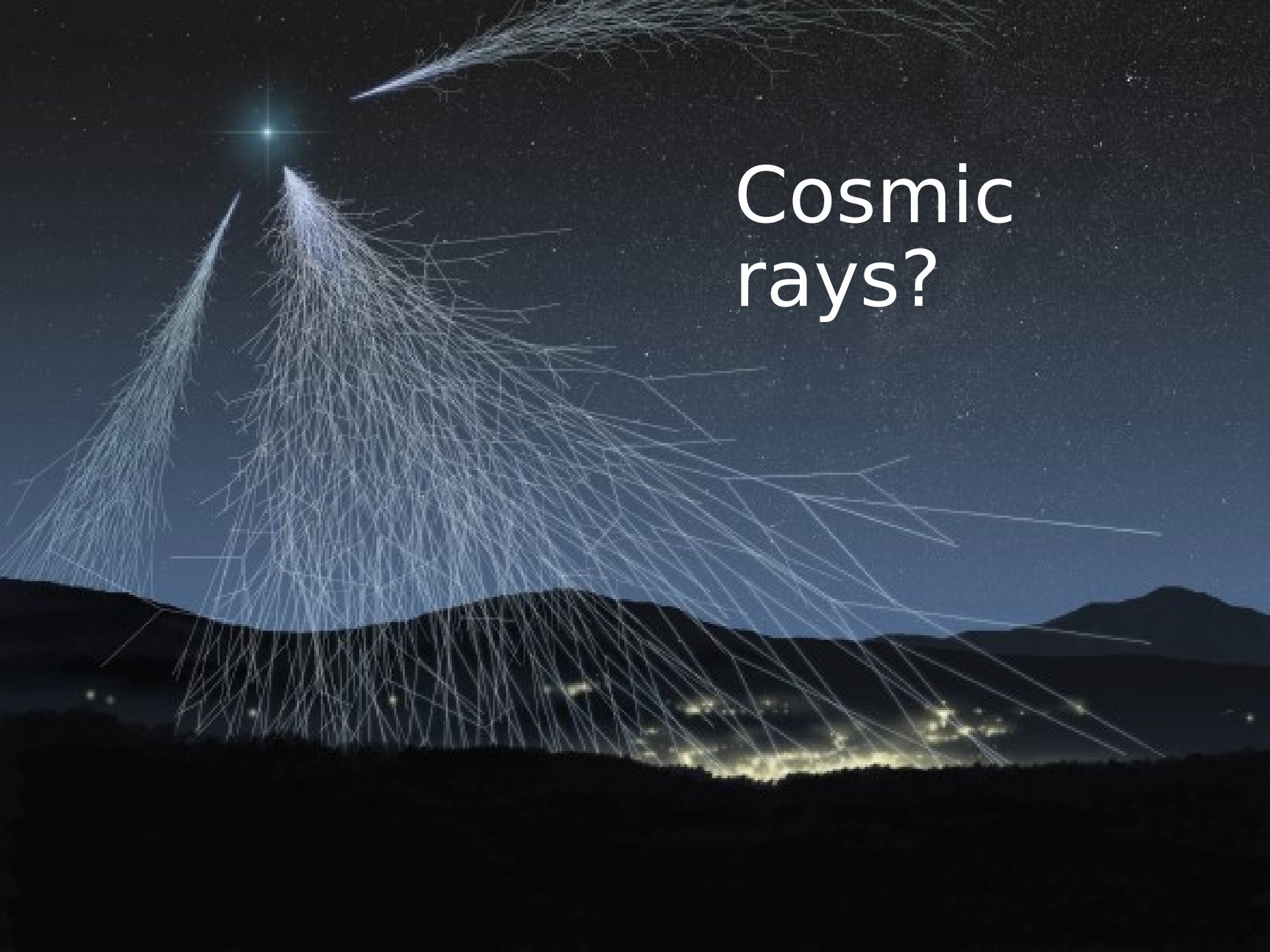


Simple model of cosmic ray showers

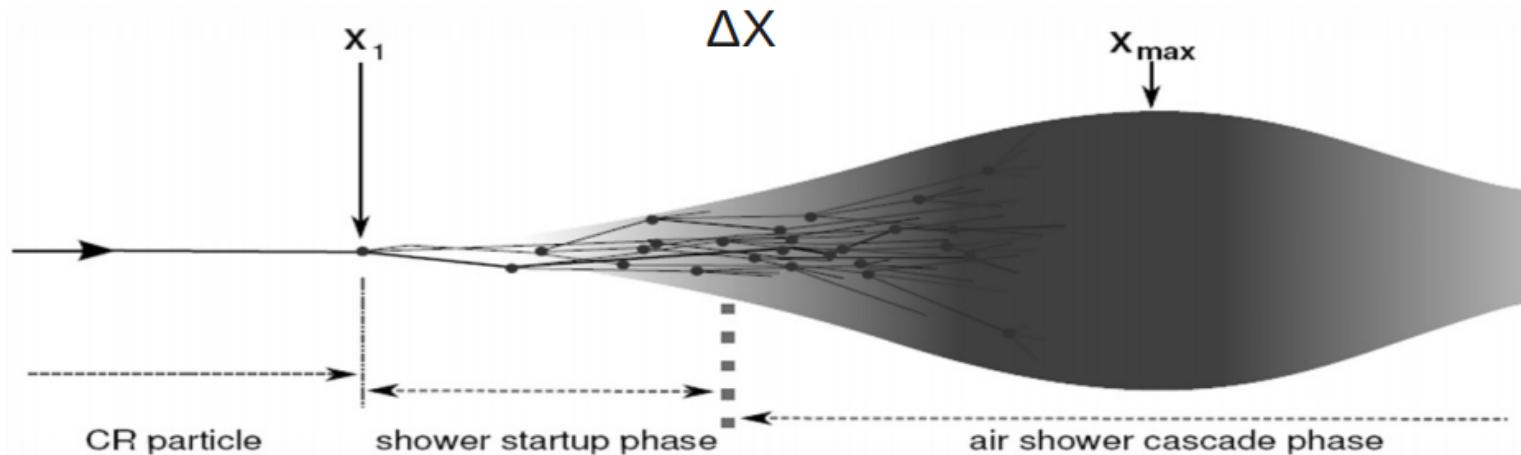
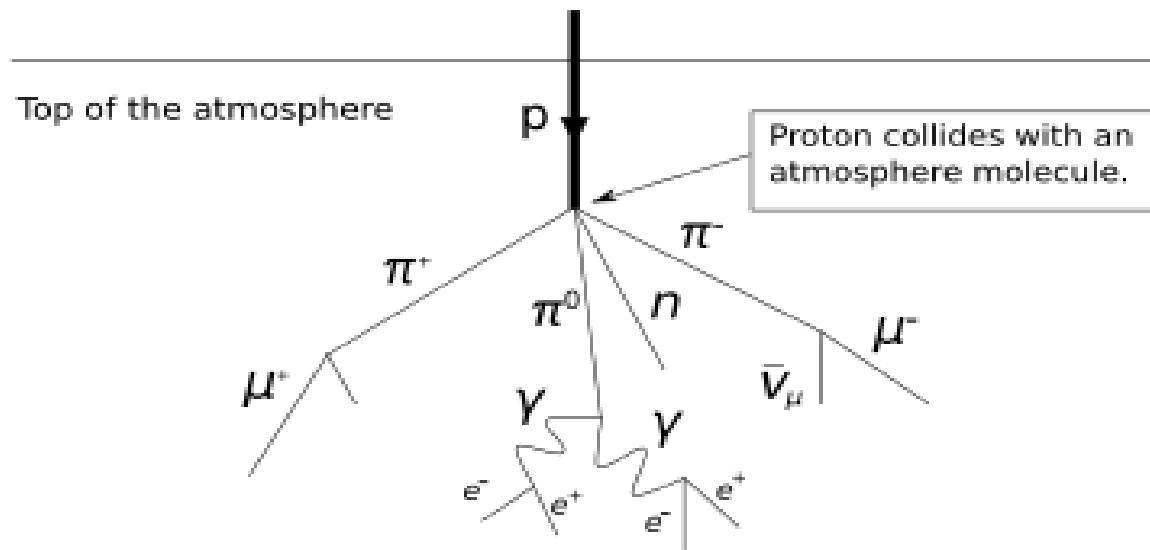
Tiago Rosa

Supervisors: Francisco Diogo e Sofia Andringa

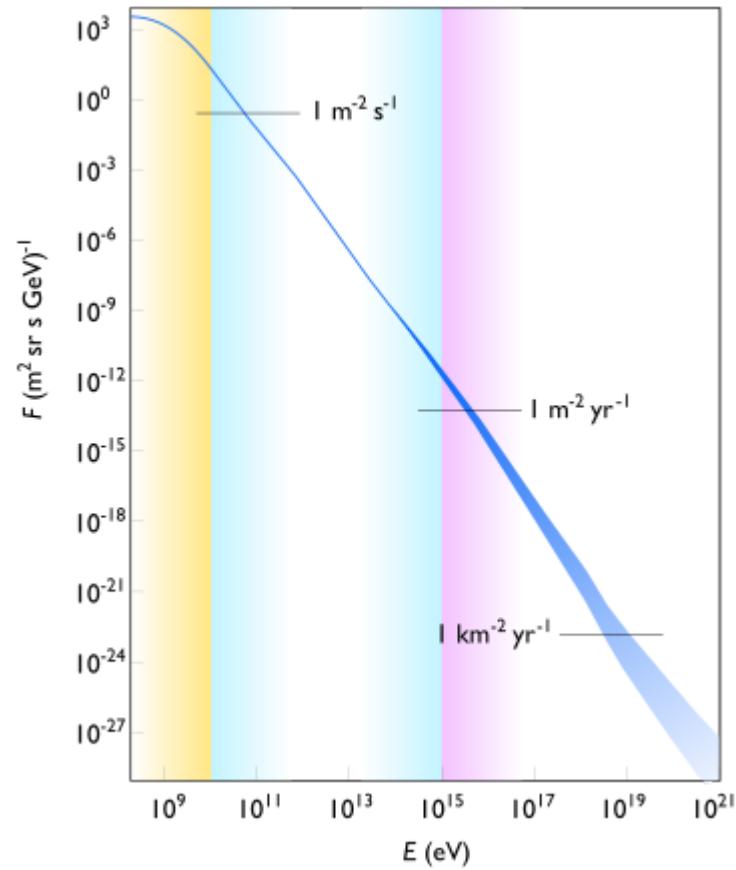
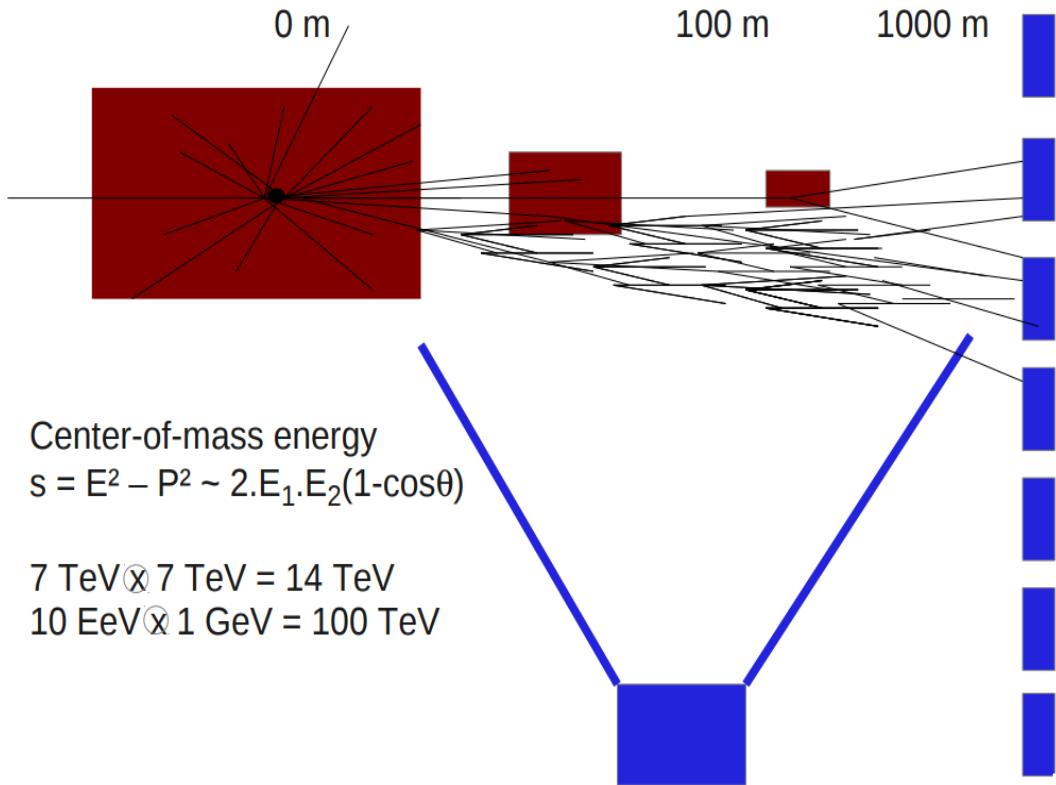


Cosmic
rays?

Cosmic rays?



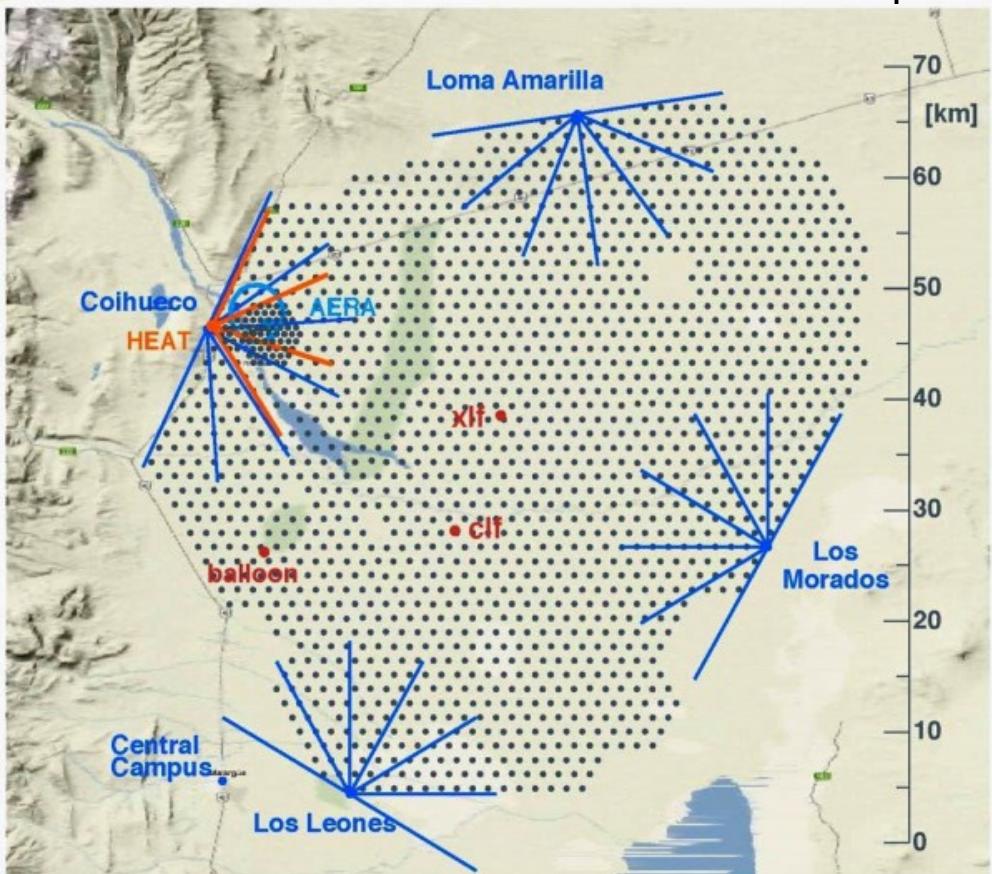
cosmic rays and the LHC



Pierre Auger Observatory



1 particle/km²/century == 30/year

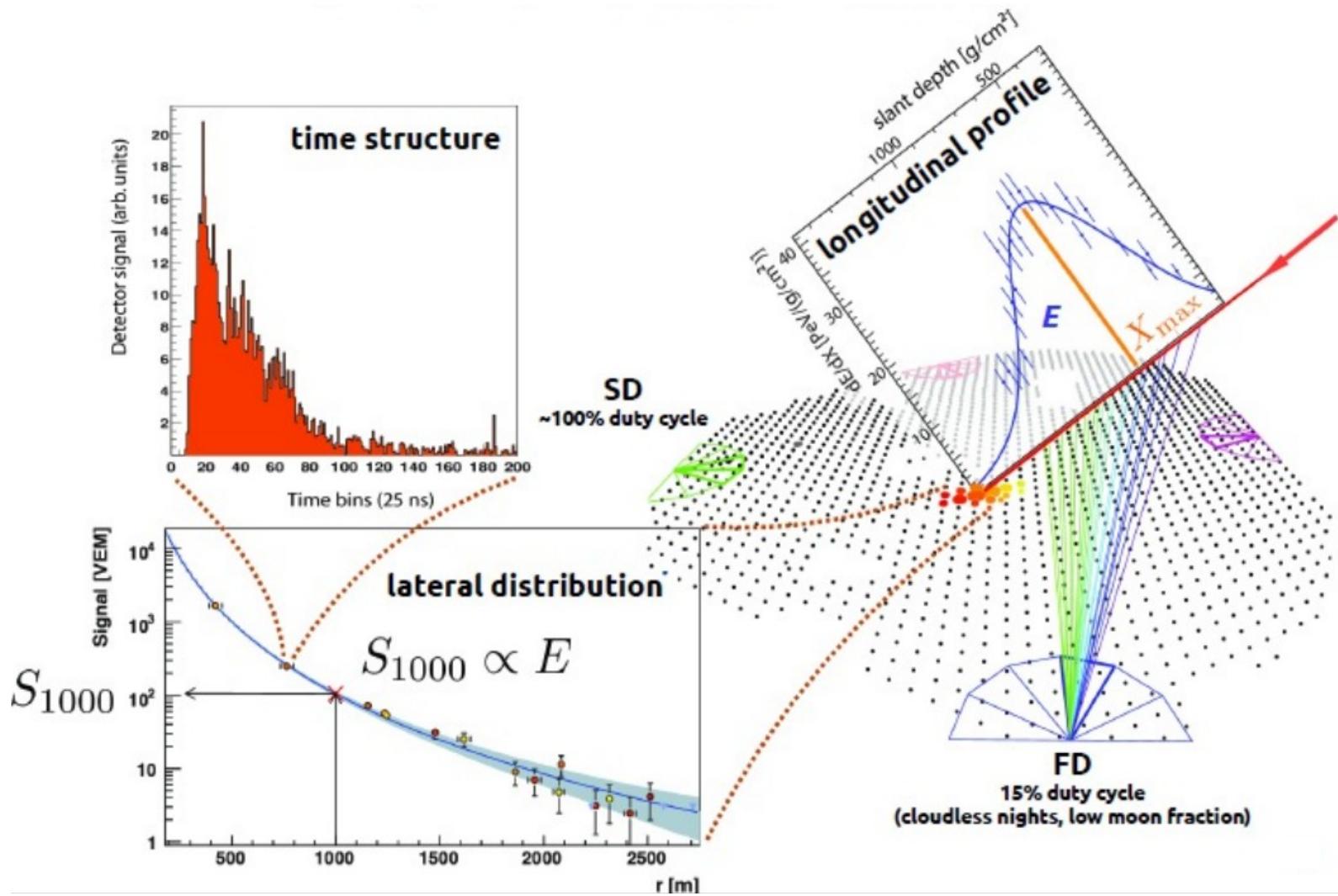


Malargüe, Mendoza, Argentina

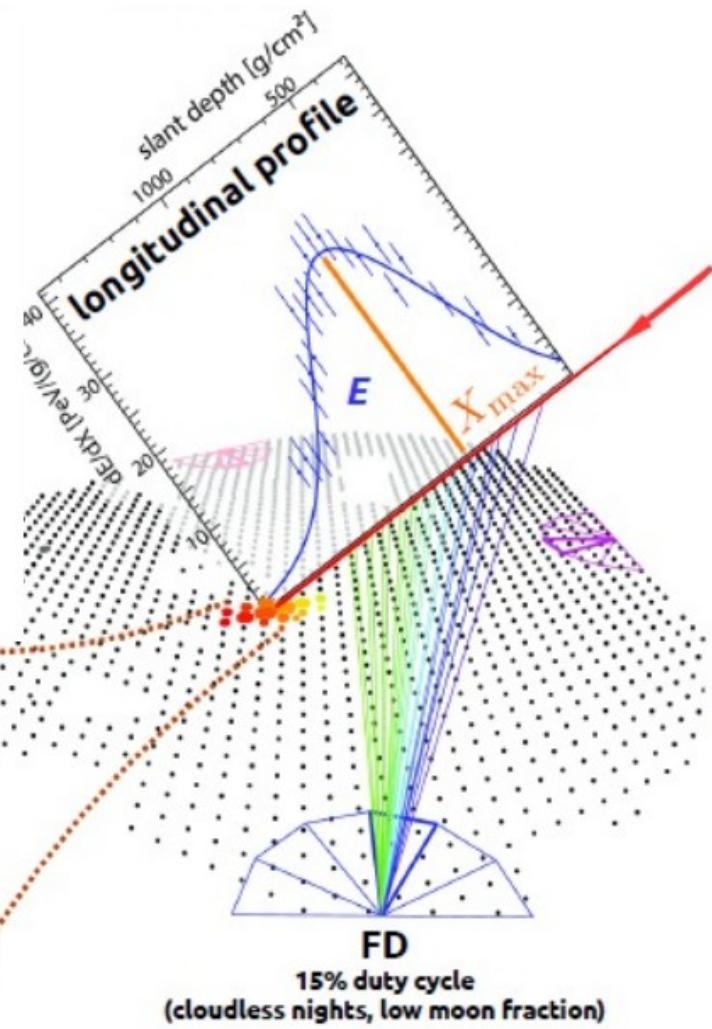
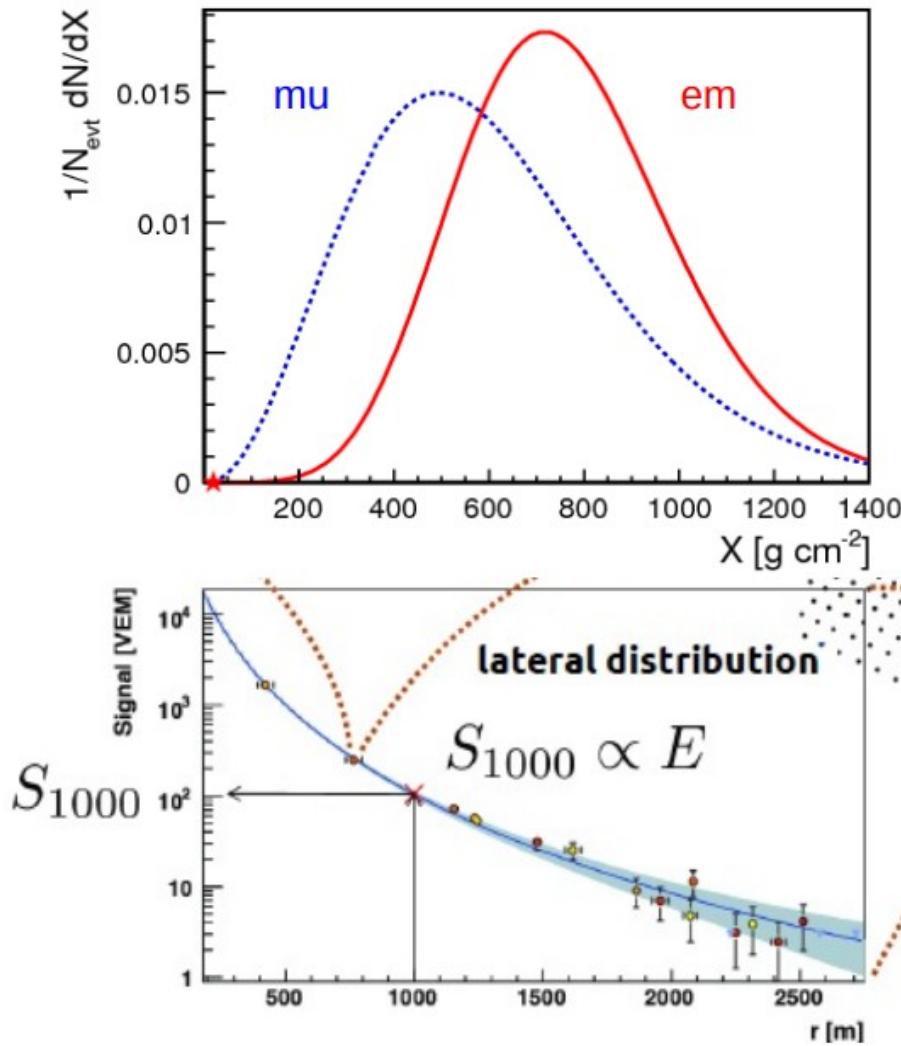
Pierre Auger Observatory



Observables

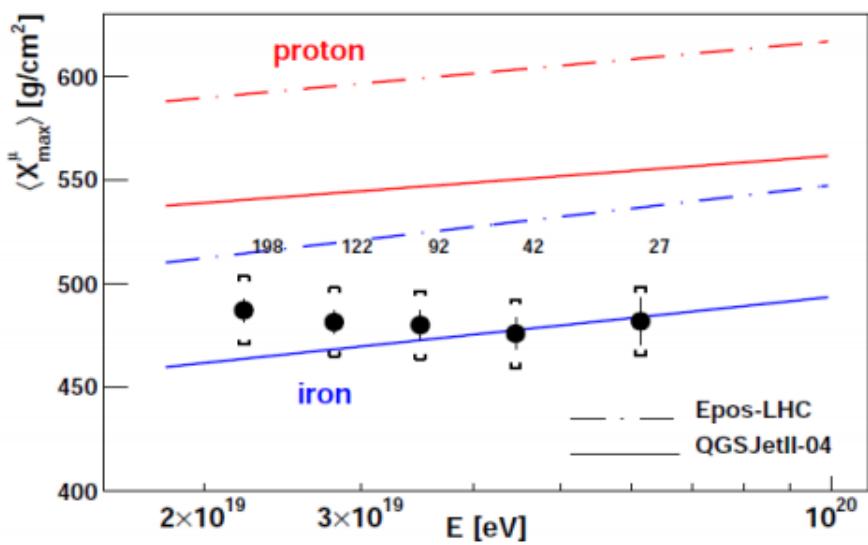
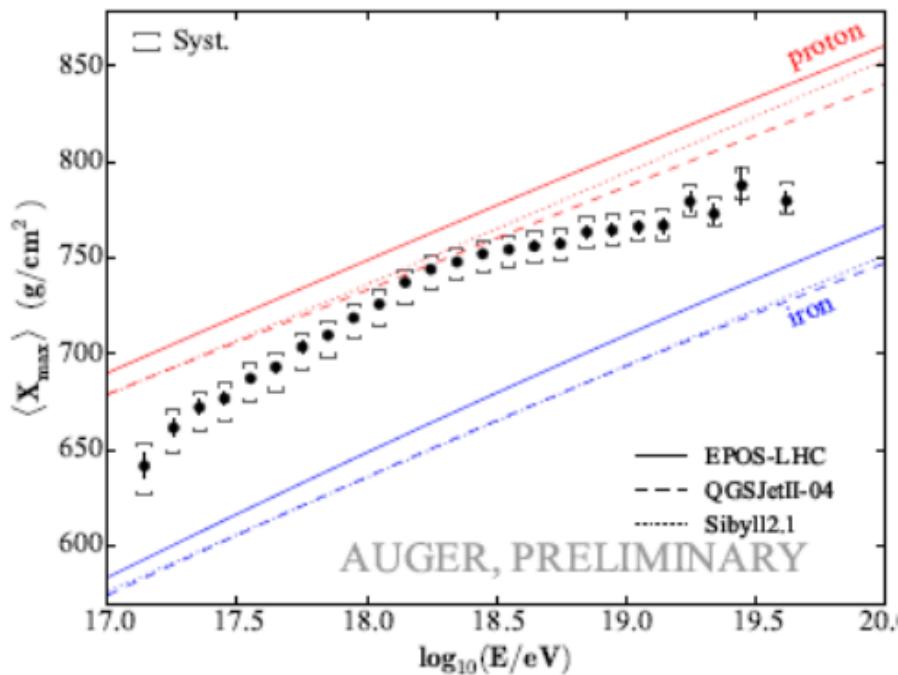


Observables

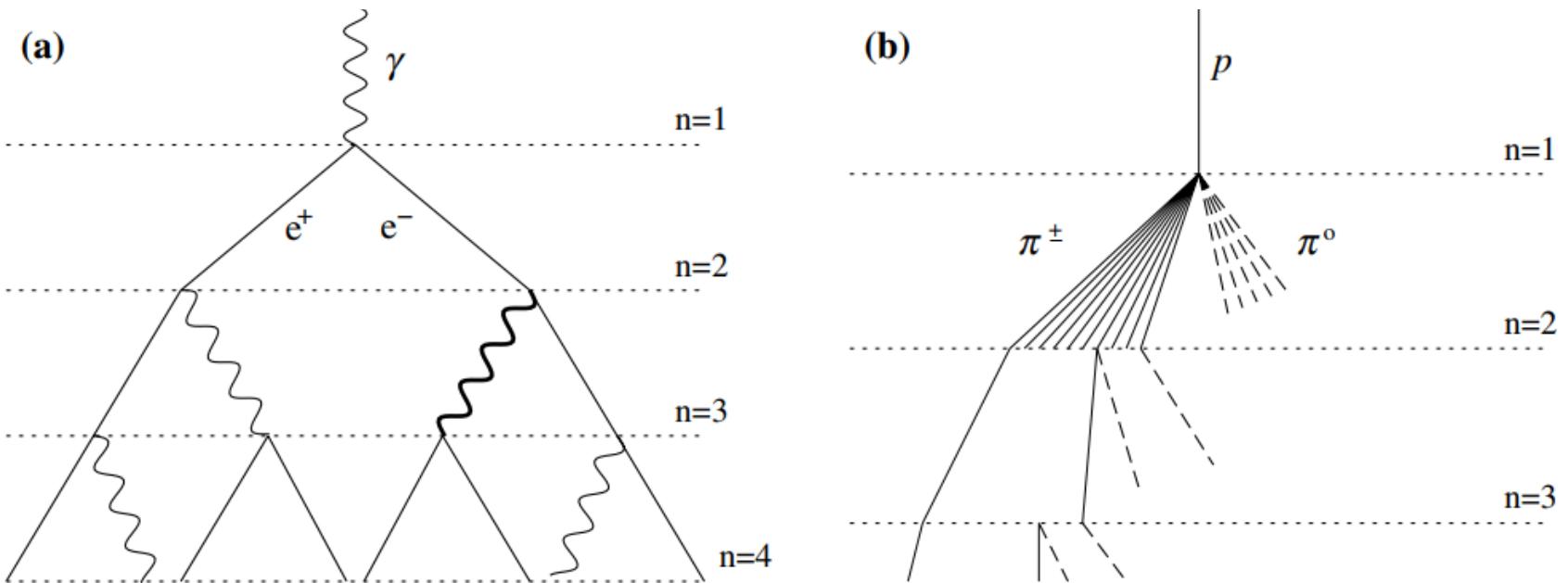


Predictions & data mismatch

average



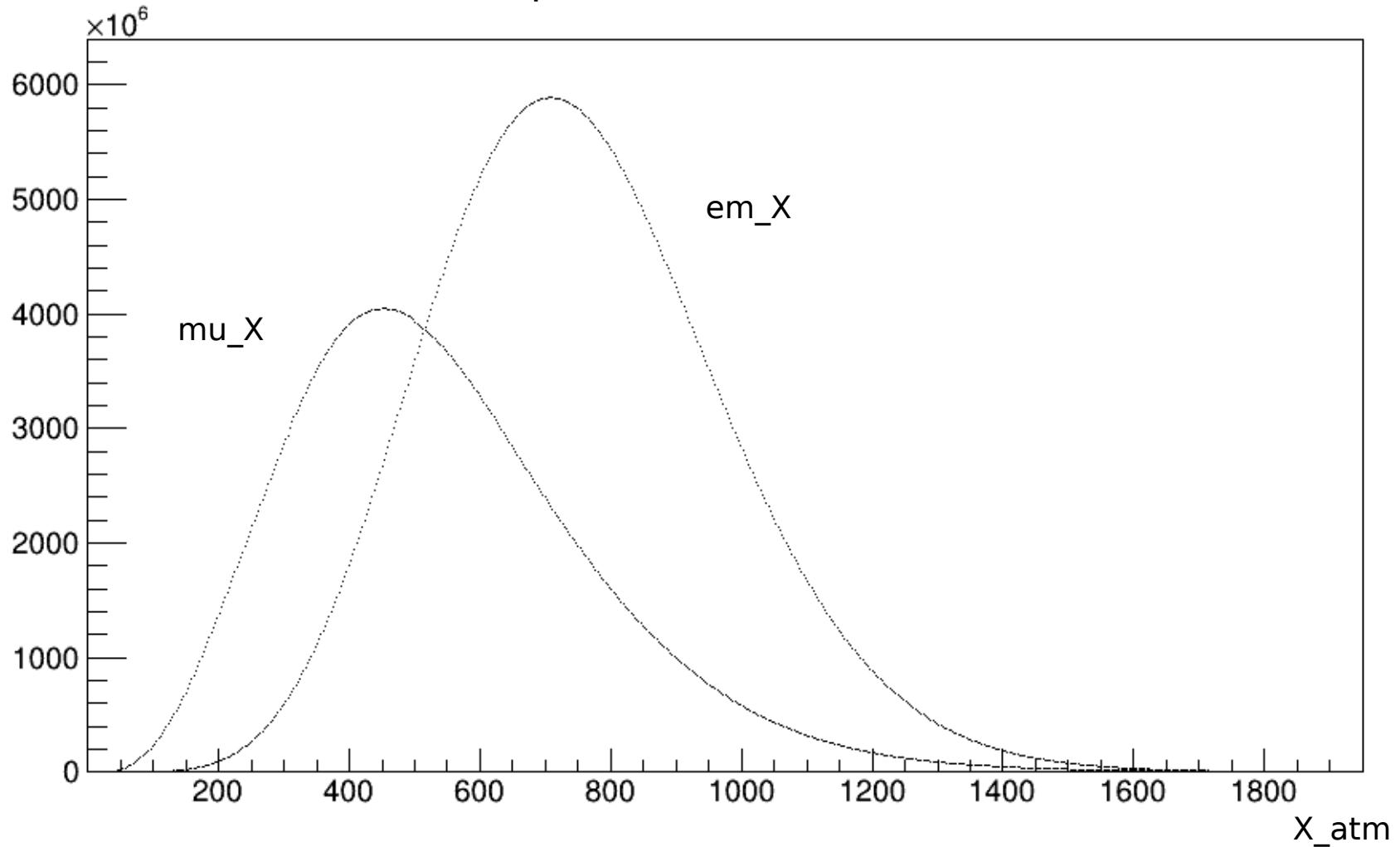
Our toy model



+ particle energy spectra

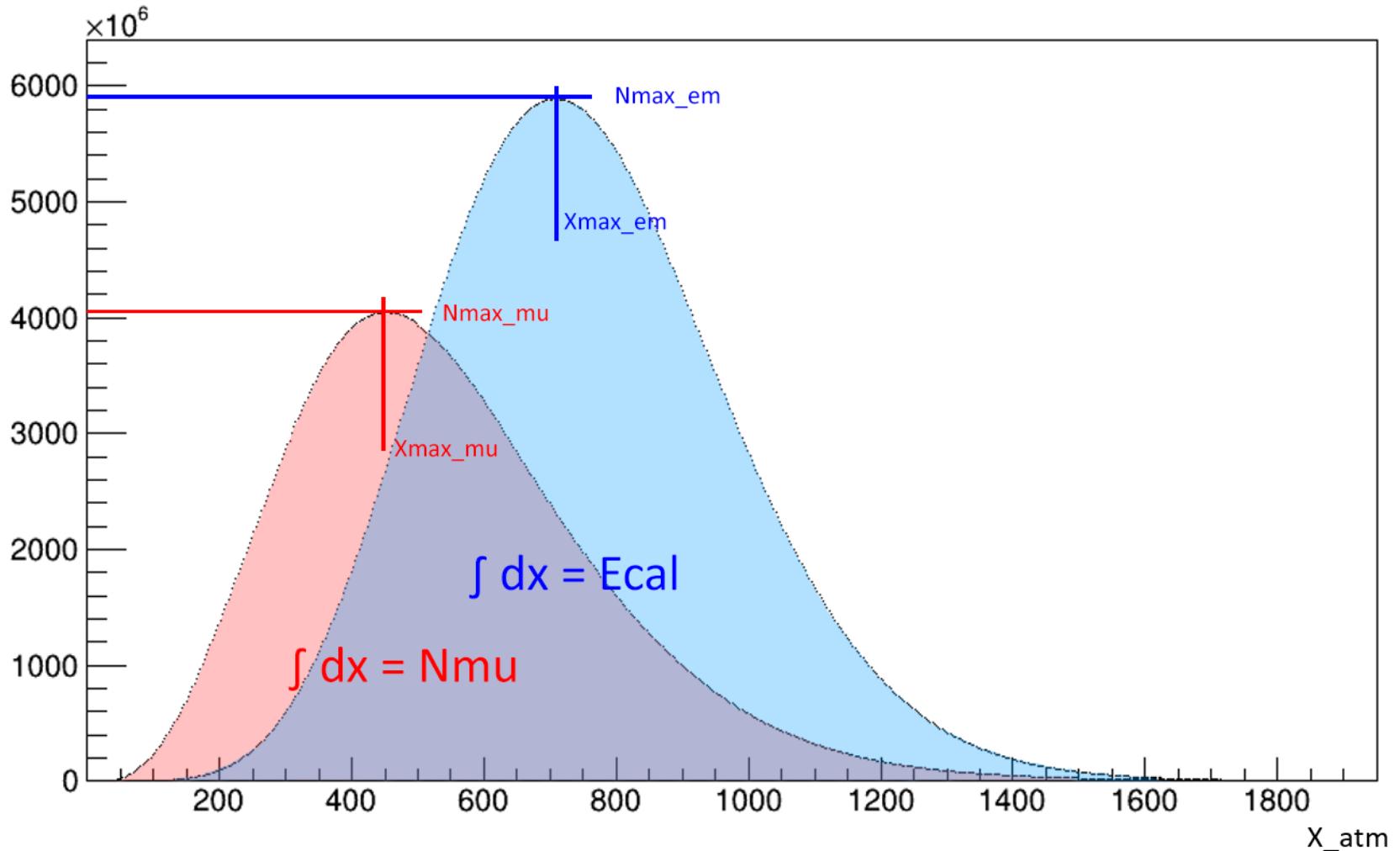
Our toy model

Muon & EM profiles of a 10^{19} eV shower

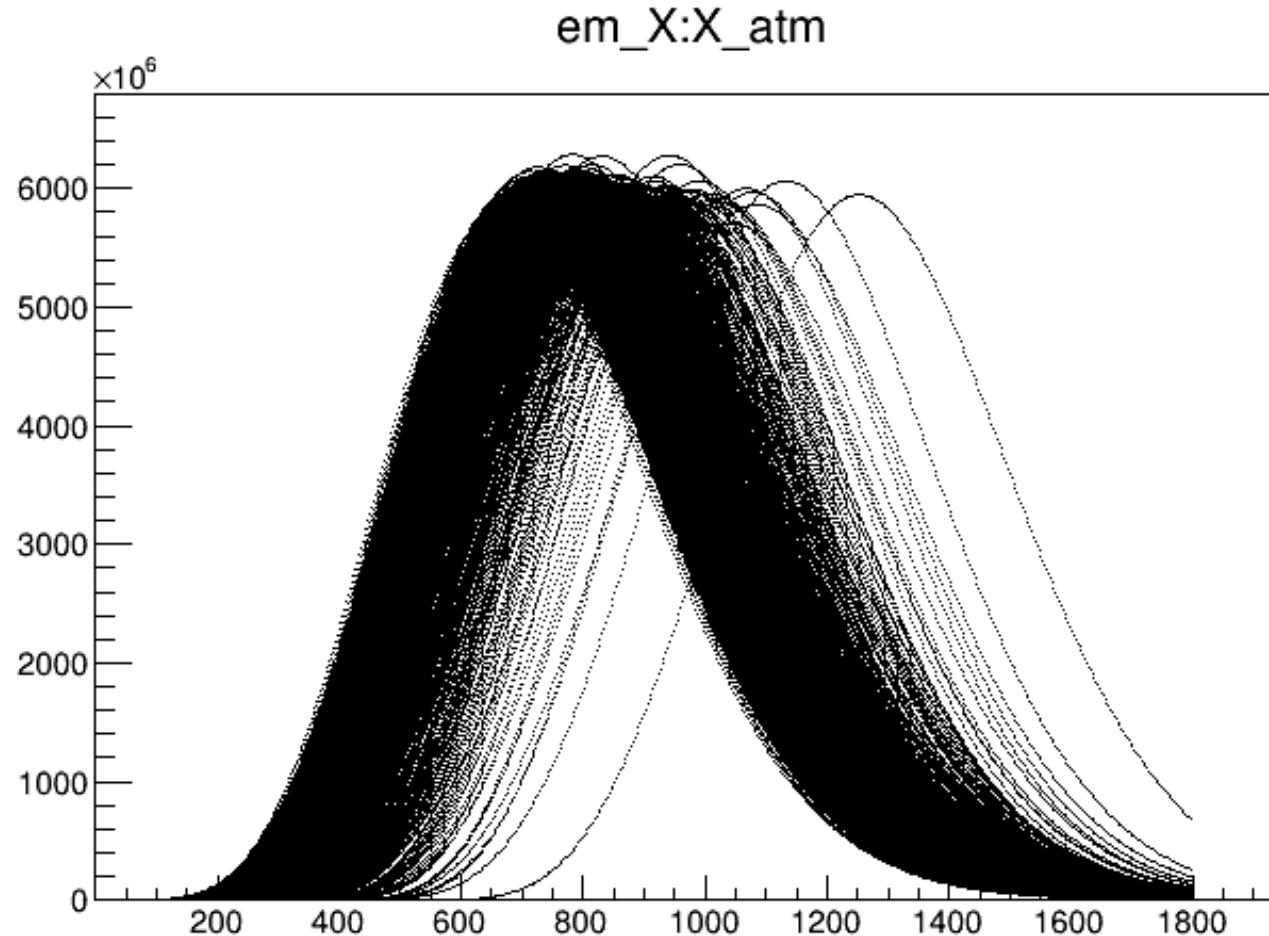


Our toy model

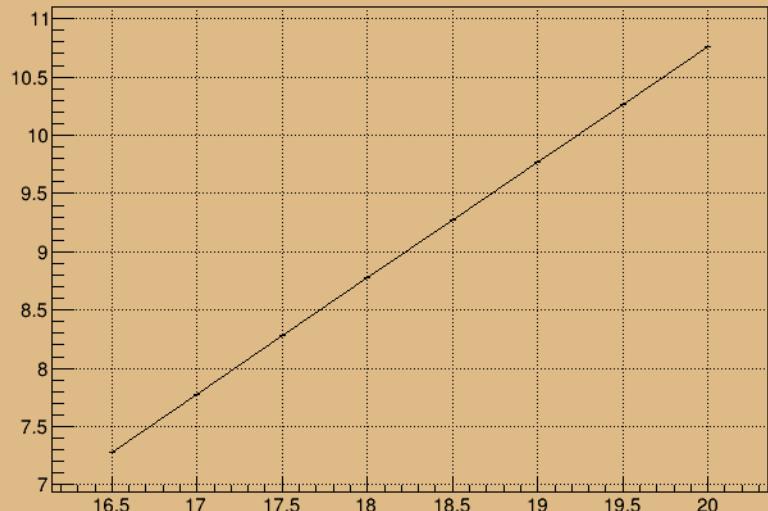
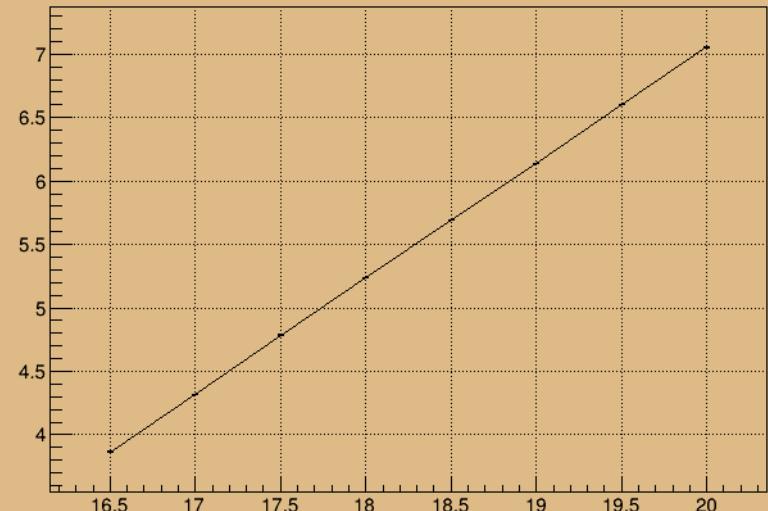
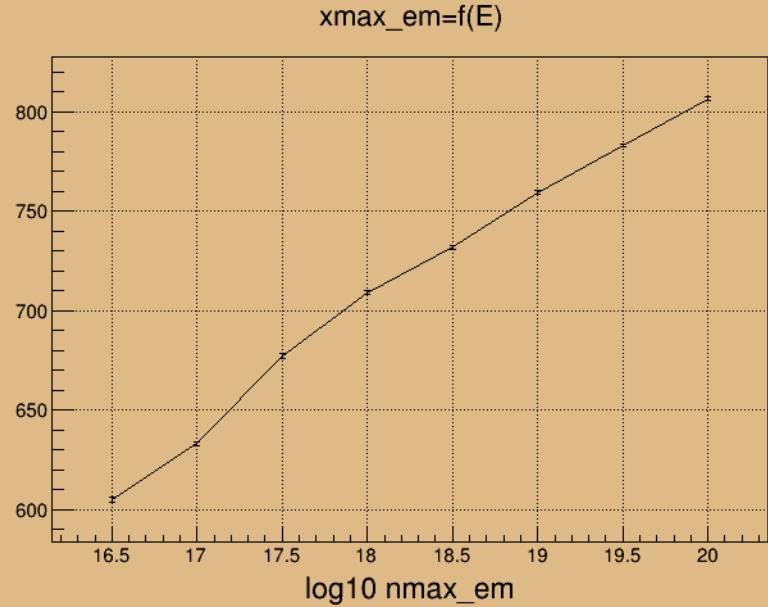
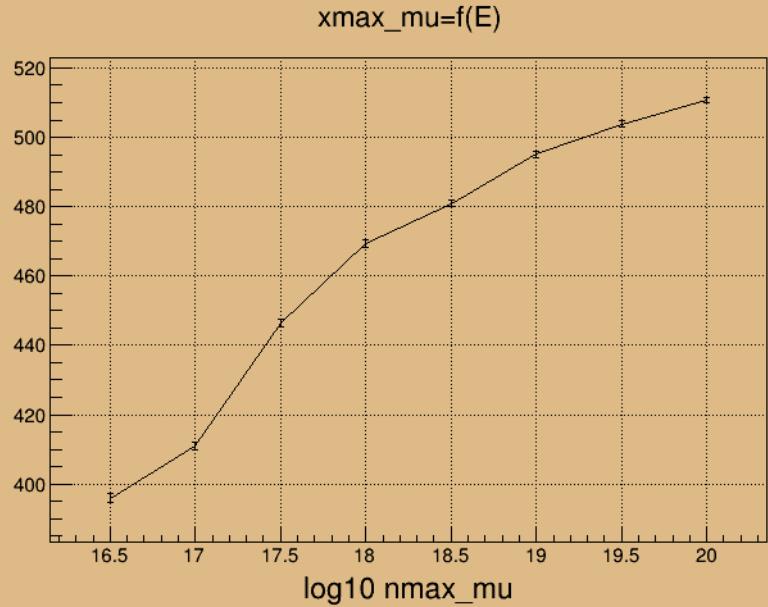
Muon & EM profiles of a 10^{19} eV shower



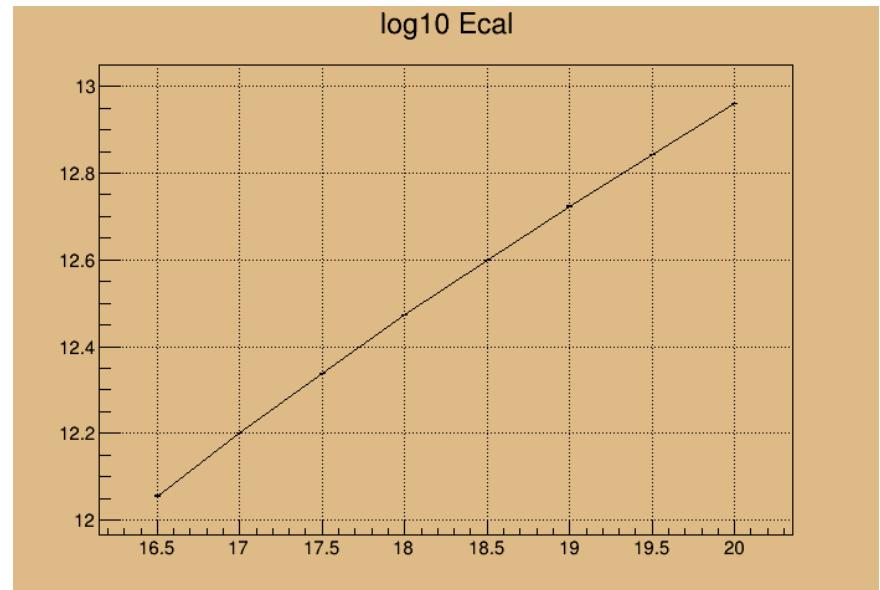
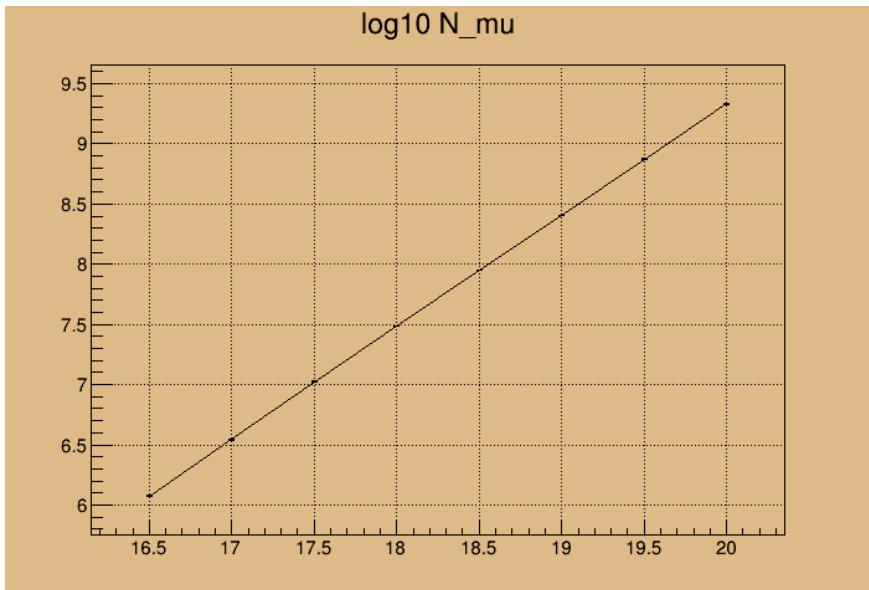
Our toy model



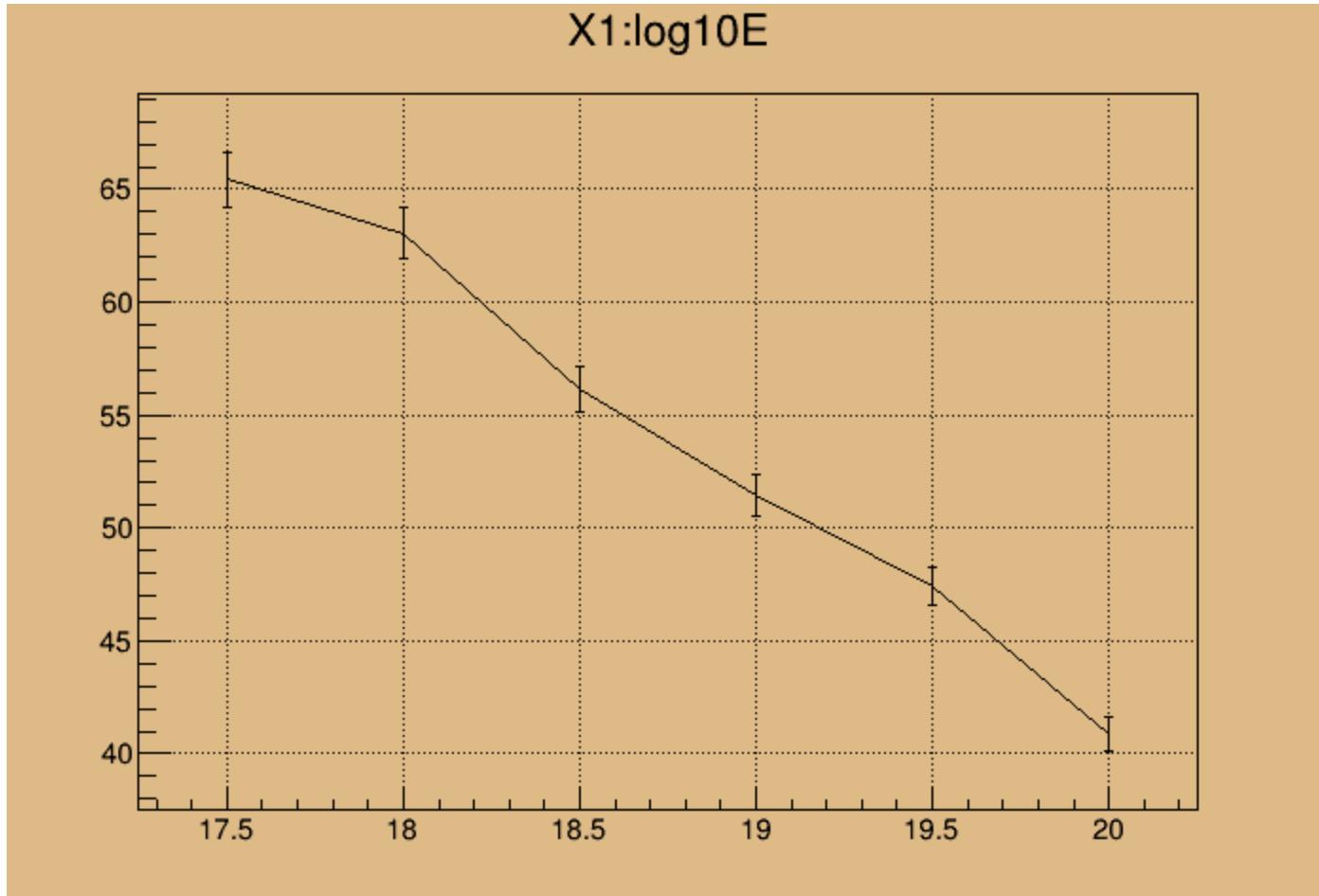
Our toy model



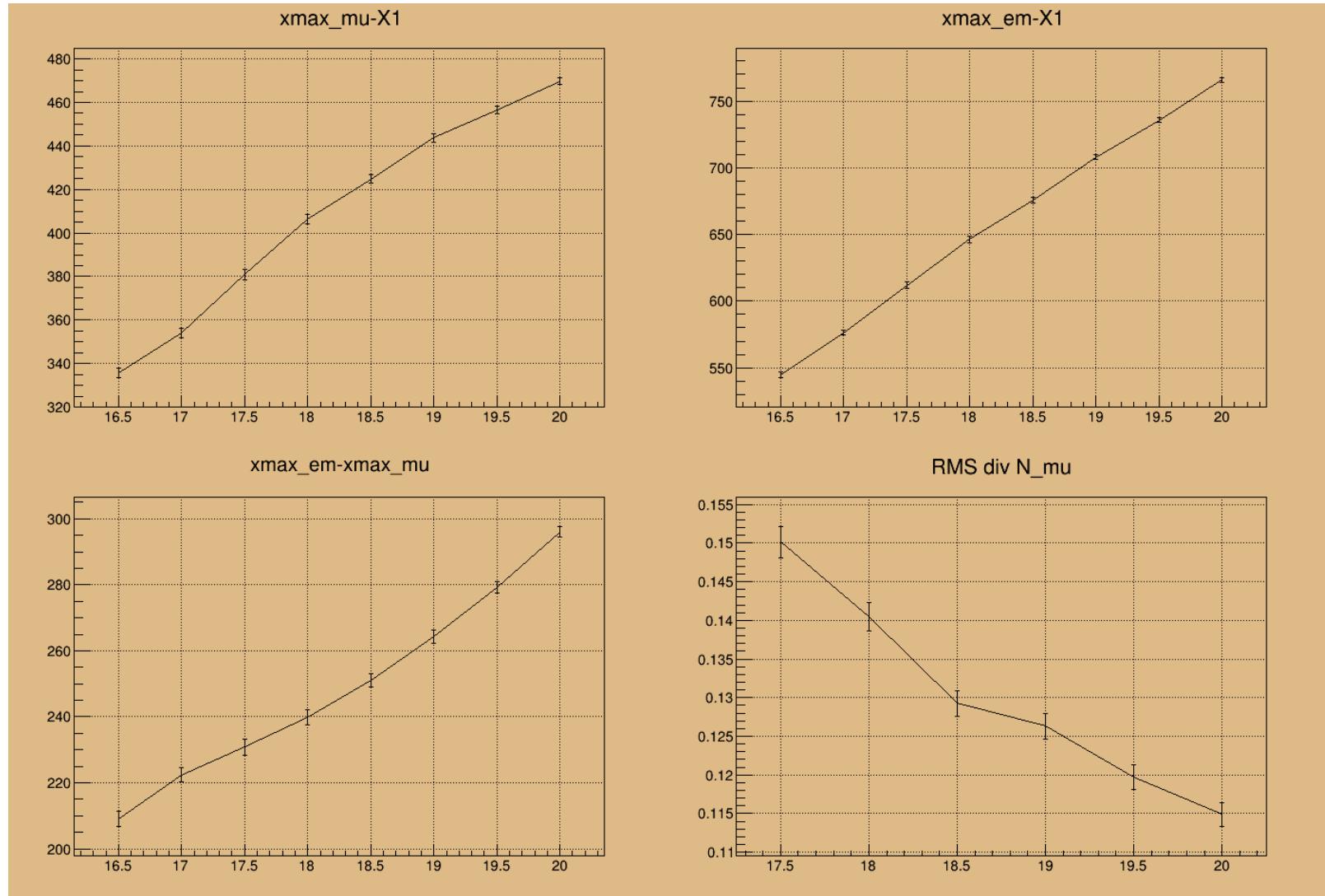
Our toy model



Our toy model

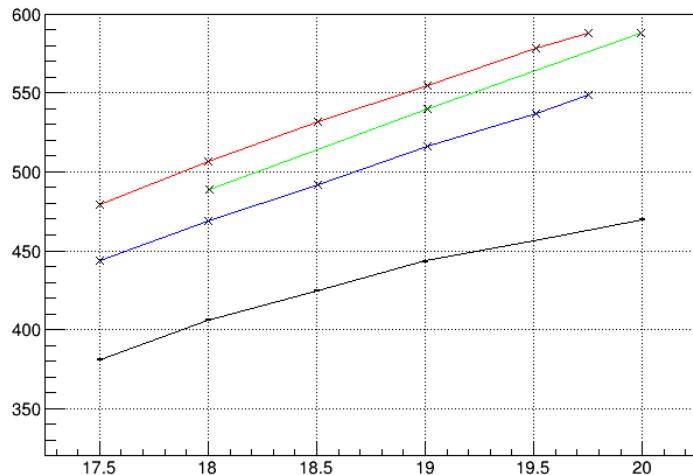


Our toy model

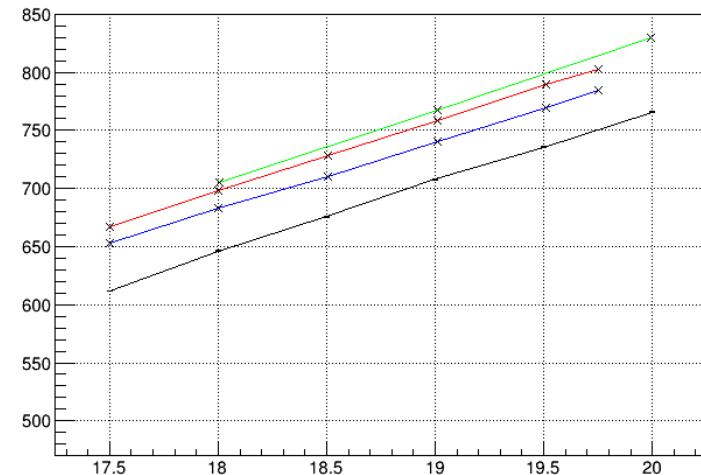


Our toy model

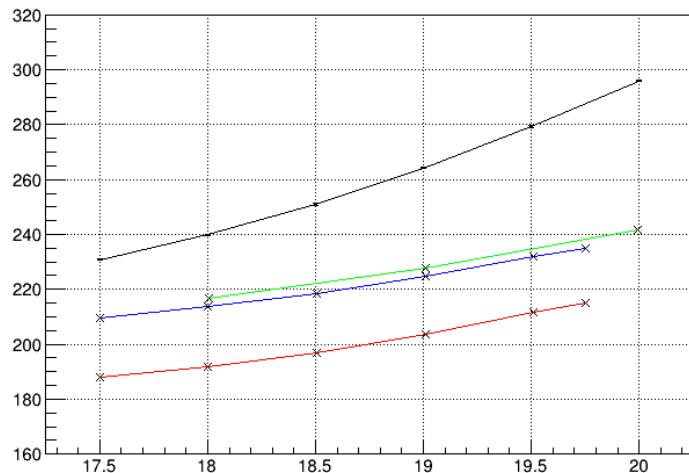
mu xmax-x1



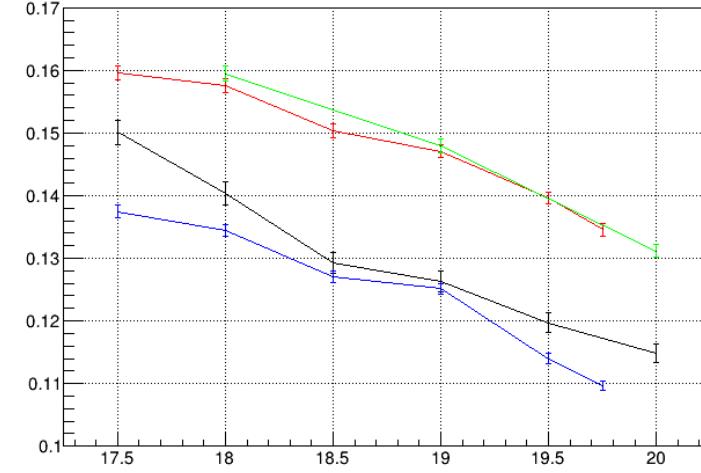
em xmax-x1



Mod xmax em-mu



Mod rms div Nmu



Our toy model

- Interaction multiplicity
- CR collision elasticity
- Neutral/Charged ratio

