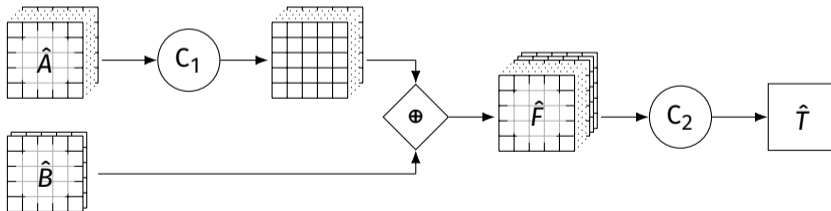


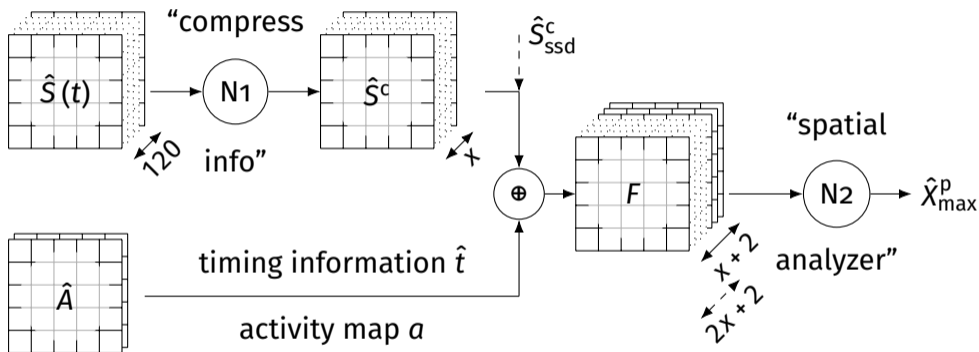
Deep-Learning based analysis of shower footprints

D. Veberič, D. Schmidt, M. Roth, **S. Hahn** | Supvs.: R. Engel, B. Wundheiler | 03.11.2021

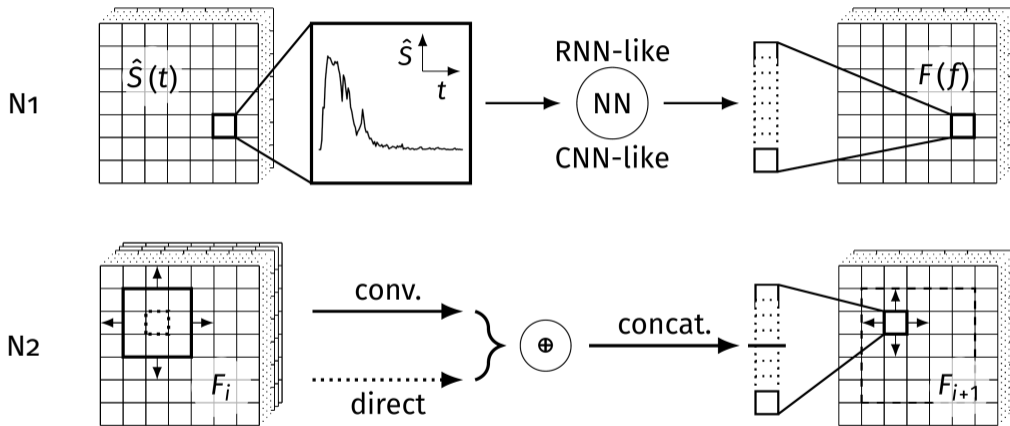
KIT - IAP



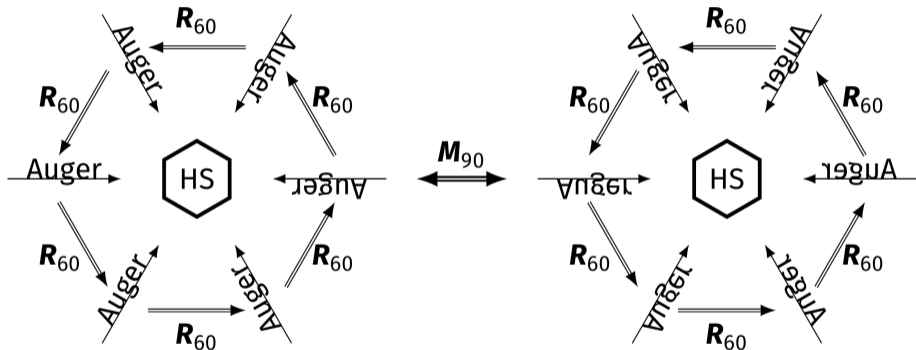
Neural networks - architecture I



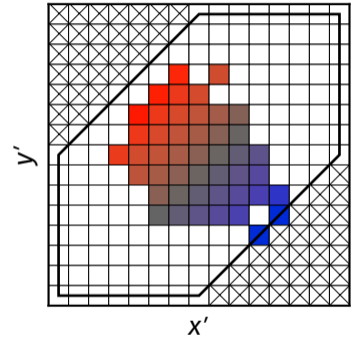
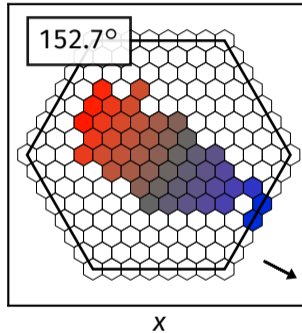
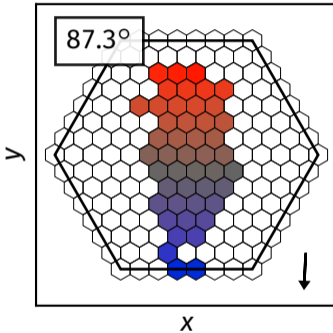
Neural networks - architecture II



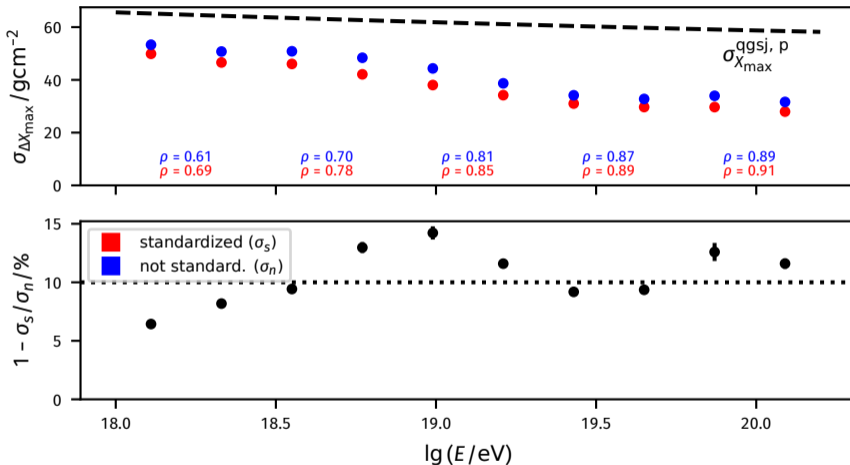
Standardization - transformations



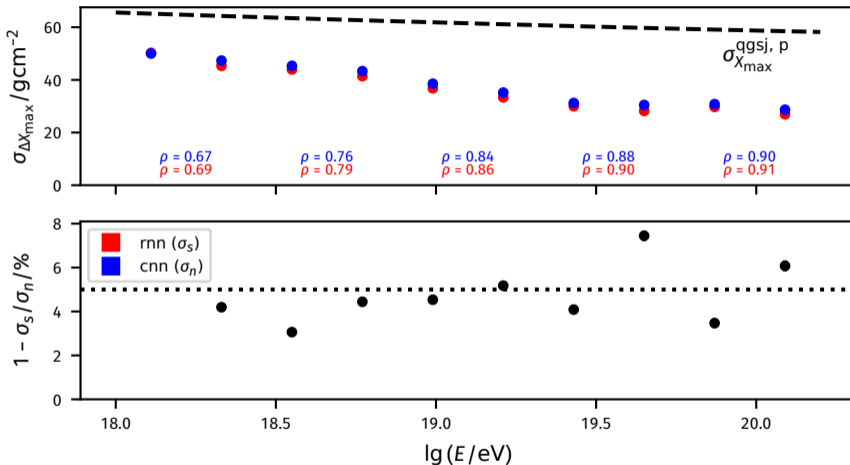
Standardization - application



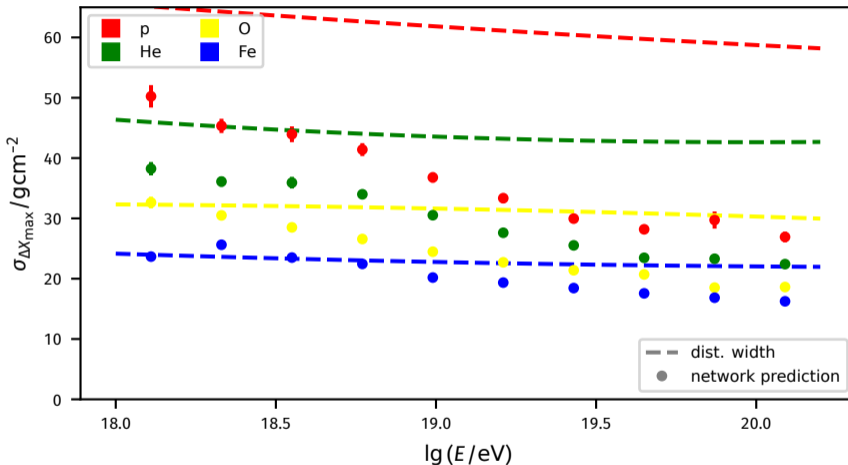
Application on MC - check standardization



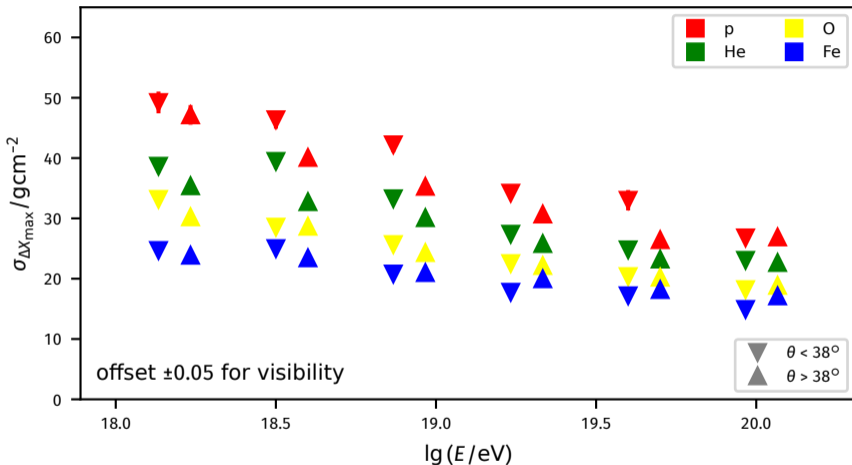
Application on MC - check trace analyser



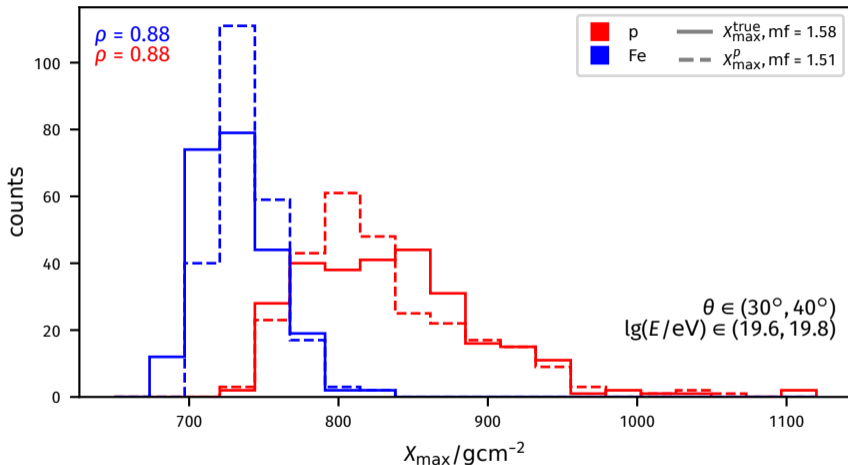
Application on MC - result I



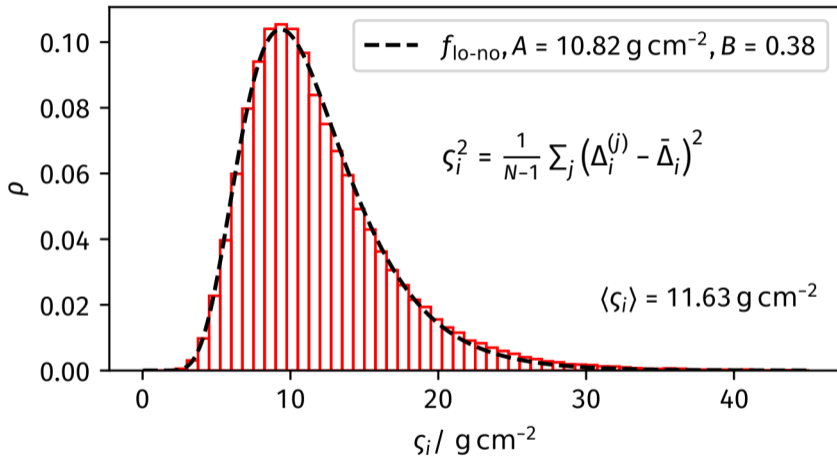
Application on MC - result II



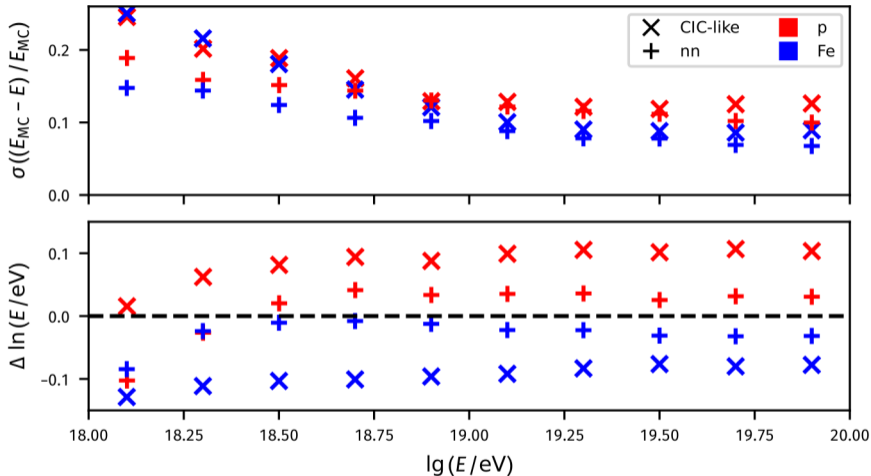
Application on MC - result III



Application on MC - tricks and traps



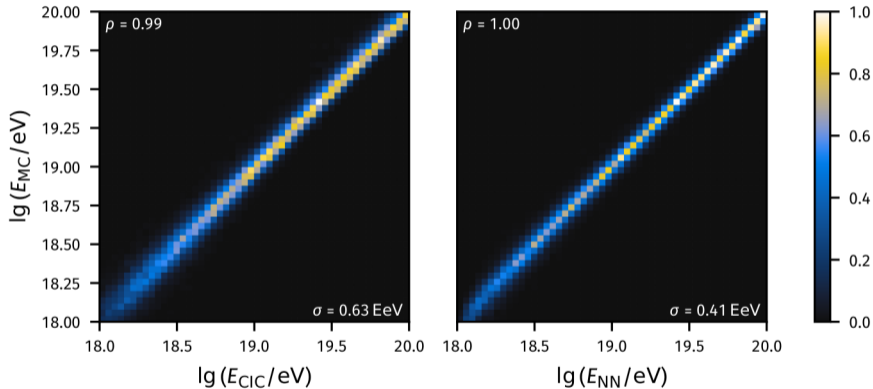
Application on MC - energy prediction I



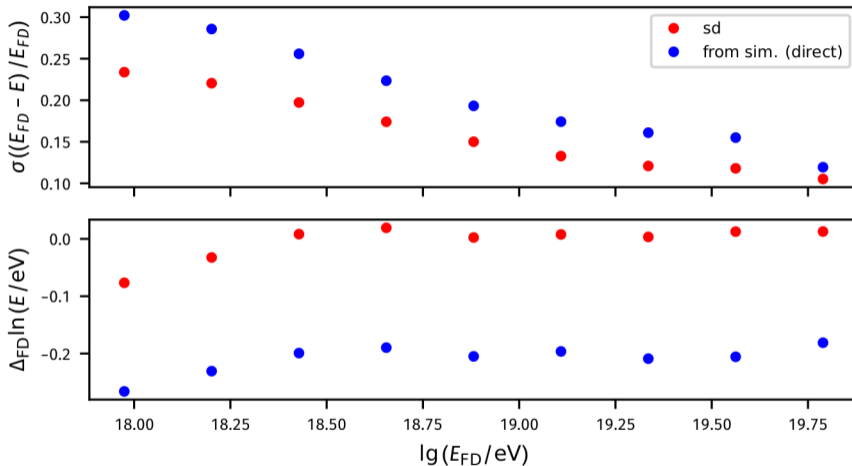
Fit function

$$\lg(E_{MC}/\text{eV}) = B \left(\lg(S_{1000}/\text{VEM}) - \lg \left(1 + \sum_{n=1}^3 a_n [\sin^2 \theta - \sin^2 \theta_f]^n \right) \right) + A$$

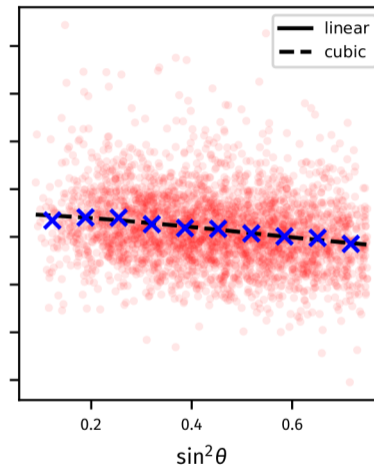
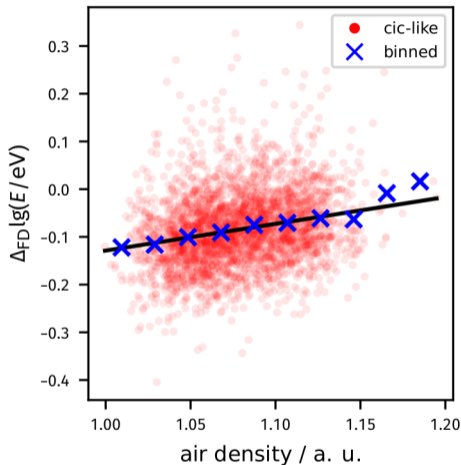
Application on MC - energy prediction III



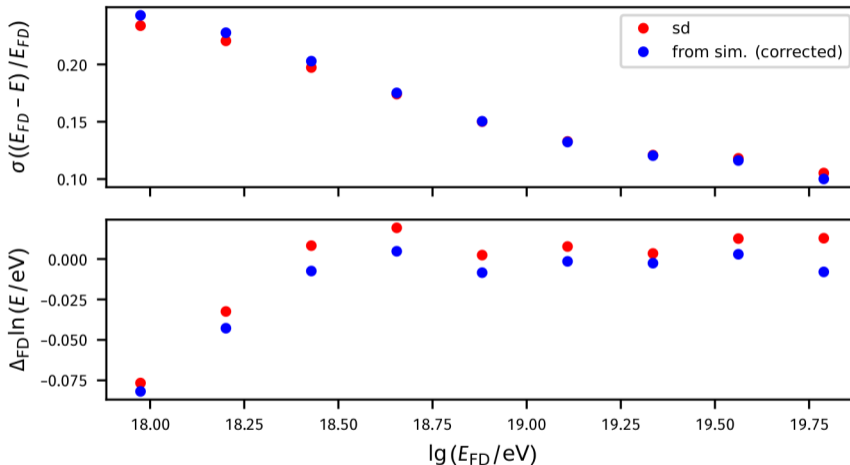
Real data - simple fit I



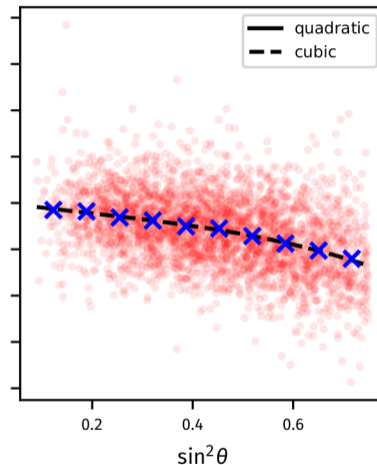
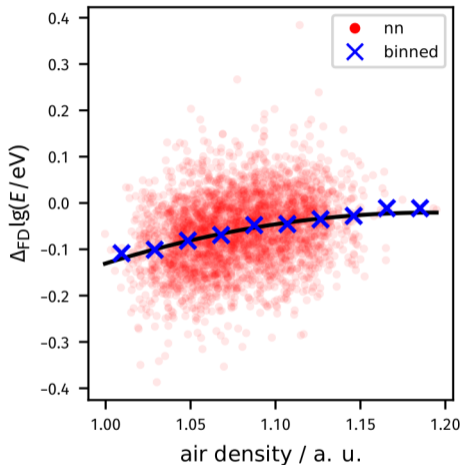
Real data - simple fit II



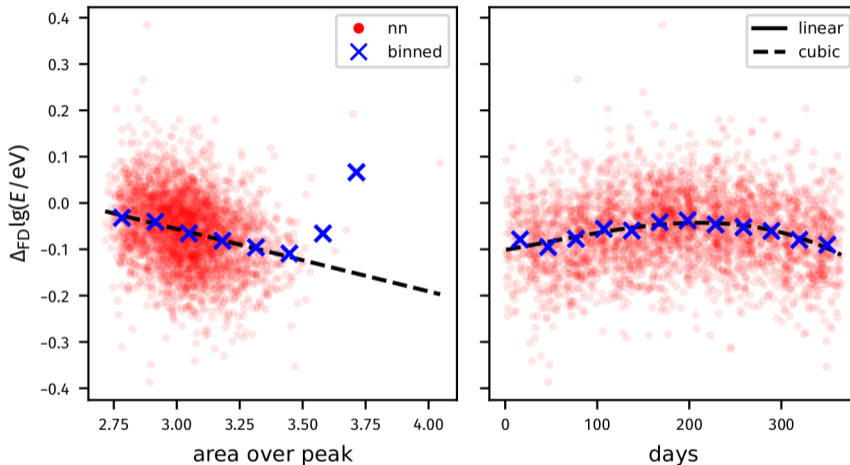
Real data - simple fit III



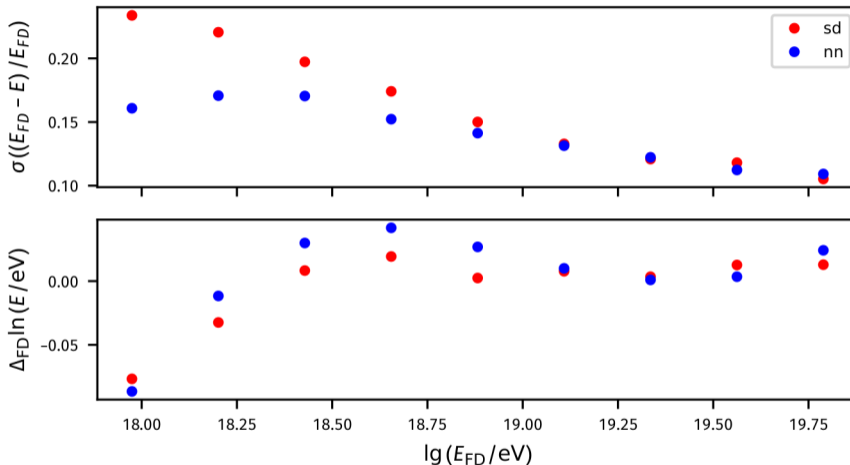
Real data - correction I



Real data - correction II



Real data - preliminary (energy) result



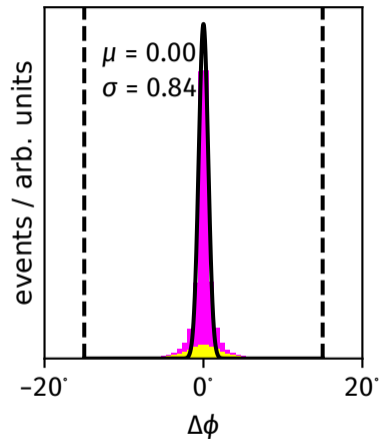
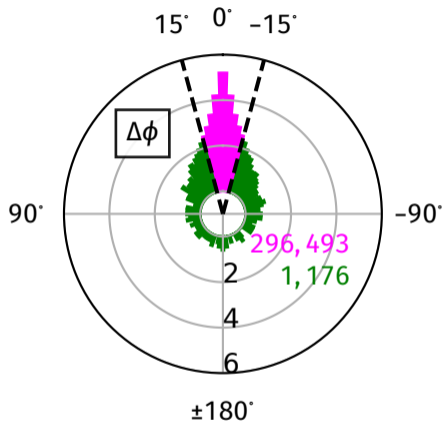
Summary

- one architecture - many applications
- transition from MC to real data seems possible

Future

- collecting all shower variables that can be used with this architecture
- predicting f_{μ} values on certain distances
- direct/indirect $\ln A$ estimation

Backup - Standardization



Backup - Standardization

