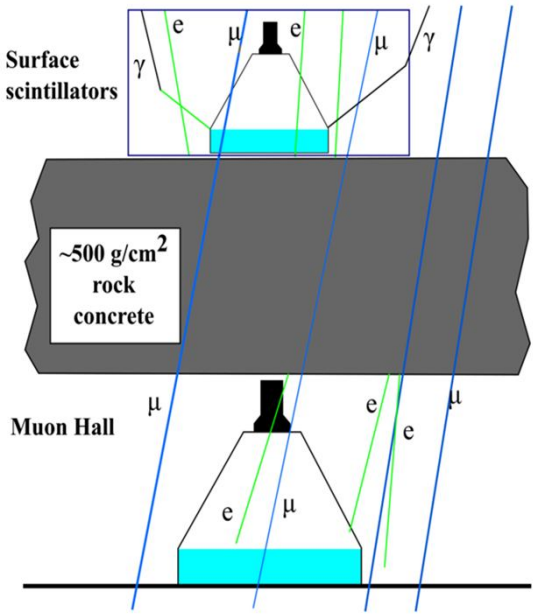
Estimation of depth of maximum by relative muon content in air showers with energy greater than 5 EeV measured by the Yakutsk array

S.P. Knurenko (knurenko@ikfia.ysn.ru)

I.S. Petrov(igor.petrov@ikfia.ysn.ru)

Yu. G. Shafer Institute of Cosmophysical Research and Aeronomy

Yakutsk array



Muon telescope

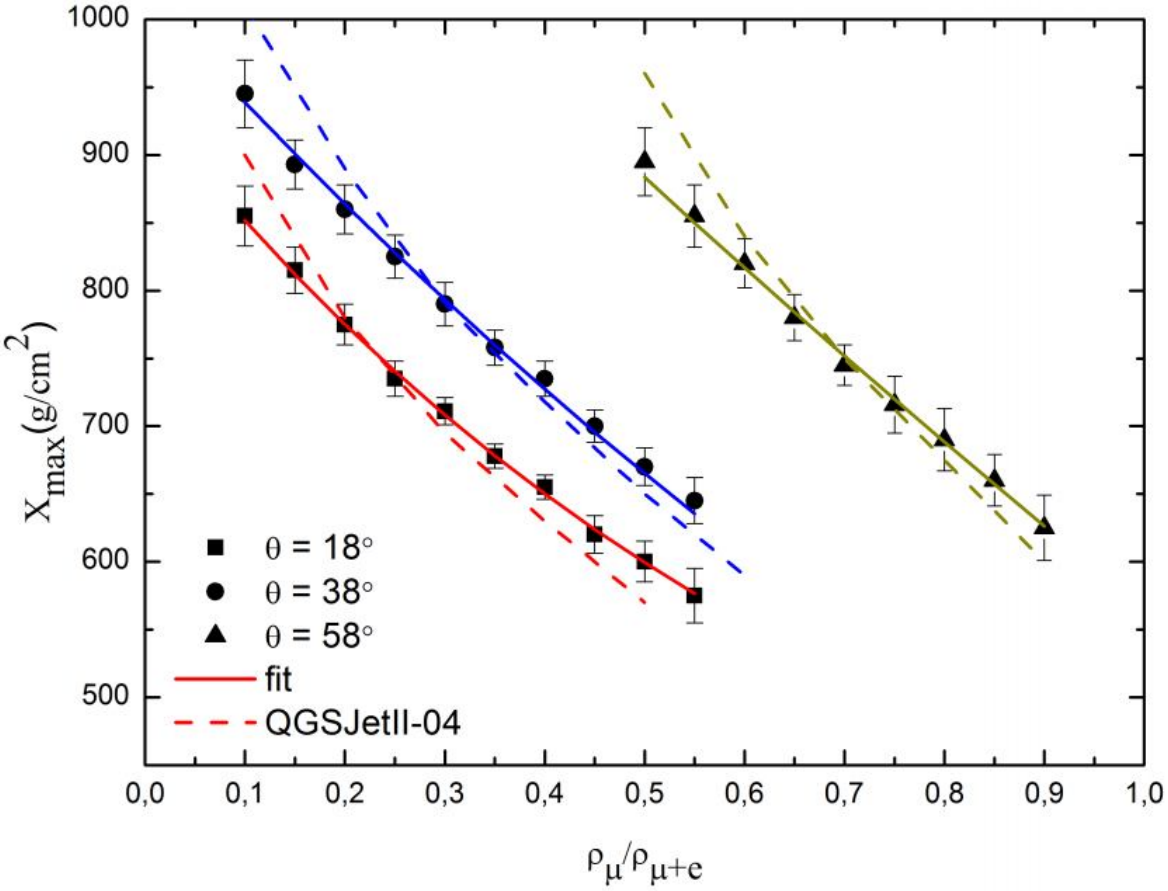
Yakutsk array consists of 6 muon detectors at 800, 500, 300 at 150 m from the center and 3 muon telescops

Area of the muon detectors: 16 m^2, 20 m^2, 190 m^2
Area of the muon telescopes: 2 m^2 each.

Area of the Yakutsk array: 13 km^2

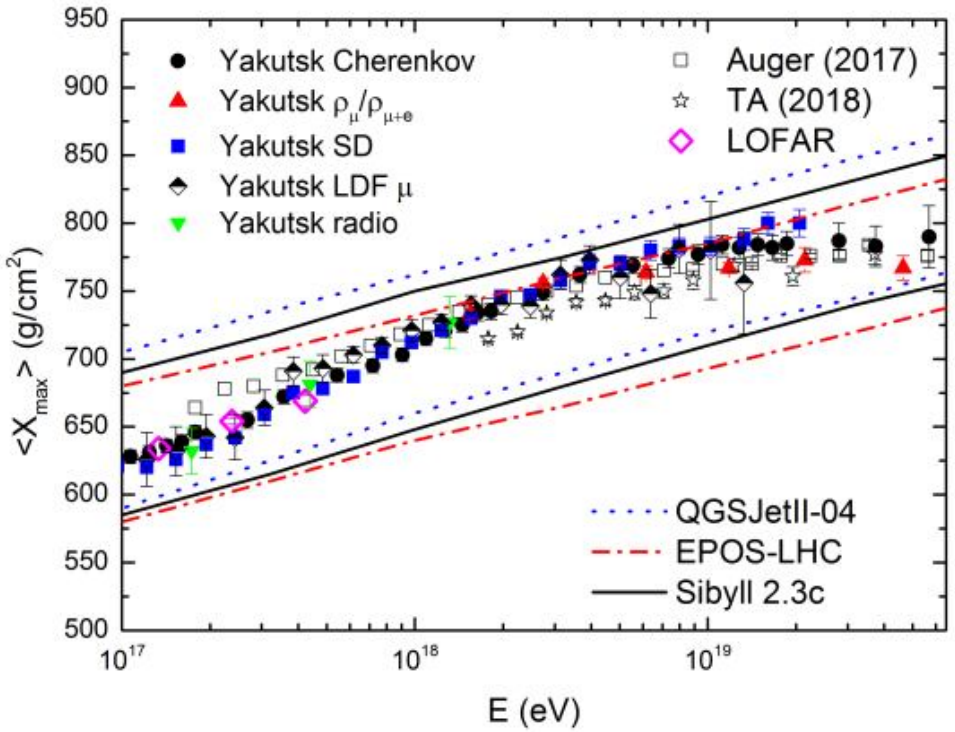
Energy range: 10^{15}-10^{20} eV,

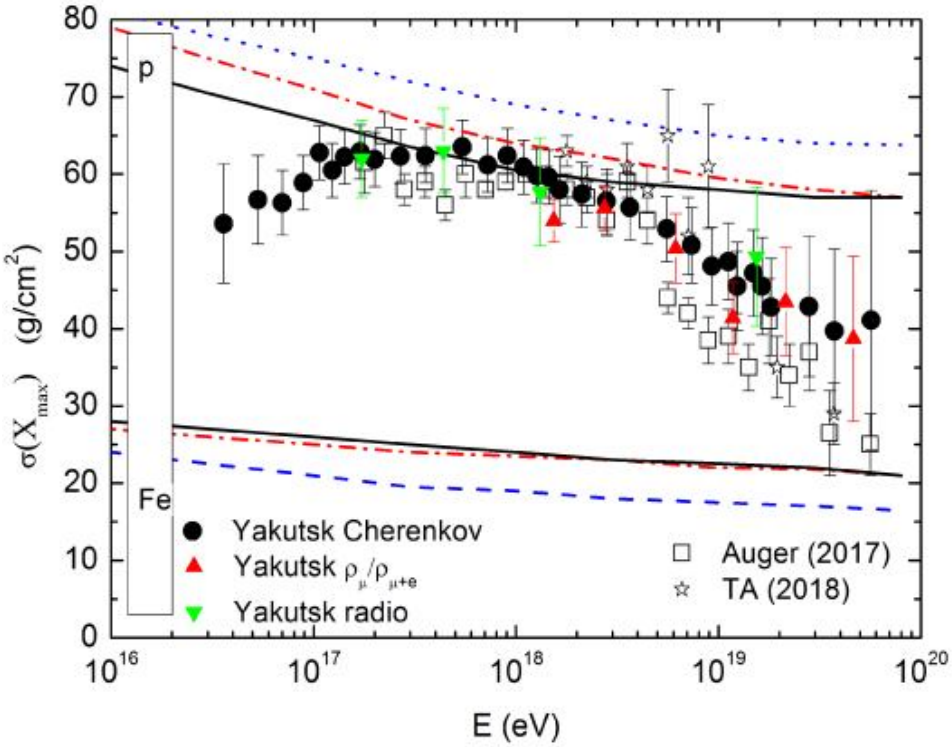
Relationship between X_{max} and $\rho_\mu/\rho_{\mu+e}$



$$X_{max} = (535 + 2887 \cdot (\sec\theta - 1)) \cdot \exp\left(-\frac{(\rho_\mu/\rho_{\mu+e})_\theta}{0.521 + 3.980 \cdot (\sec\theta - 1)}\right) + (386 - 2524(\sec\theta - 1))$$

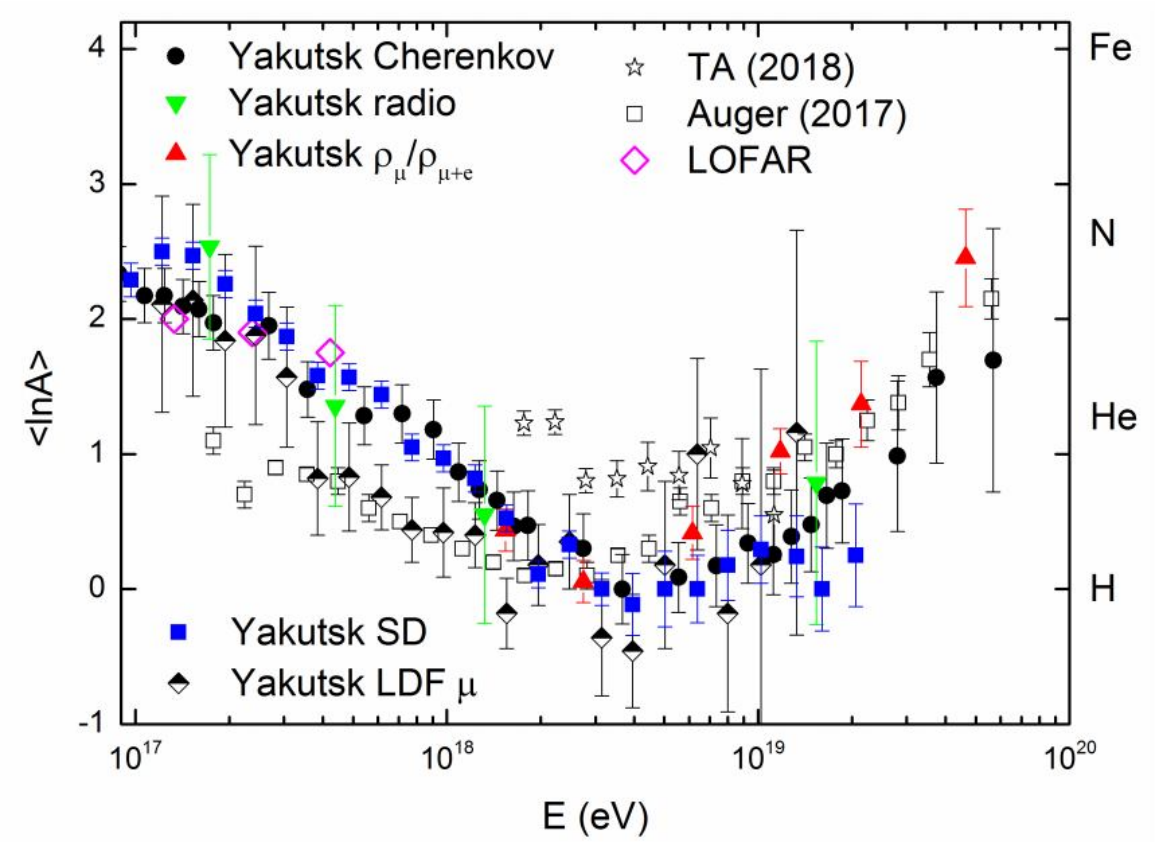
$<X_{max}>$ vs E and fluctuation of $<X_{max}>$





$$\sigma^2(X_{\max}) = \sigma^2(X_{\max})_{meas} - \sigma^2(X_{\max})_{app}$$

$<X_{max}>$ vs E and MC



$$\langle lnA \rangle = \frac{X_{max}^{exp} - X_{max}^{p}}{X_{max}^{Fe} - X_{max}^{p}} \cdot lnA_{Fe}$$