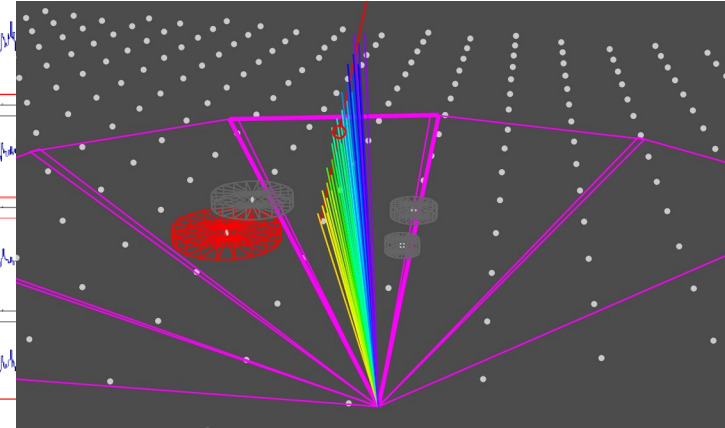
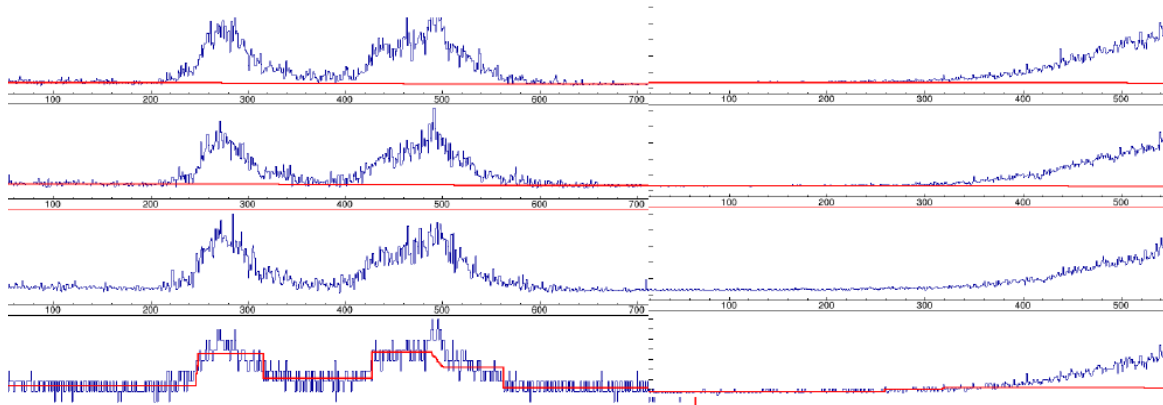
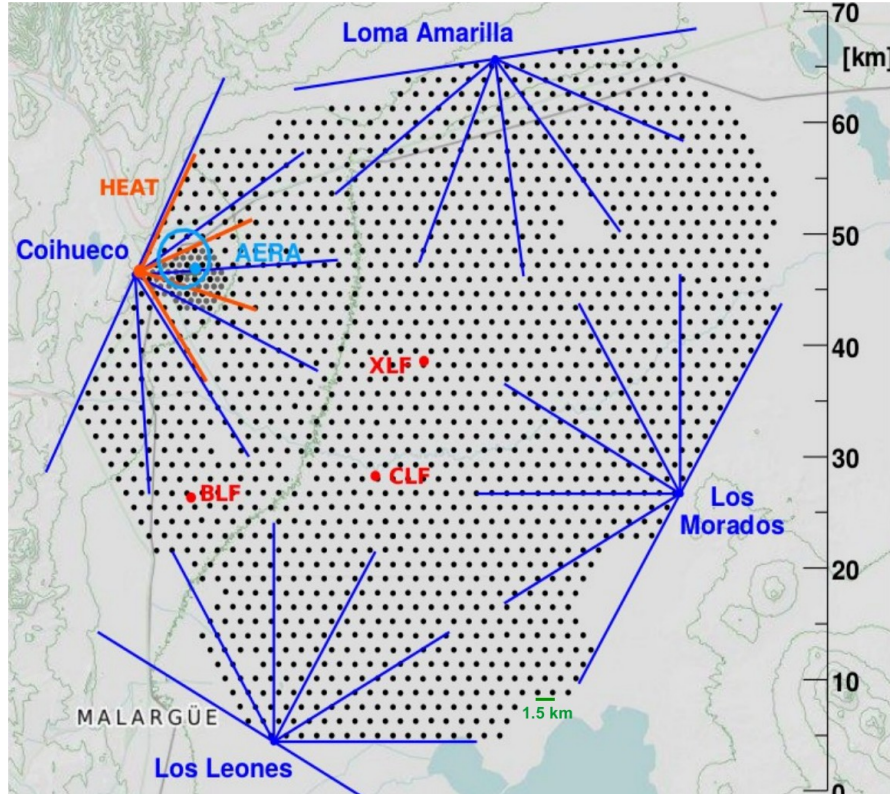


Extending the Physics Reach of the Pierre Auger Observatory using Low-Level Trigger Data

Martin Schimassek

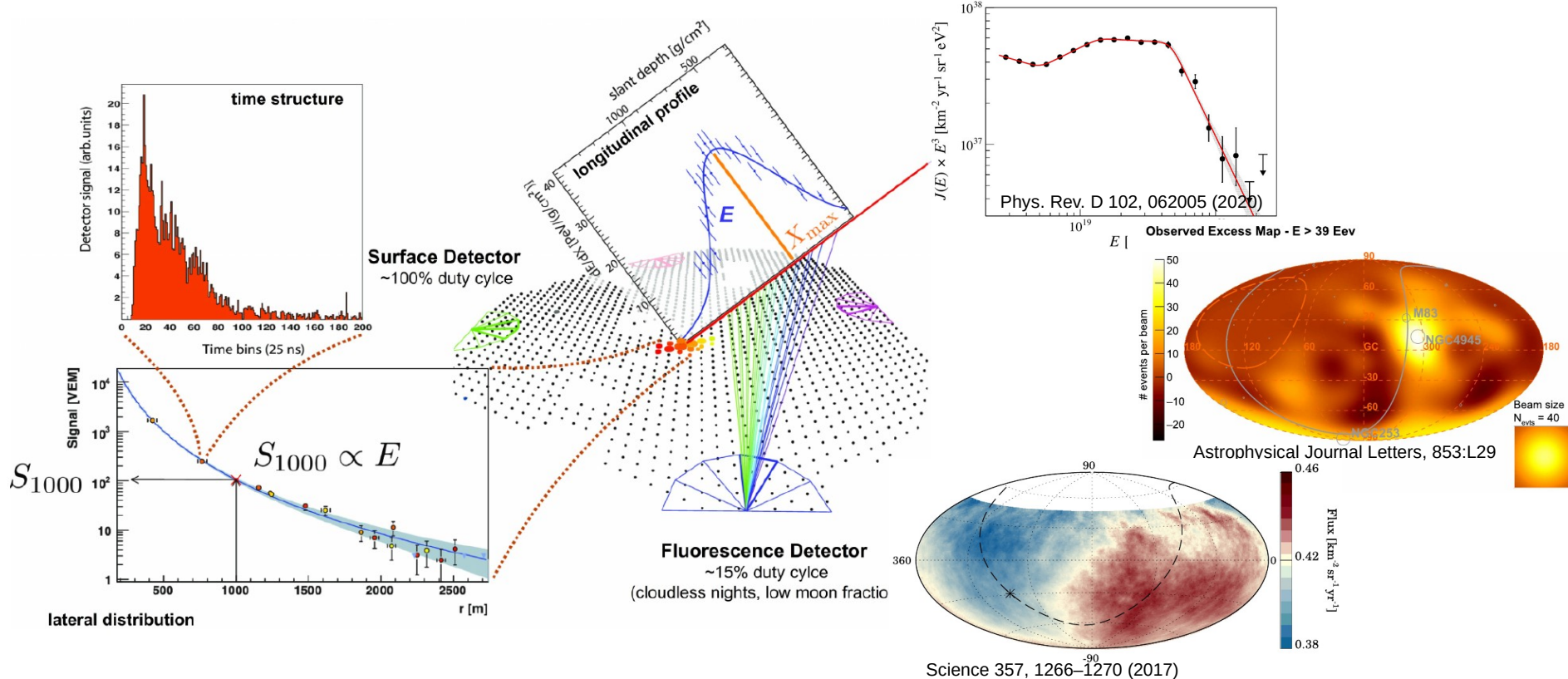


The Pierre Auger Observatory



covering 3000 km²
built for the highest energies

The usual Measurements



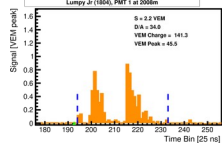
The Trigger System

signal trigger

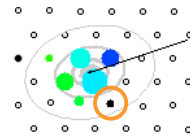
station trigger



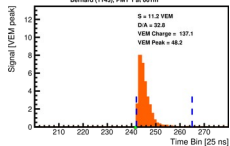
promote



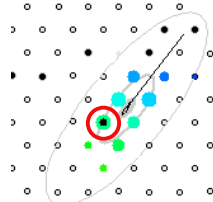
'for EM-part'
13 bins
> 0.2 VEM



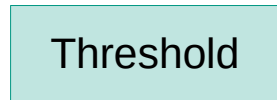
2 Hz



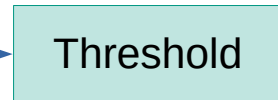
'for muons'
> 3.2 VEM



20 Hz



higher
threshold



now available for 'offline' analysis

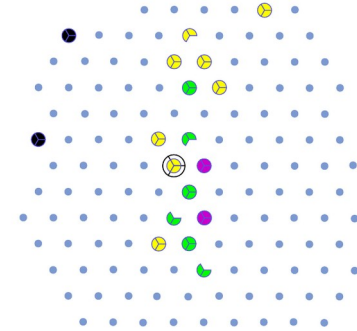
geometry

array trigger

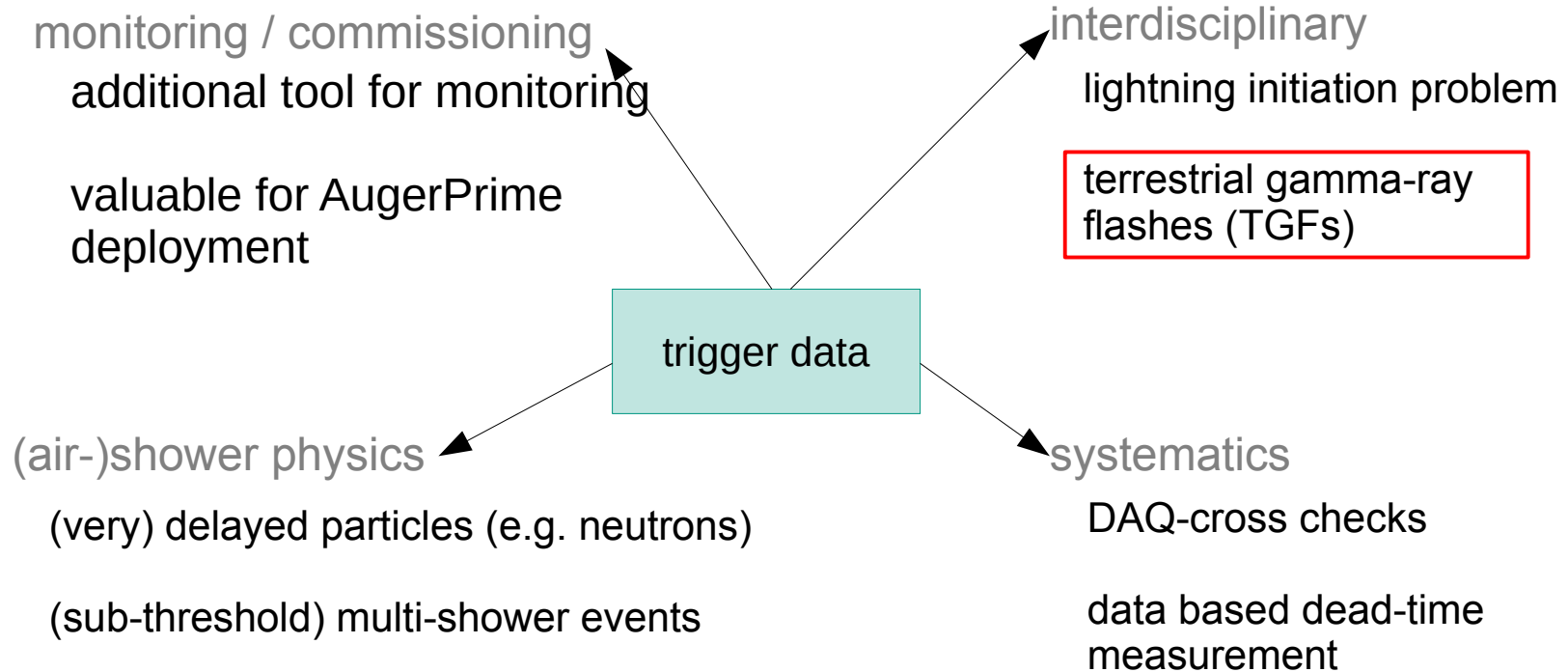
~0.1 Hz

timing

only trigger data

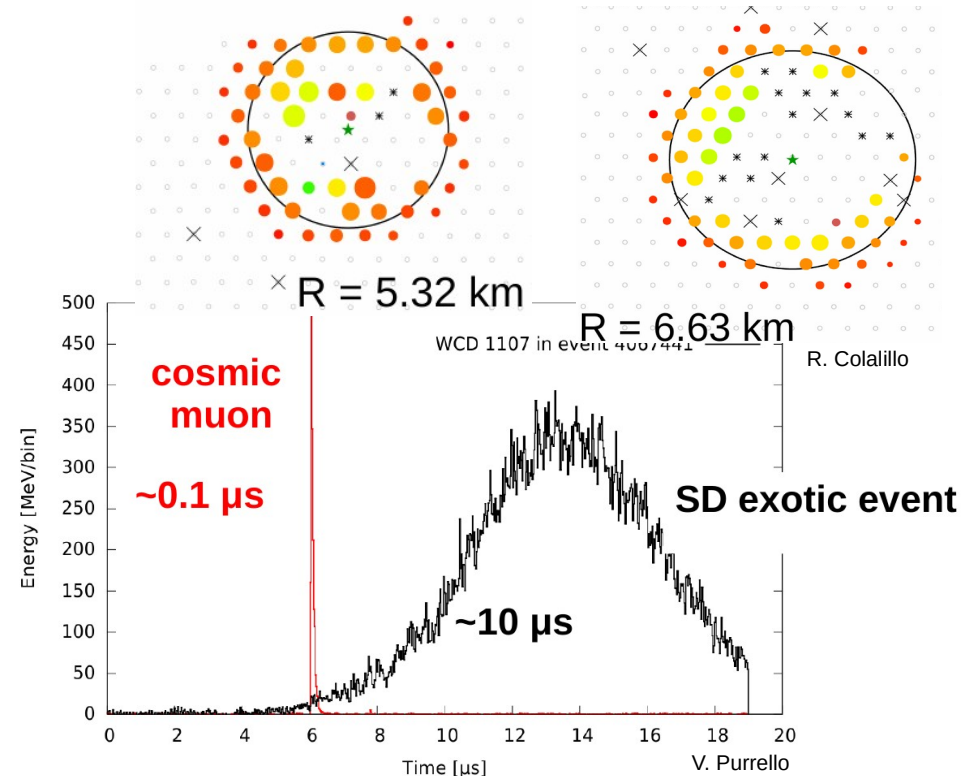


Extending the (Physics) Reach?



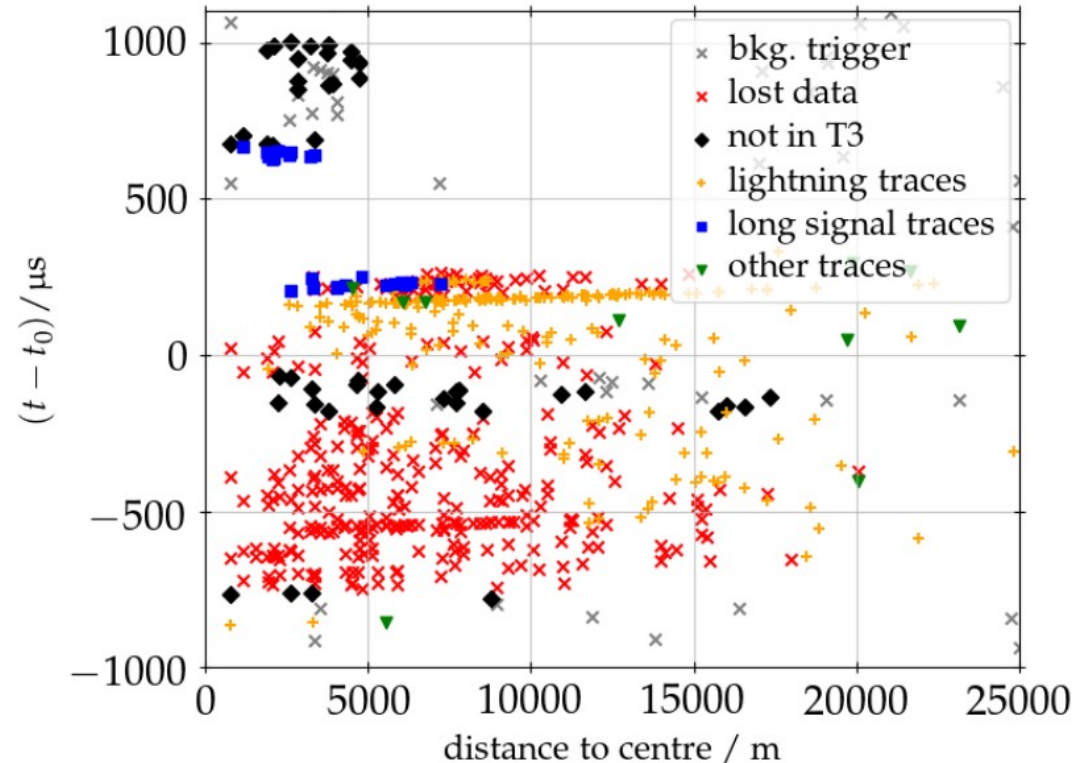
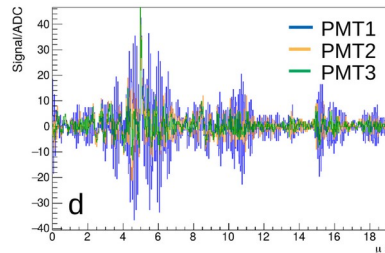
TGFs – ‘SD-Rings’

- very large signals
 - often longer than the recorded trace
- footprints variable, typically large and circular
 - some events: ‘hole’ in the center
 - some completely filled
- rare: ~1 event per year



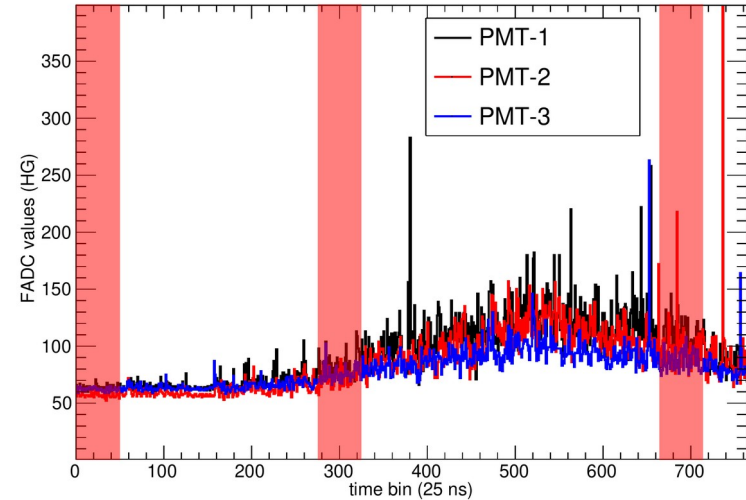
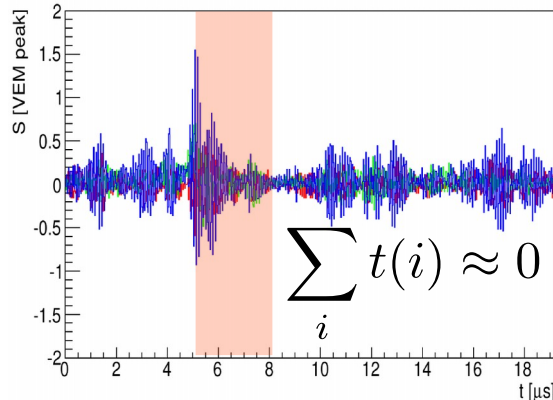
Current Limitations

- example event that has such signals
- DAQ optimised for UHE-CRs
 - CR: ~4 triggers, here: ~1000
- lightning causes RF-traces



Extention – Selective Trigger Flag

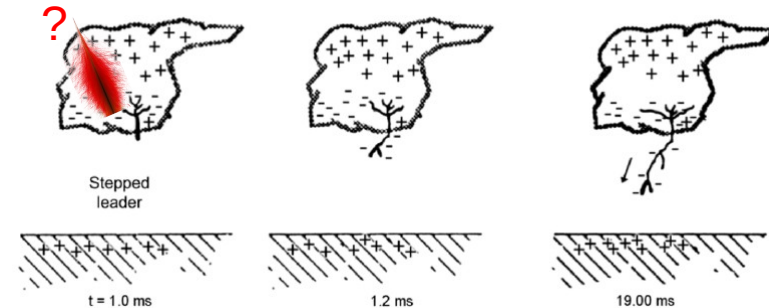
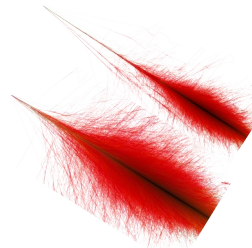
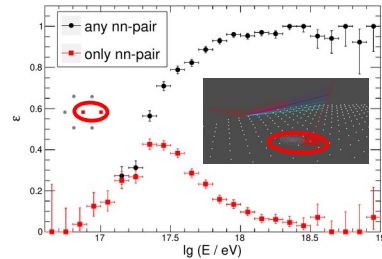
- developed algorithm to find these events
- make use of different timing
- integrals insensitive to HF noise



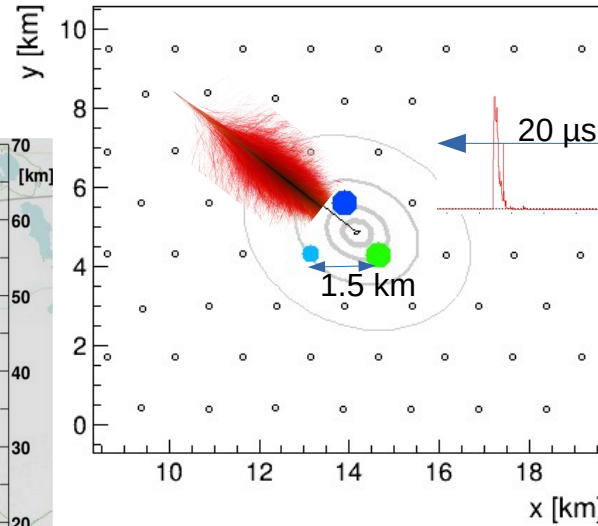
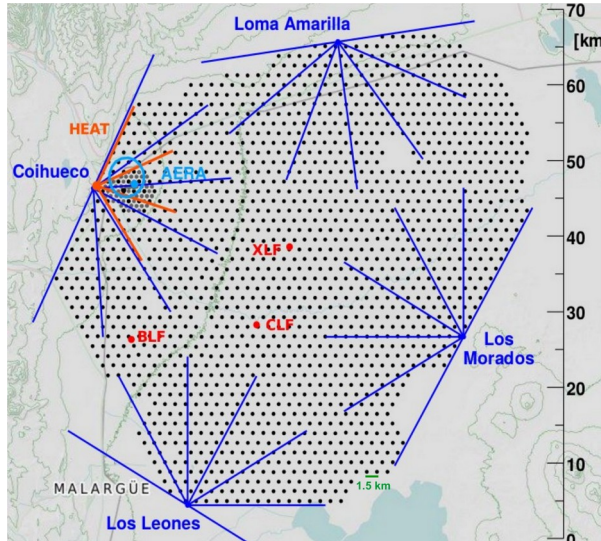
$$\sum_i t(i) > 0$$

Summary

- rich data set from station triggers available at the Pierre Auger Observatory
- used to improve trigger for special lightning events
- other applications: lightning initiation, delayed particles, multi-shower events, 'exotic signatures'



Energy Ranges



distance selects
energy range:
highest energies

