LUPM HESS LIDAR

A Gamma Ray Experiment Lidar application

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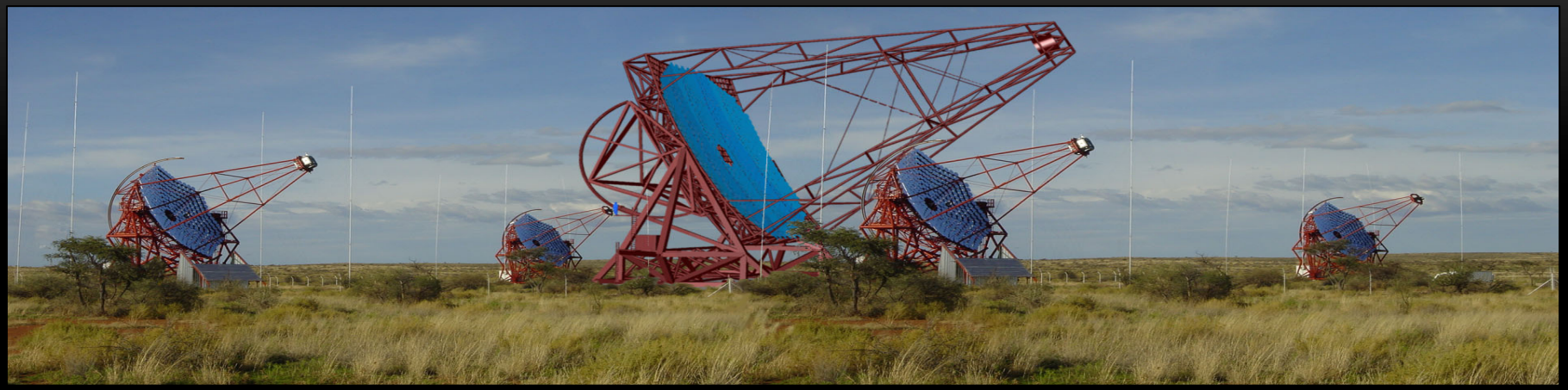
THE HESS EXPERIMENT

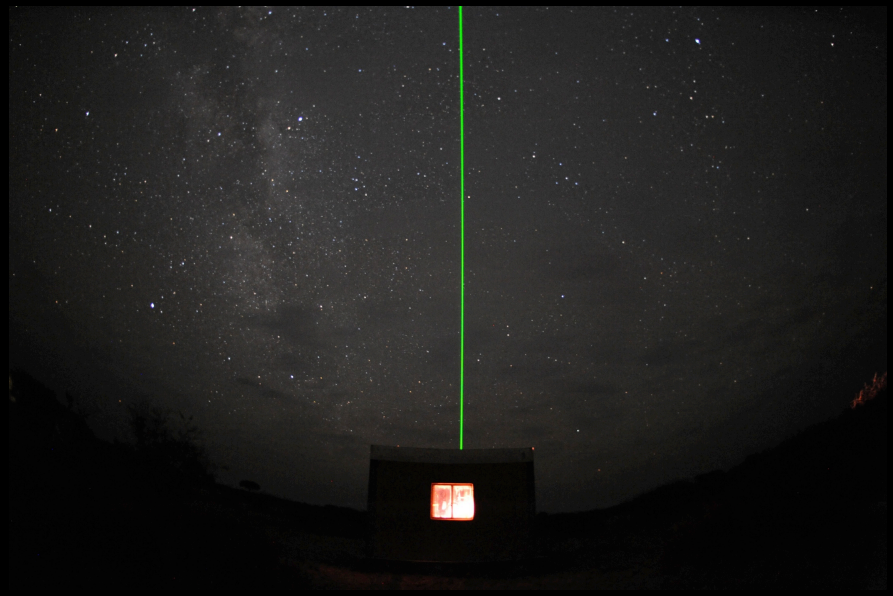


- Four 13 m diameter telescopes in the Khomas highlands of Namibia (southern Africa)
- Latitude 23° south → good for galactic sources
- 100 GeV – 100 TeV, 15% energy resolution
- 5’ angular resolution, 5° field of view
- A single giant (30 m) telescope under construction in the centre of the existing 4 telescope array
- Lower energy threshold, better sensitivity

SITE & INSTALLATION

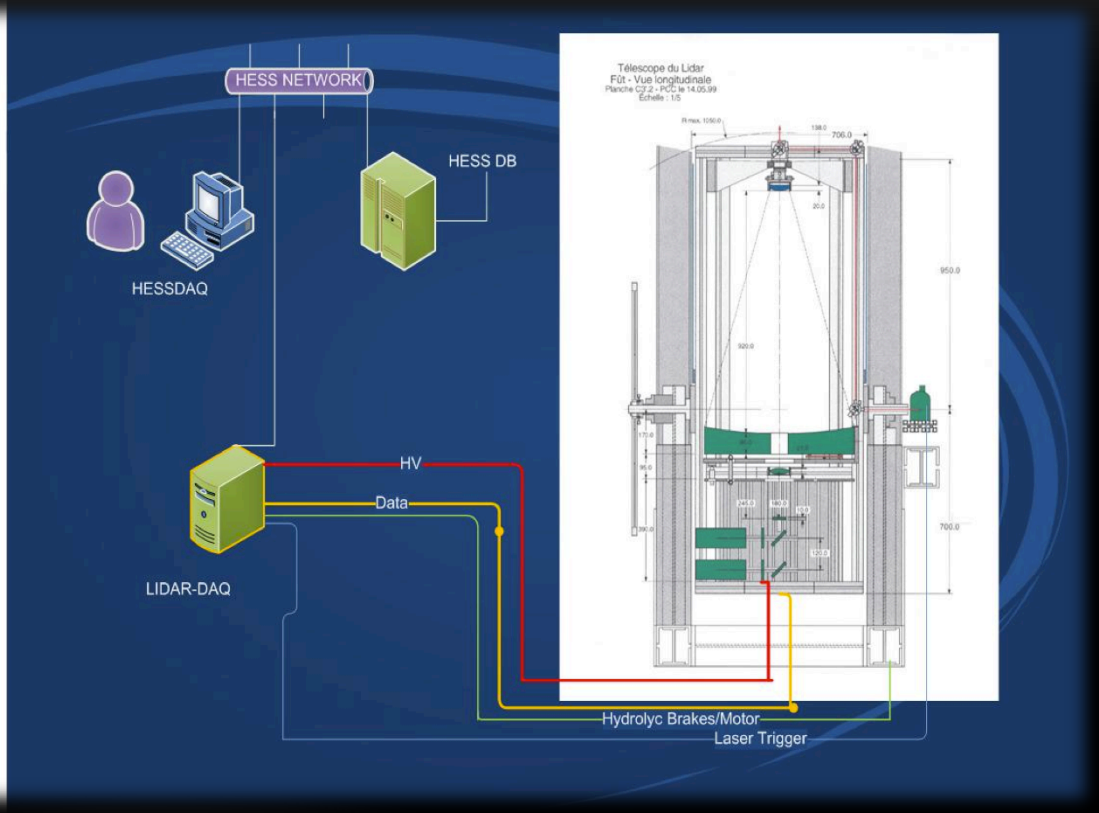
Correct Gamma-Ray spectrum of observed source (flux/energy) for absorpion/bias coming form aerosol presence

- Installed for the last 4 years at the HESS site in Namibia/Africa
- 1700m Altitude
- 850m away from the telescopes
- Dedicatd hut
- Runs in inhibit mode
  - In-between phycics runs
- Fast and efficient
- Single atmospheric profile in less than 90 sec



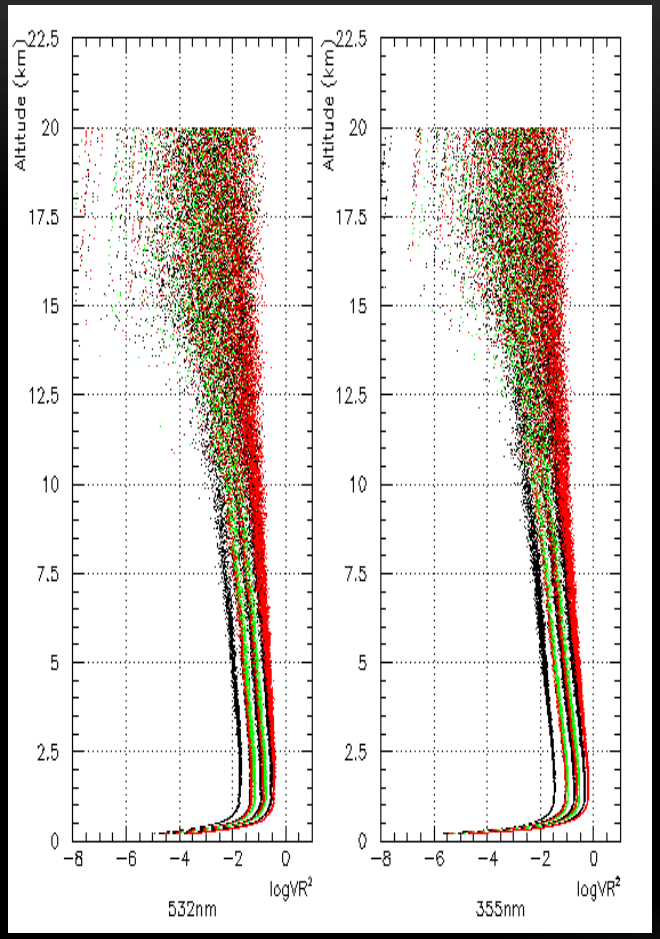
LIDAR SPECIFICATIONS

- Elastic Lidar
- Biaxial/Coaxial Configuration
- Quantel Brillant 30
  - 355 nm
  - 532nm
  - 10Hz
  - 3.4W
- 60 cm mirror
- f1.4
- Cassegrain telescope
- PMTs readout
- Zenith-3^{o} pointing fixed
- Fully automated
  - Shift mode
  - Standalone mode



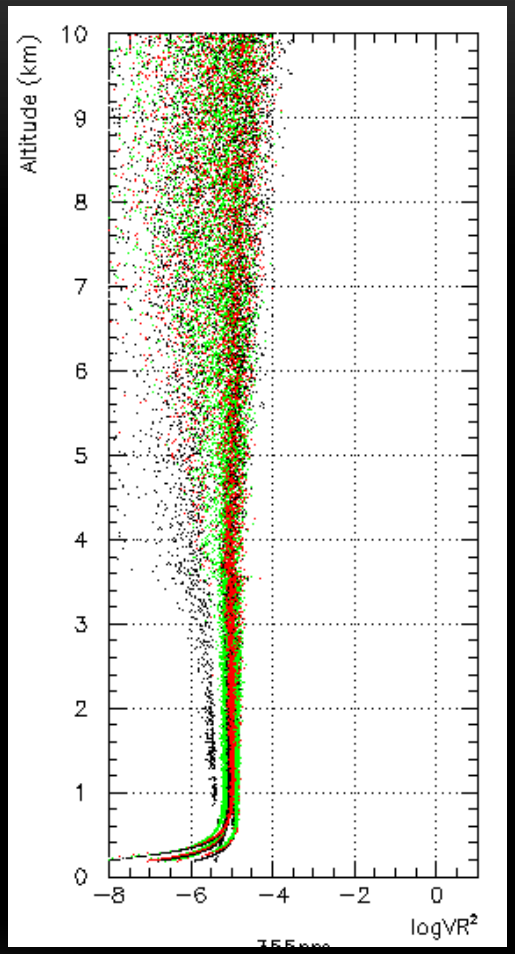
A VIEW

BI-AXIAL



Altitute analysis threshold 1.5km

COAXIAL

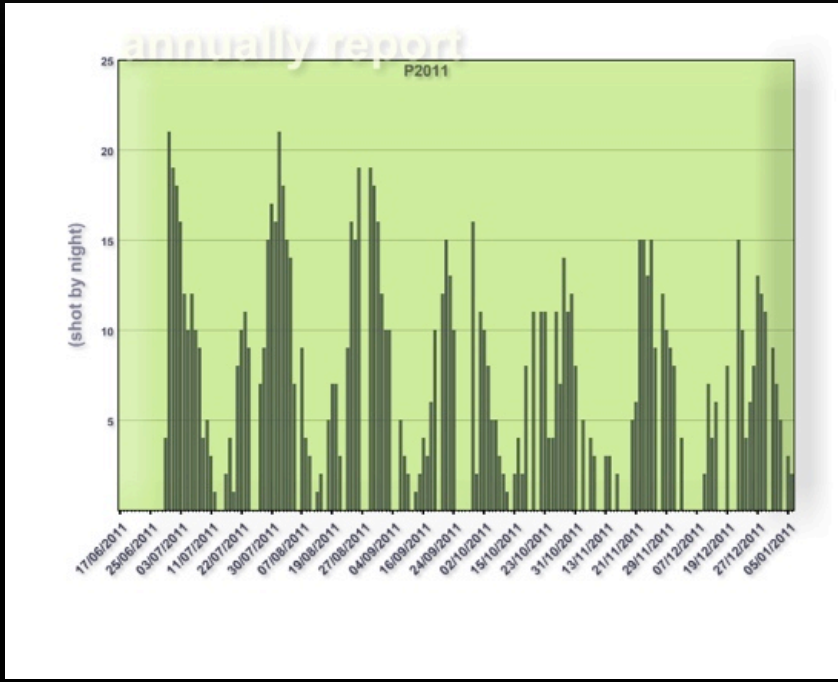


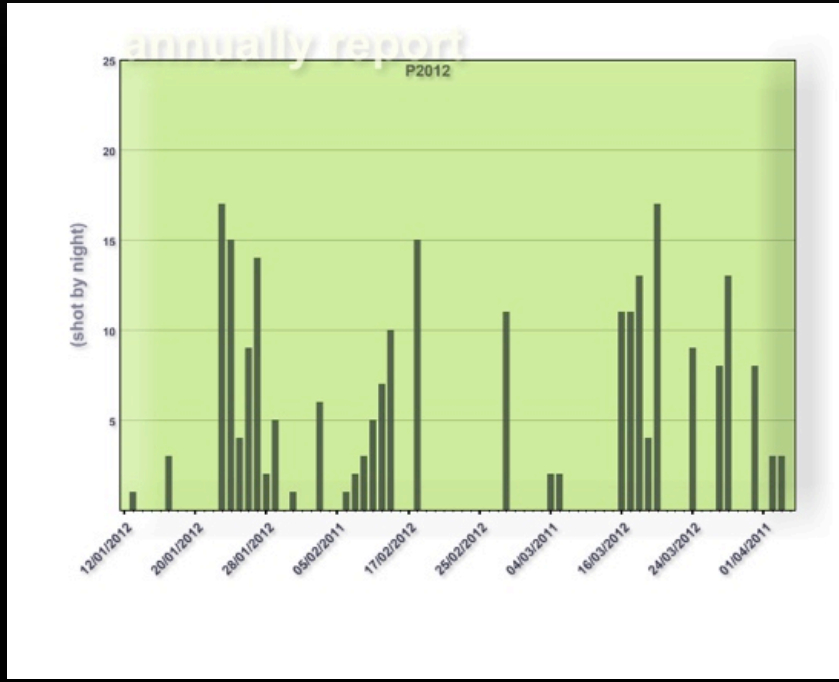
Altitute analysis threshold 0.6km

Coaxial Configuration (with 2nd laser beam for setup purposes

Biaxial Configuration

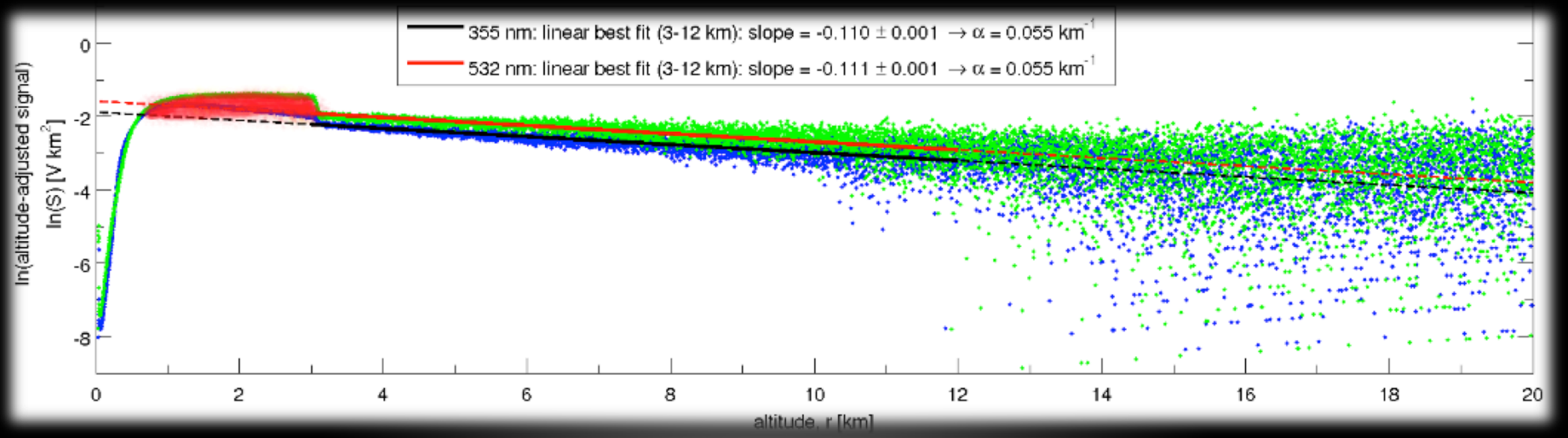
DATASETS STATISTICS



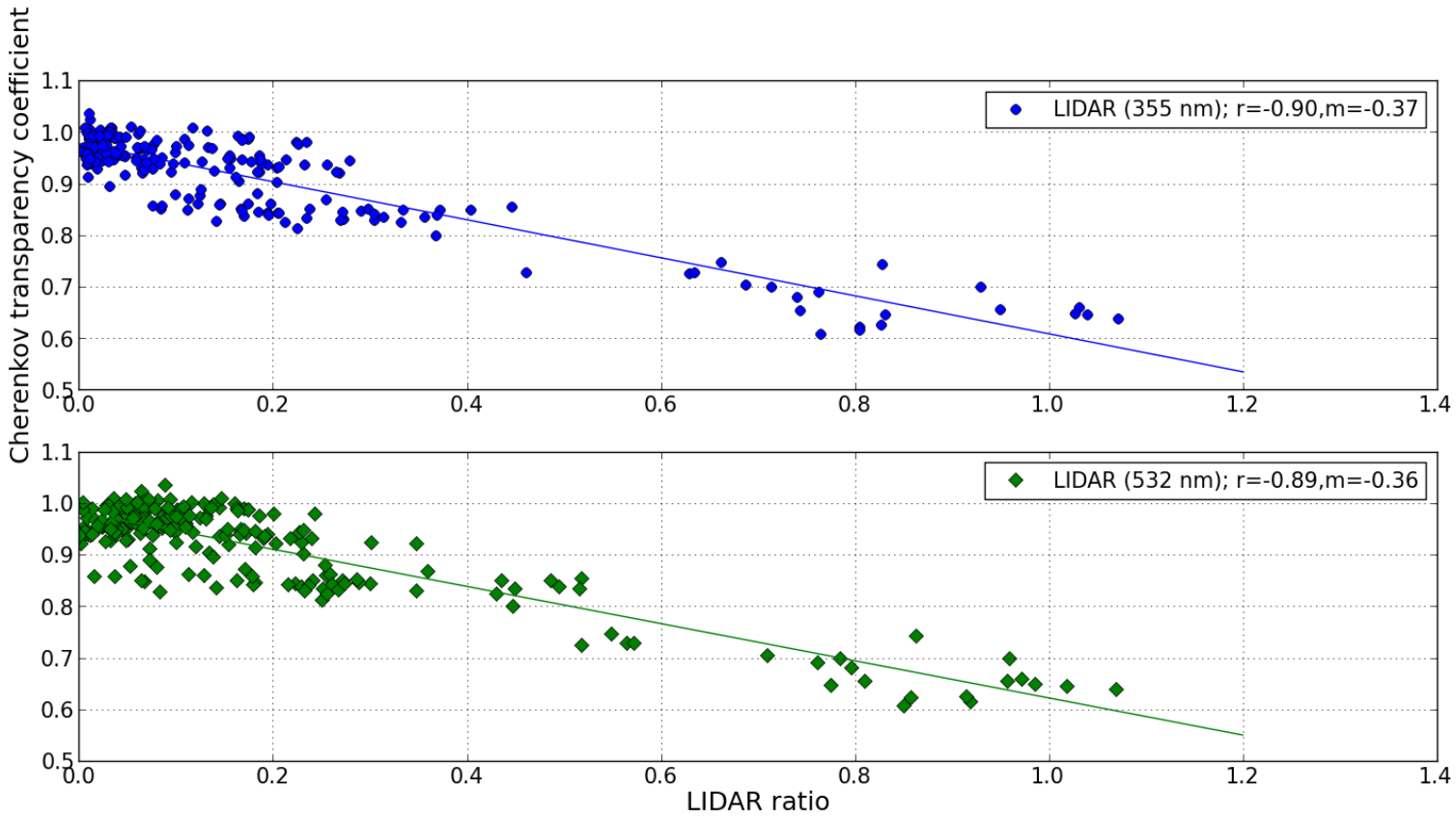


DATASETS – CORRELATION FACTOR

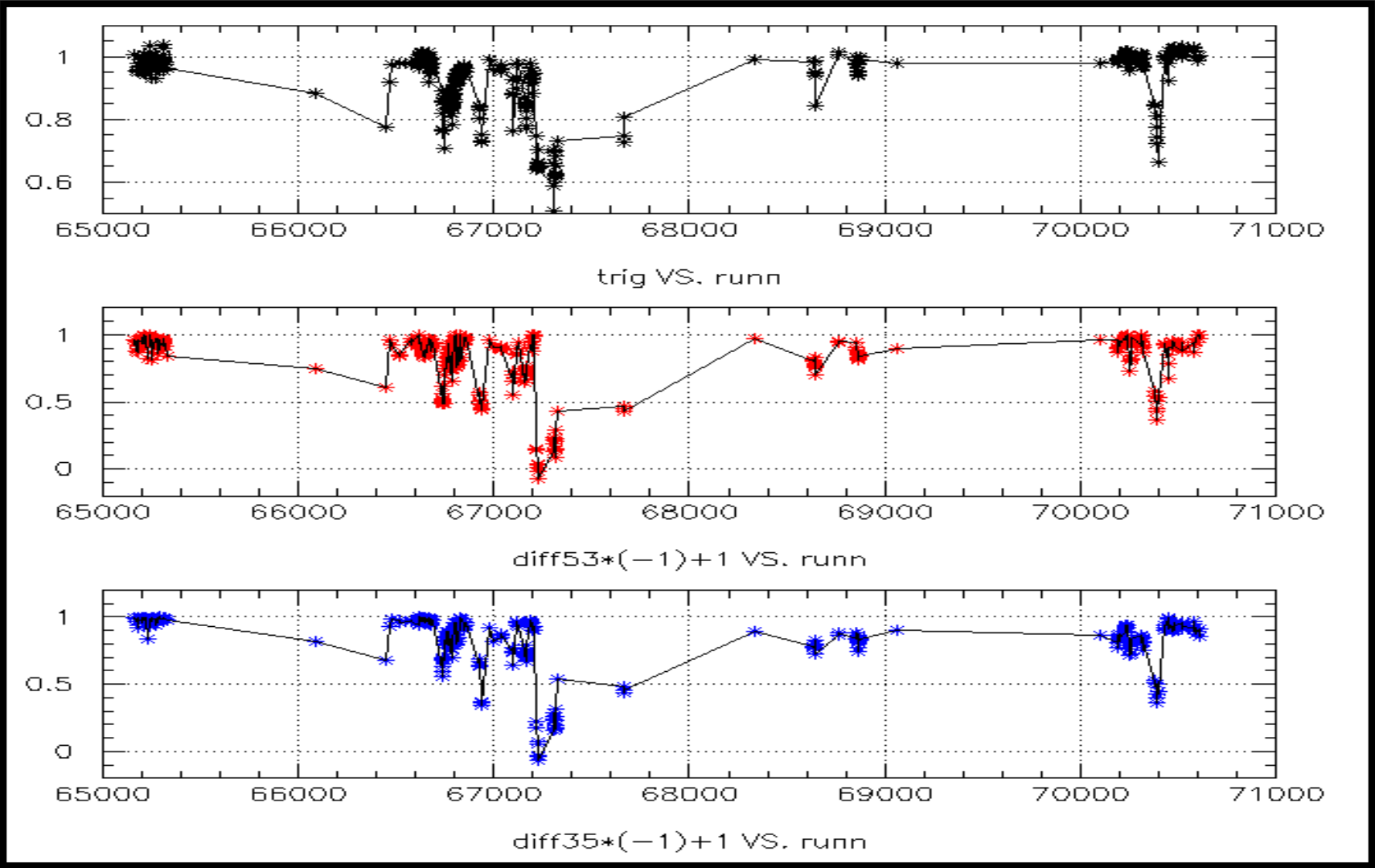
- Covered period June 2011 – April 2013
- 1200 shots profile
- All data biaxial configuration
- Transparency Coefficient available (see Raquel et al.)
- *At first try to establish a firm coherence with HESS trigger data*
- Remove Cloudy nights
- Aerosol dependent coefficient extracted from Lidar profiles
  - Calculate area under the aerosol zone (threshol- upto 4km)
  - Compare to an aerosol free area (7-10km)



LIDAR.VS.TC CORRELATION PLOT

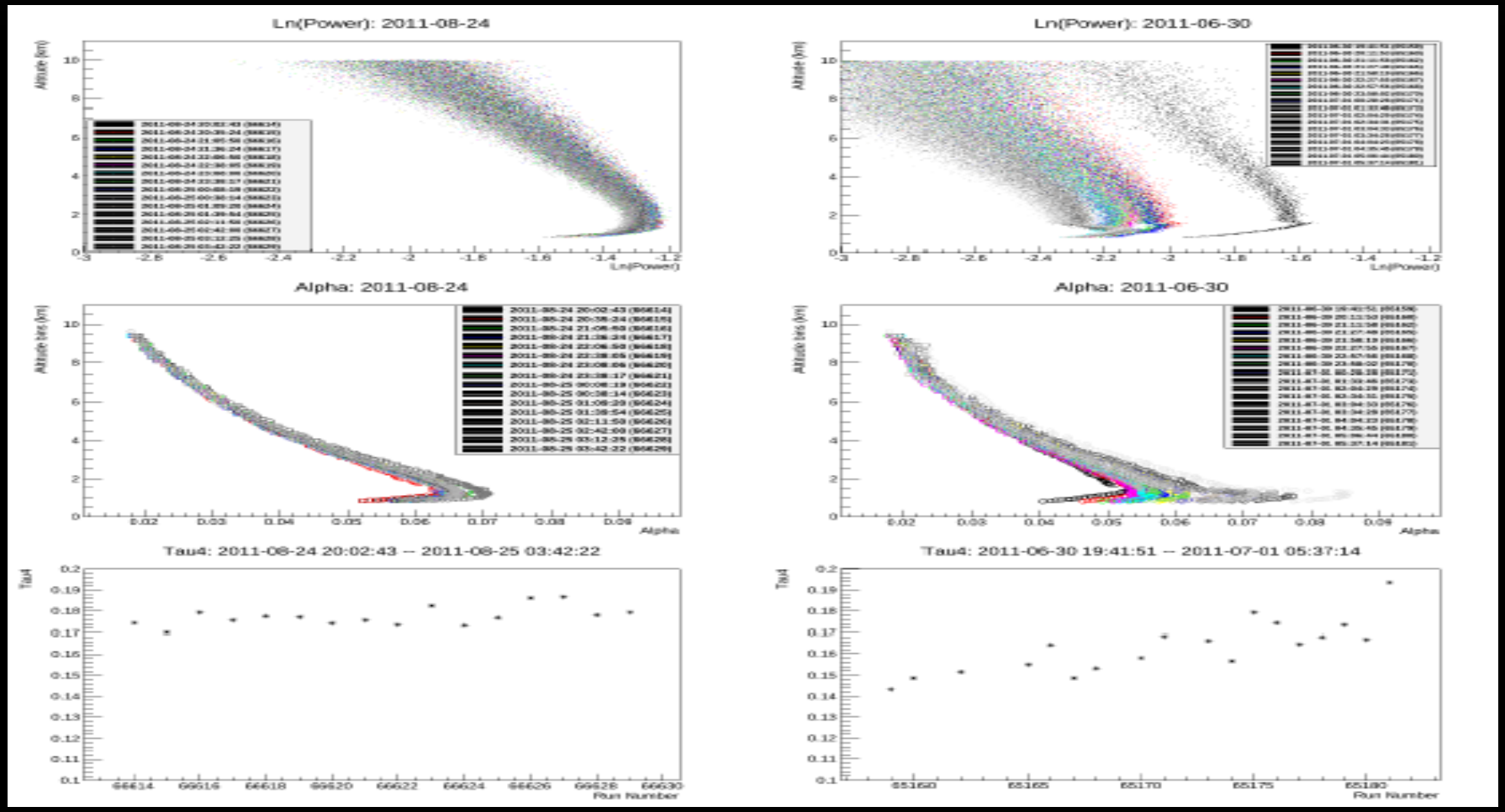


TIME EVOLUTION



NEXT STEPS

- Started calculating absorption coefficient (Klett/Fernald method)
- Need to start implementing these profiles to the HESS MC and predict impact on energy/flux of observed sources.



CONCLUSIONS

- Confident that we indeed “see” the same skies as the HESS telescopes
- Aerosol Coefficient, as defined, could serve as an additional Qualtity assurance factor
- Need to better understand and align Lidar coaxial configuration
- HESS physics analysis
- A Raman Lidar in a couple of years time