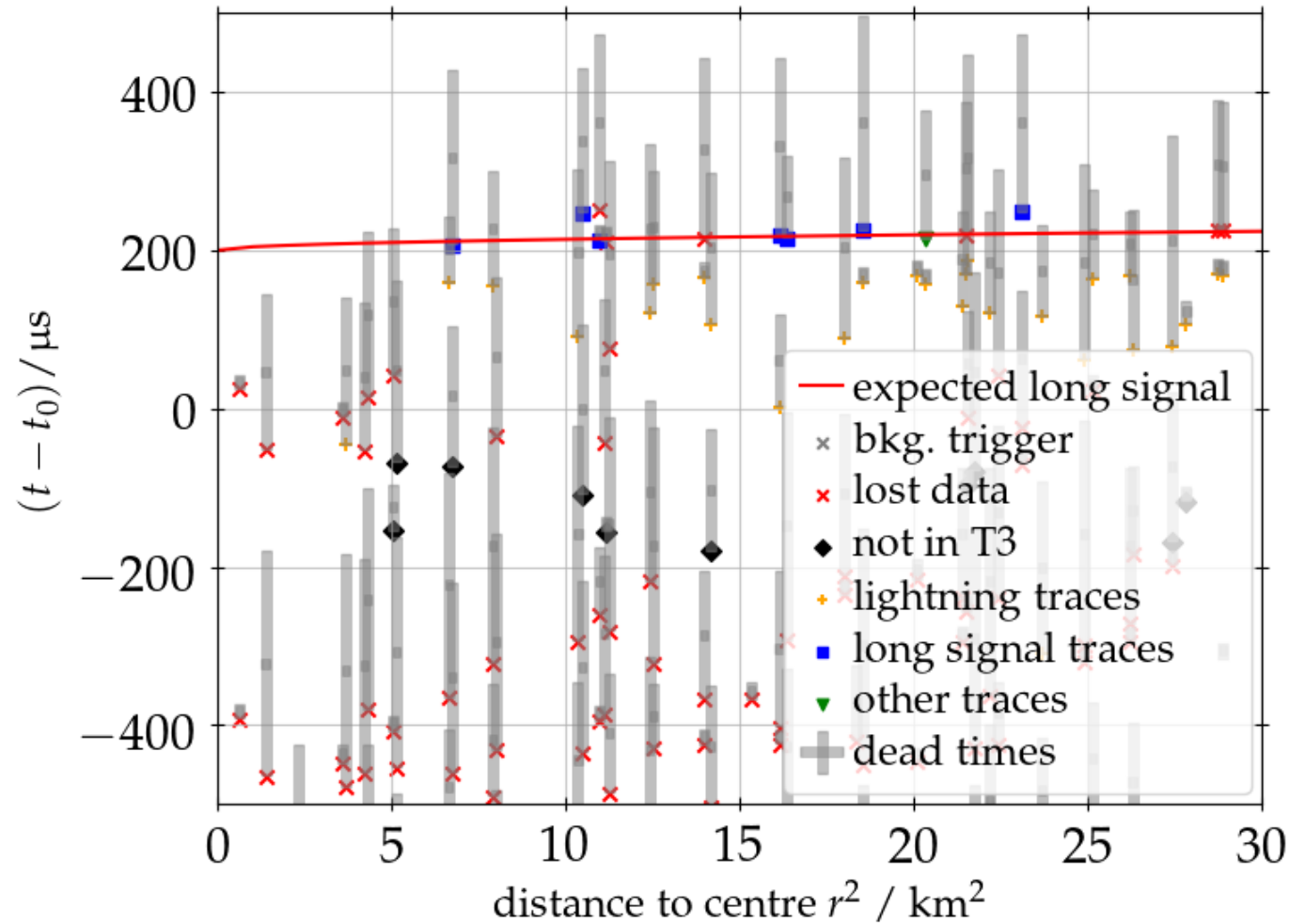
A station has two ring-buffers for triggers:

- for more than 2 triggers in succession there is a dead-time
- but not decisive for the SD-rings (or normal data)

Effect 2: Request order



Conclusion: Inconclusive



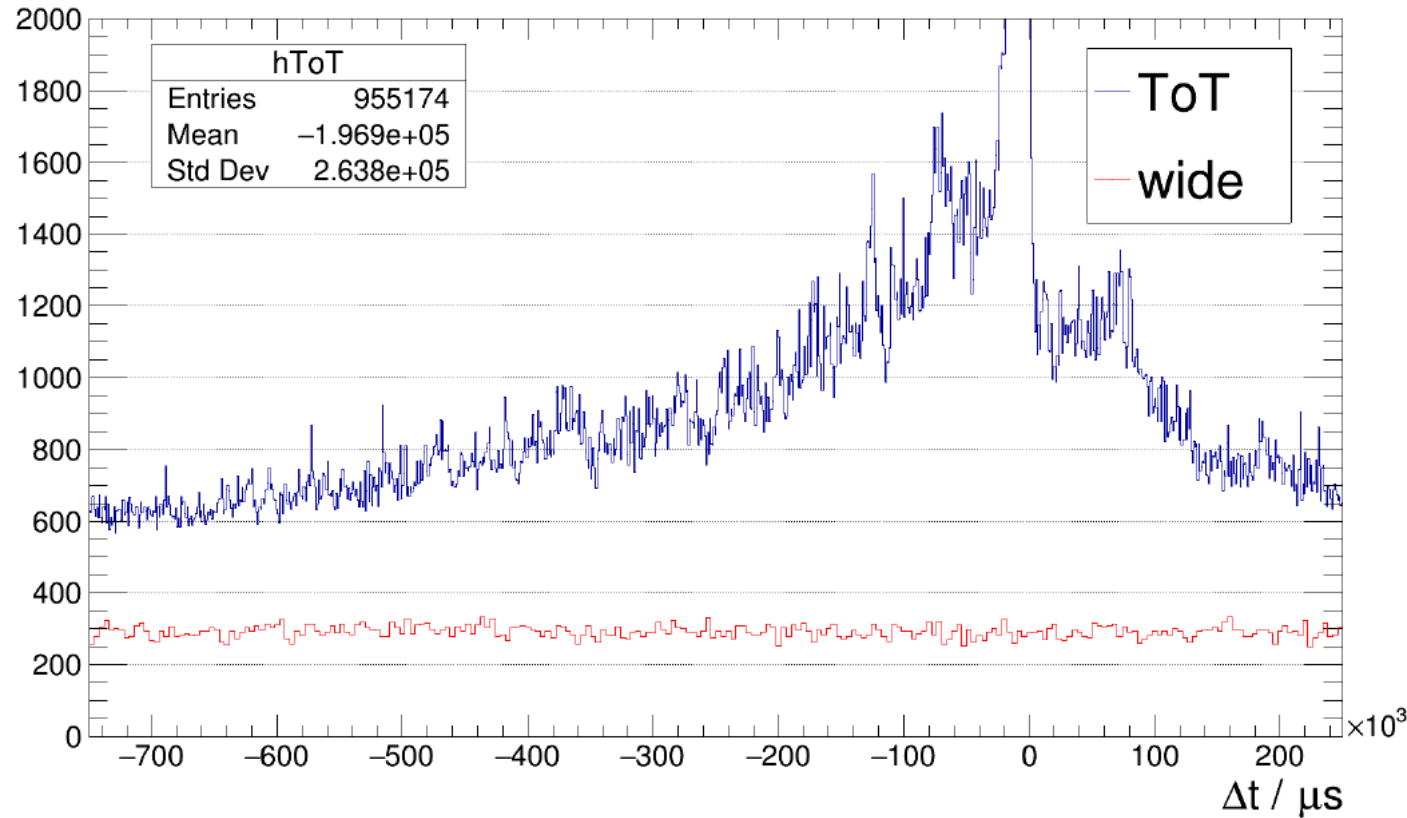
Hole in the centre still unexplained

→ re-order and signal tagging proposed and in development

→ physical origin of signals not clear

→ TGFs?

More: CR \leftrightarrow Lightning?



Is there a correlation of CRs and lightning strikes?

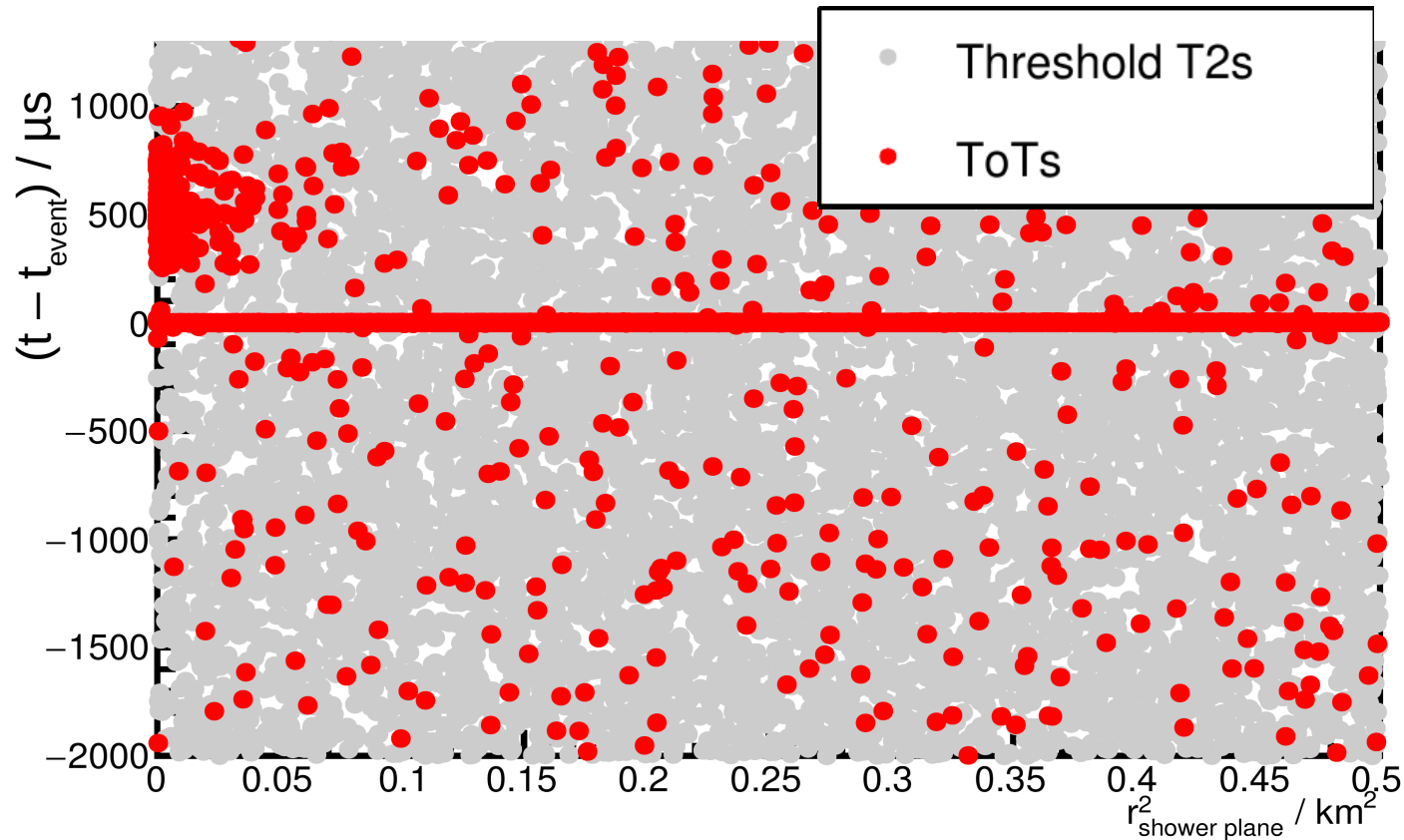
- lower energy (10^{13} eV?)

→ single stations

→ correlation ?

- but avoid RF-noise triggers

More: CR \leftrightarrow late neutrons?



Do we see late arriving particles?

- neutrons (created in soil) or moving very slow might arrive later than the bulk of particles

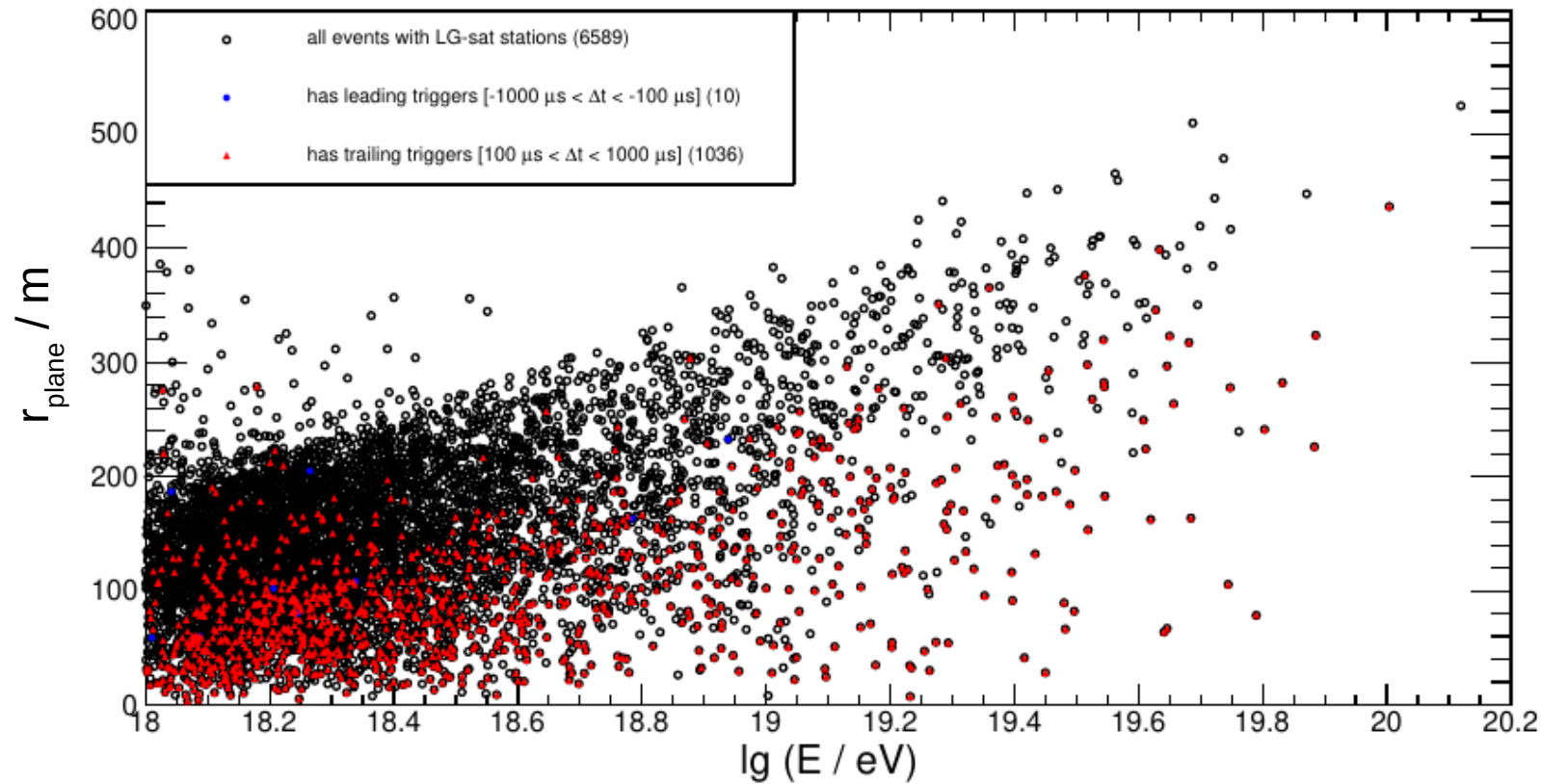
→ single station trigger?

→ correlation of triggers with events

More: CR \leftrightarrow late neutrons?

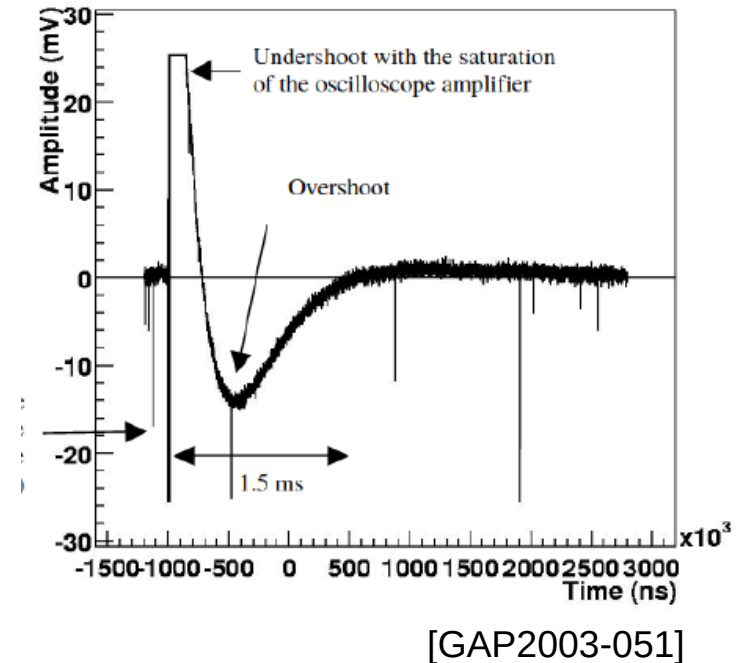
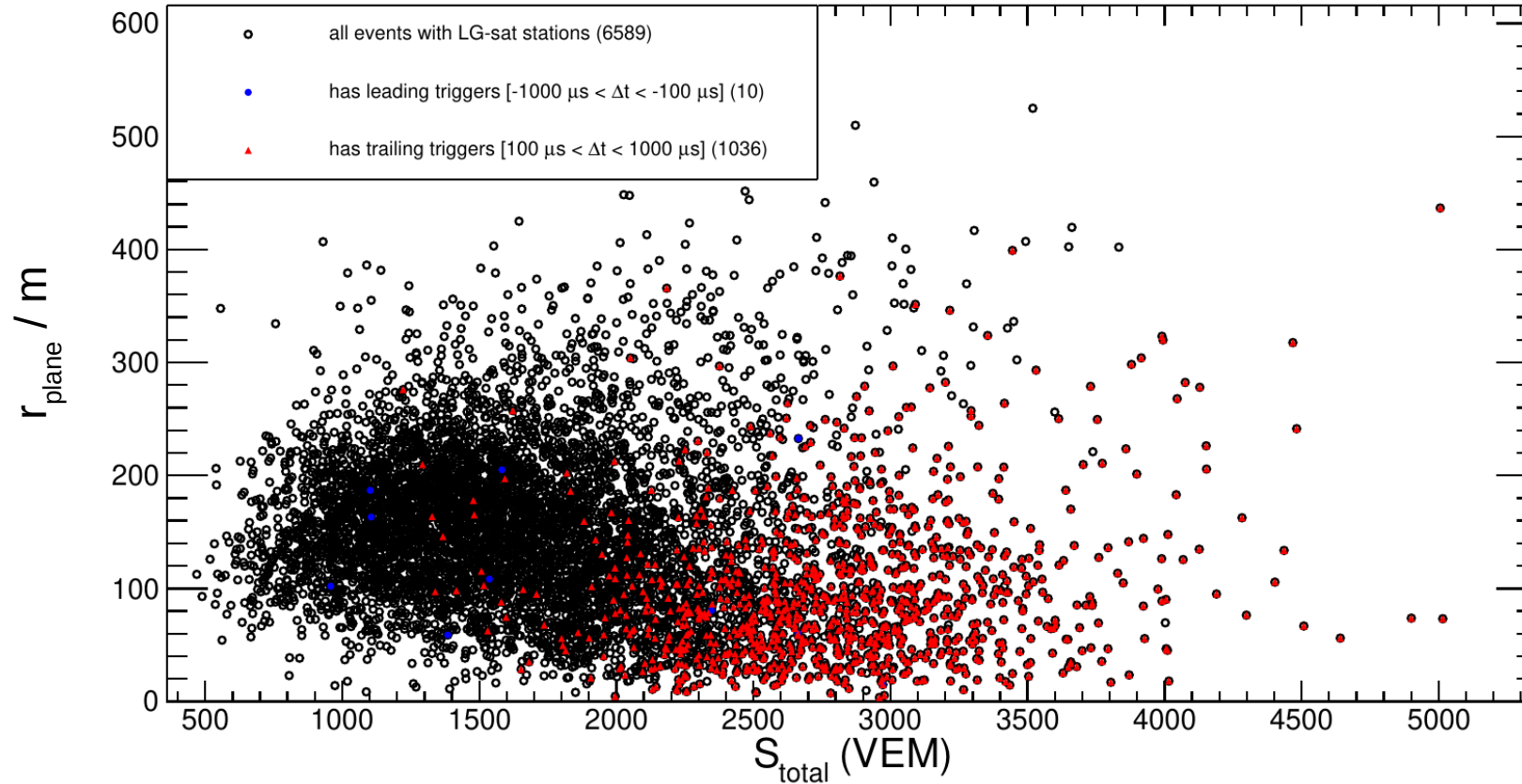


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Correlation with energy and plane distance!

More: CR \leftrightarrow late neutrons?



But: local feature of the station ...
Relaxation of PMT-base after large signal

Summary & Conclusion

Analysis of trigger data of the Auger SD

- lower energy and high-statistics compared to UHECR
- effects of electronics and instabilities
- analysis of special lightning events
- statistical analysis of 'sub-threshold' events



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