

Zwischen Knie und Knöchel

Between Knee and Ankle

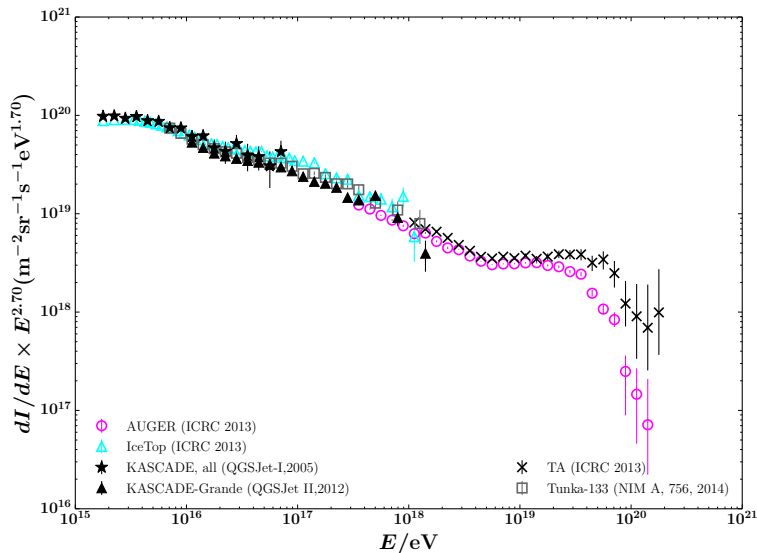
Sven Schoo

Karlsruher Institut für Technologie - Institut für Kernphysik

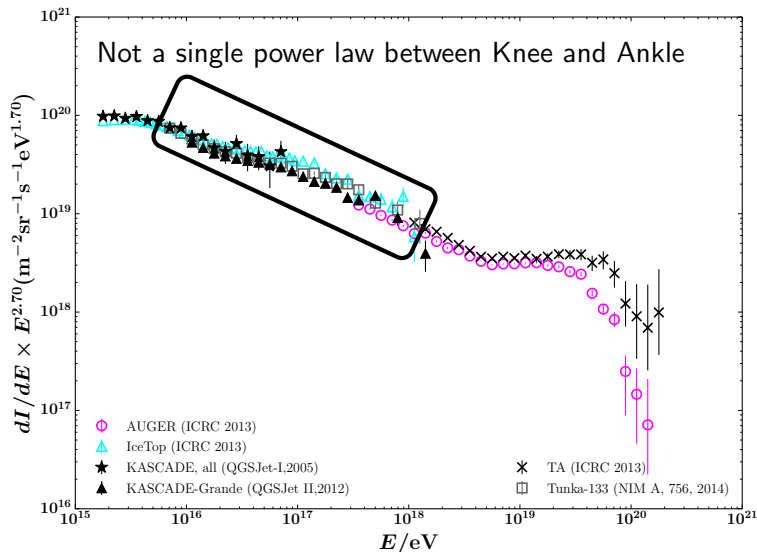
30.09.2014



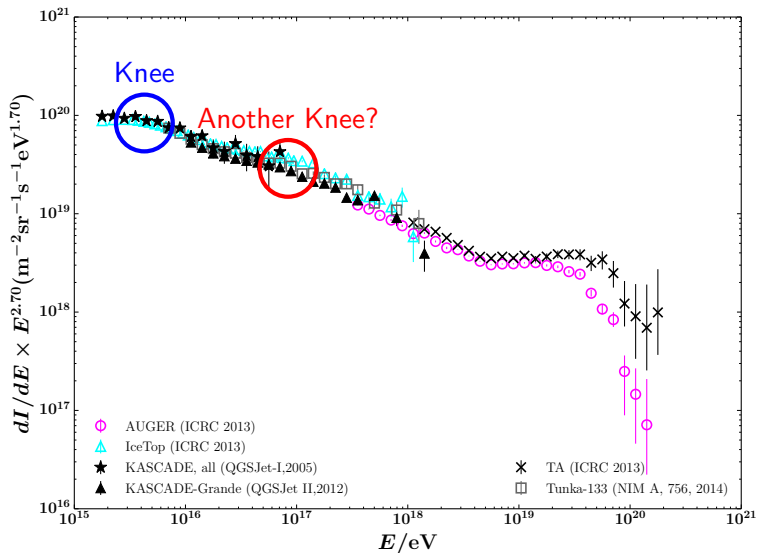
The All-Particle Energy Spectrum



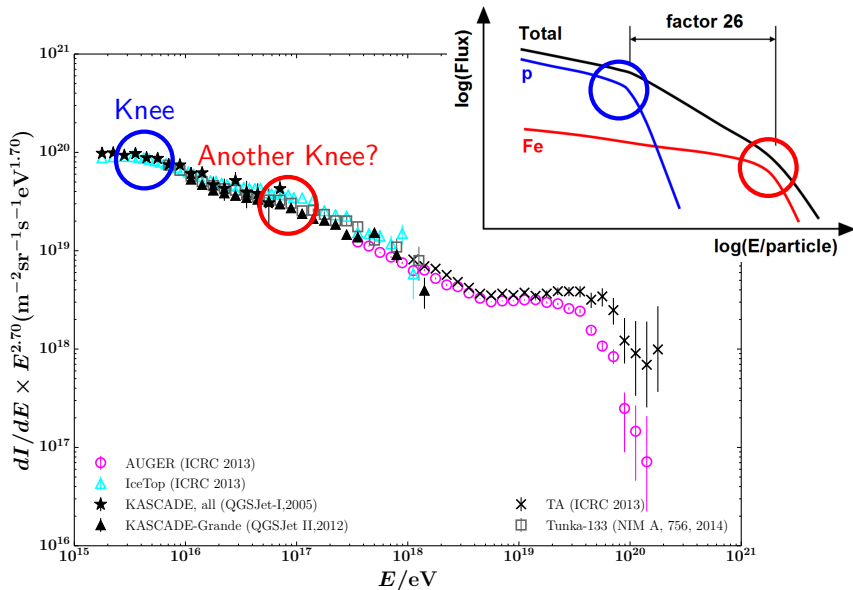
The All-Particle Energy Spectrum



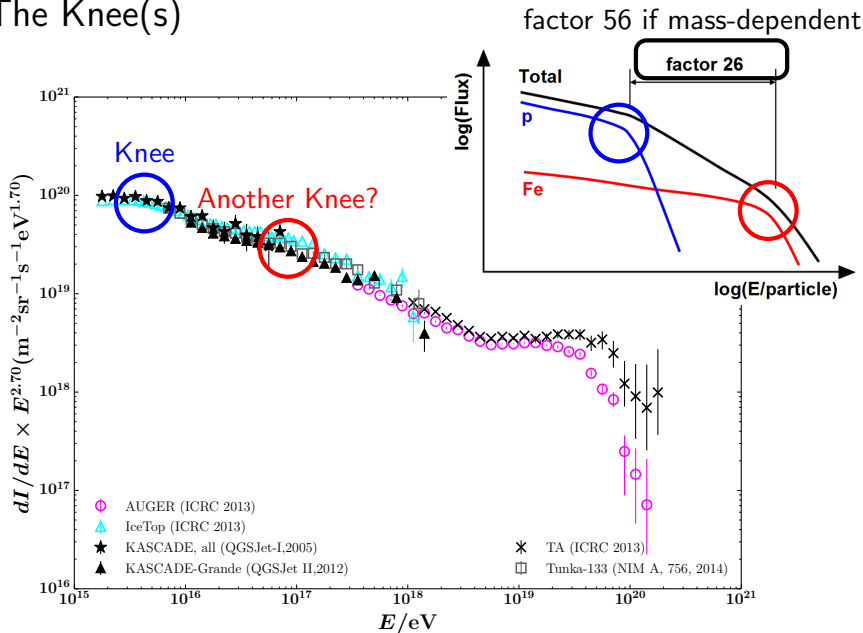
The Knee(s)



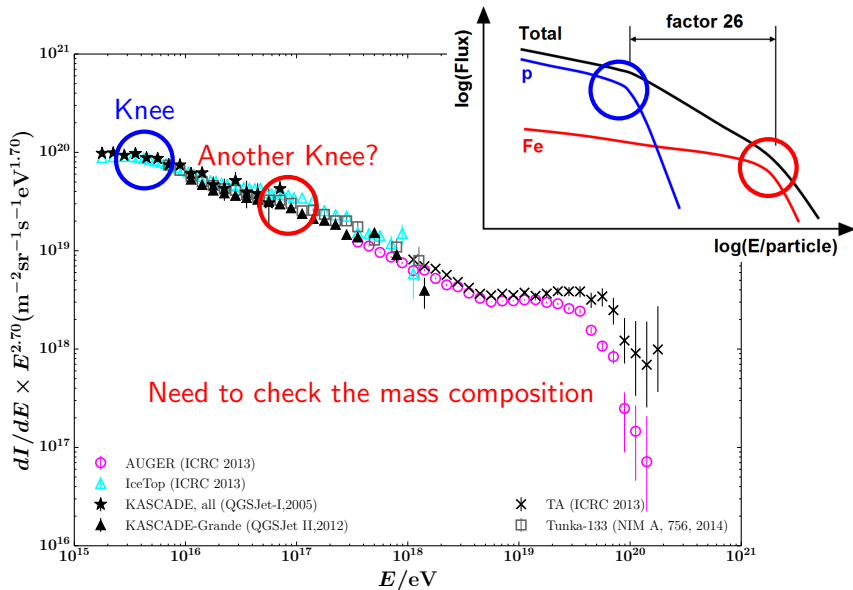
The Knee(s)



The Knee(s)



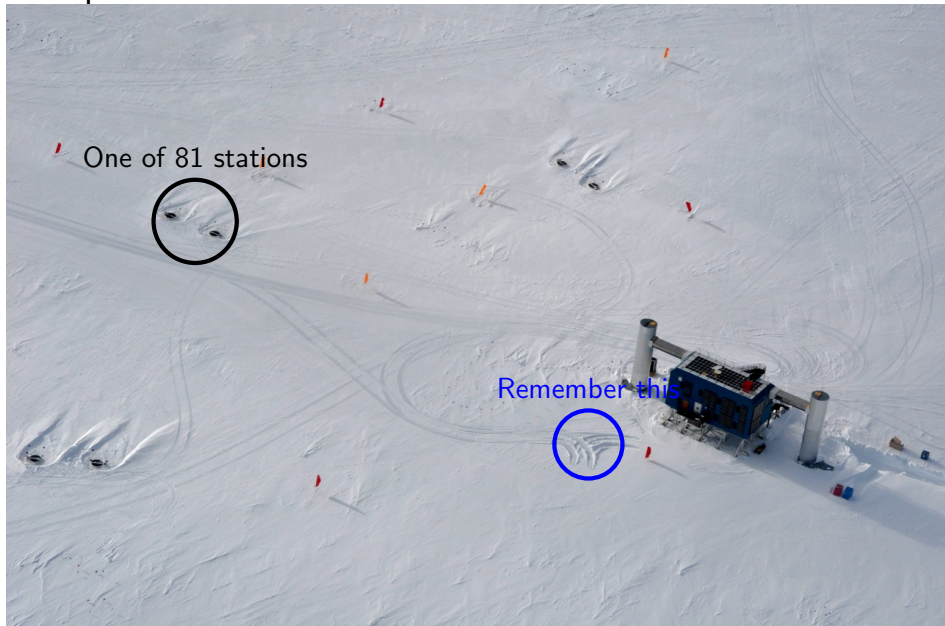
The Knee(s)

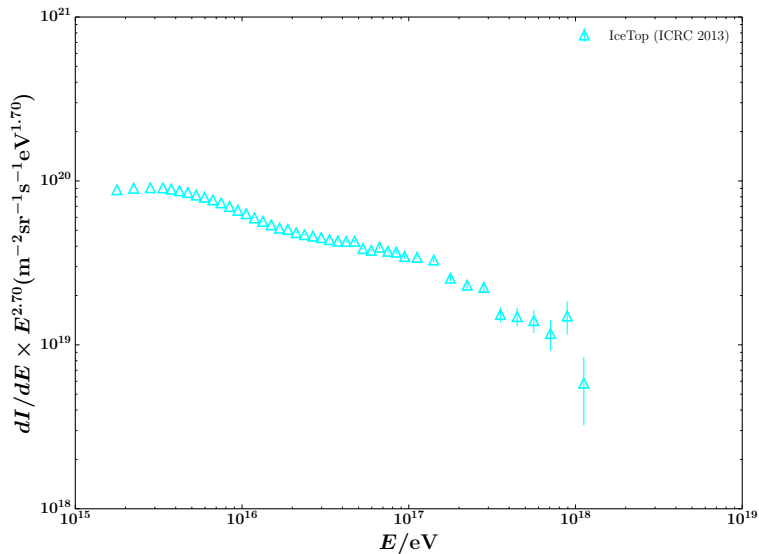


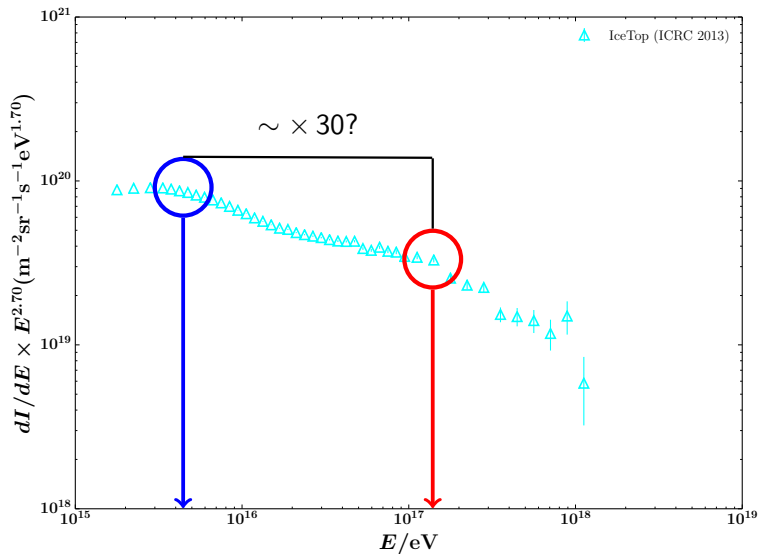
IceTop

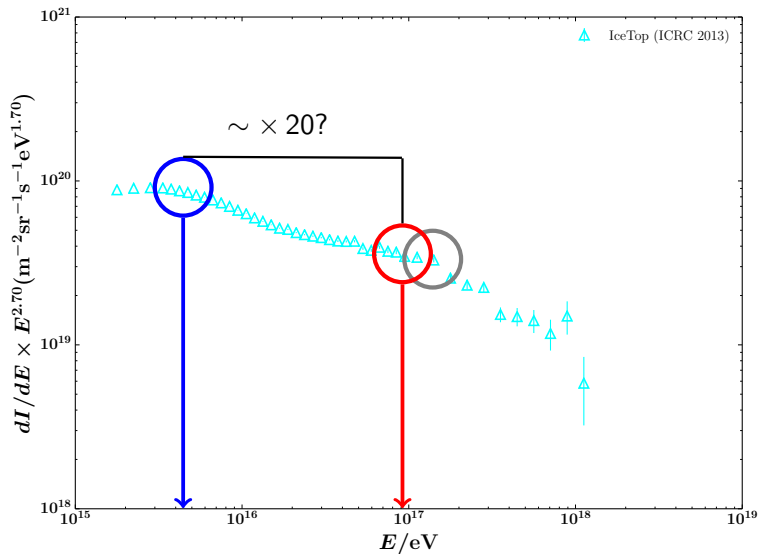


IceTop



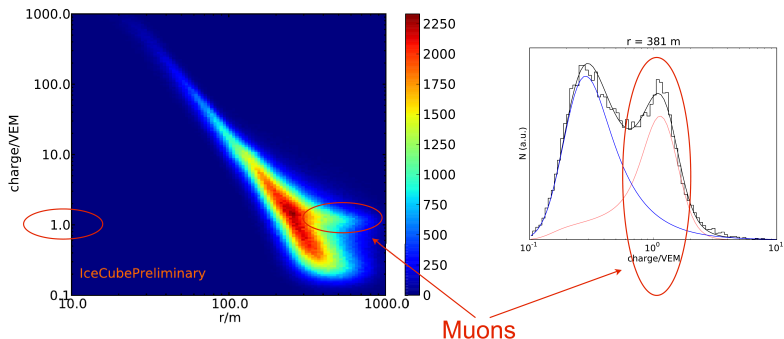








Charge-Distance to Axis Distribution



Muons

$$28^\circ < \theta < 32^\circ$$

$$10 \text{ PeV} < E < 12.6 \text{ PeV}$$

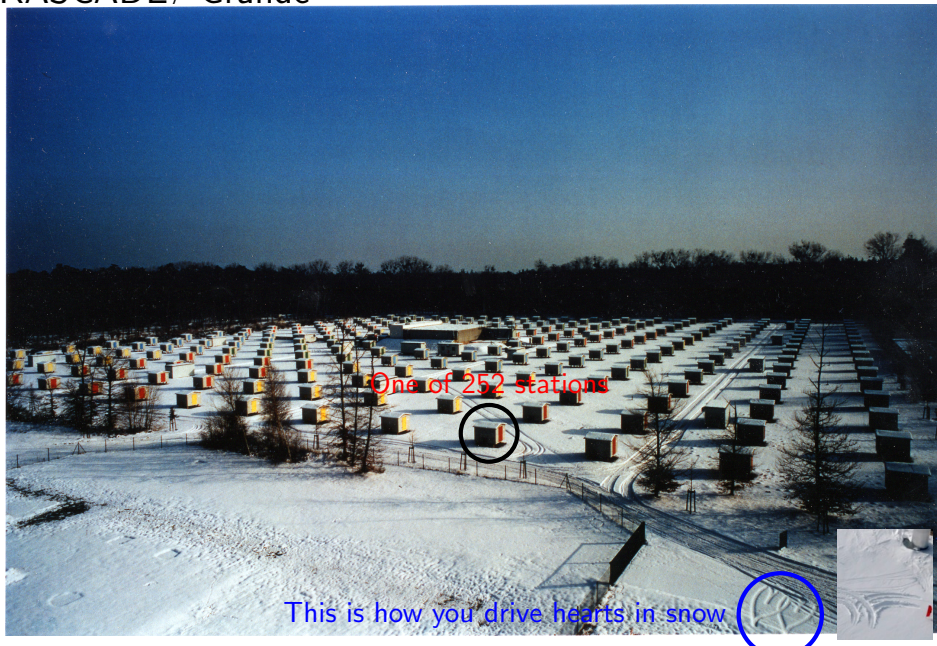
Javier Gonzales, ISVHECRI2014

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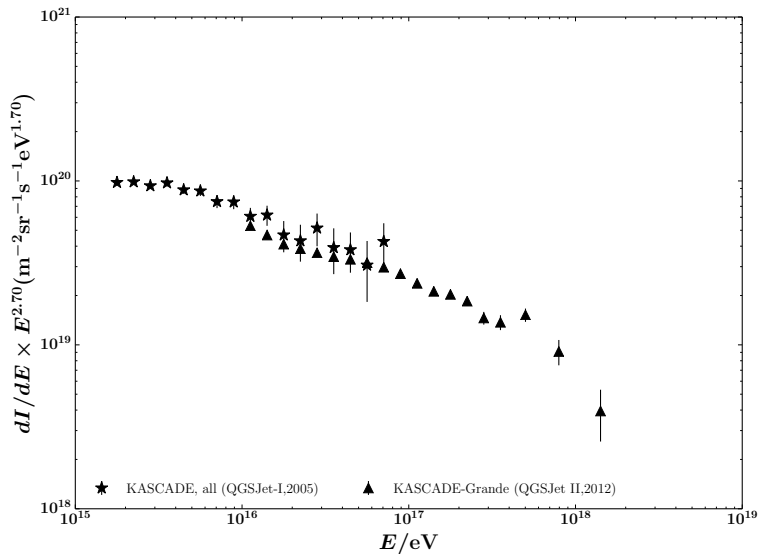
KASCADE/-Grande



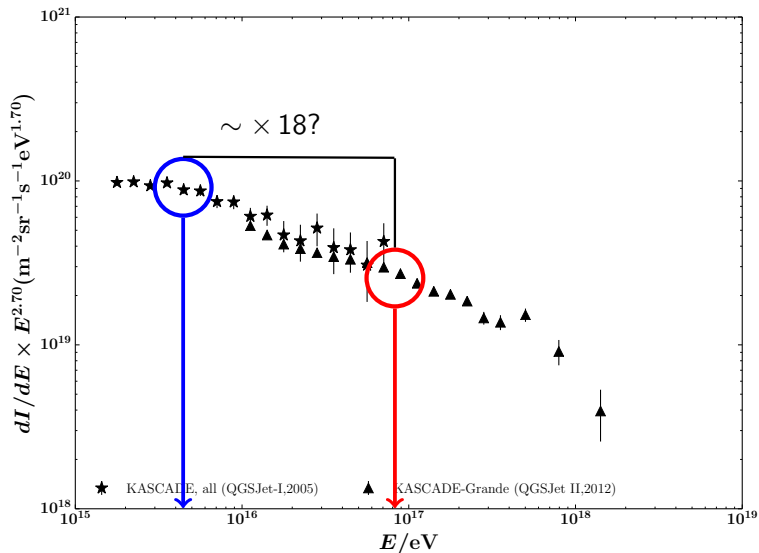
KASCADE/-Grande



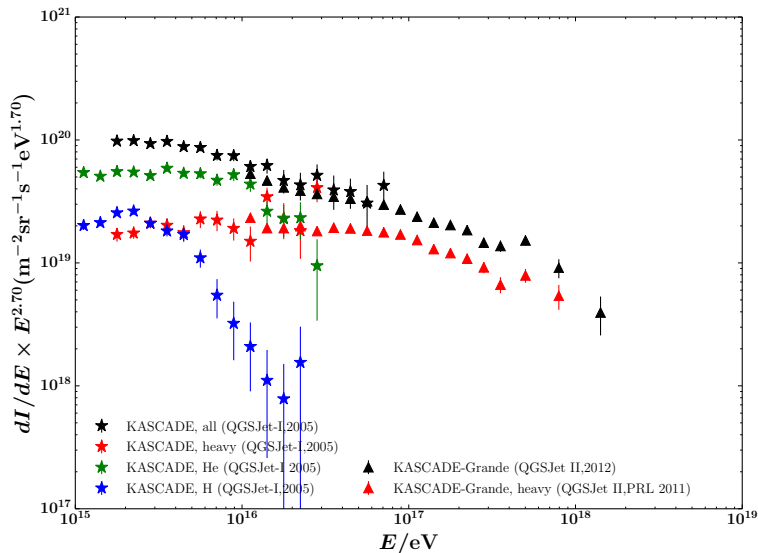
KASCADE/-Grande



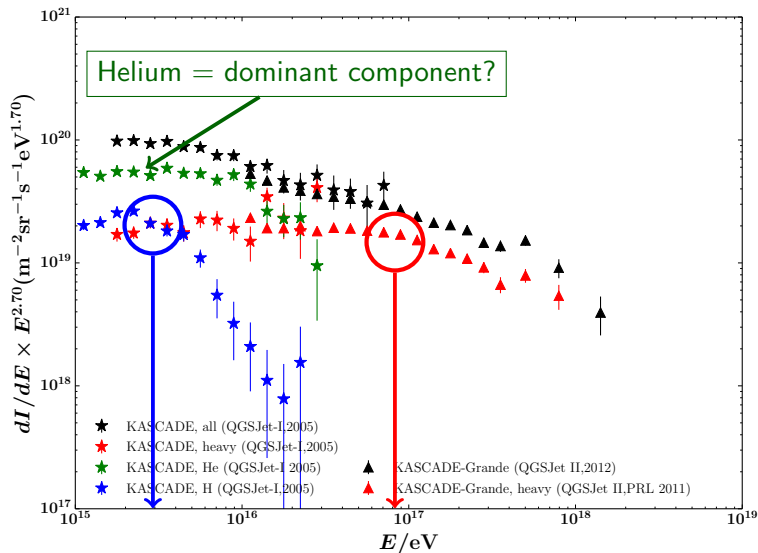
KASCADE/-Grande



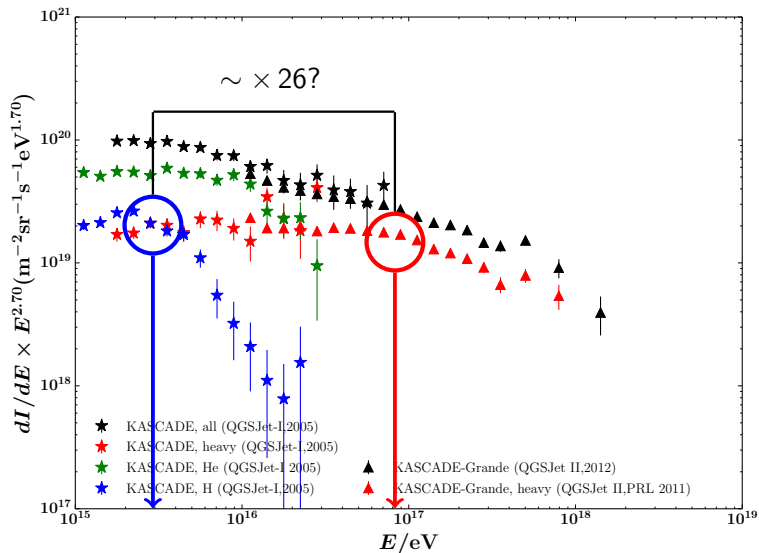
KASCADE/-Grande - composition



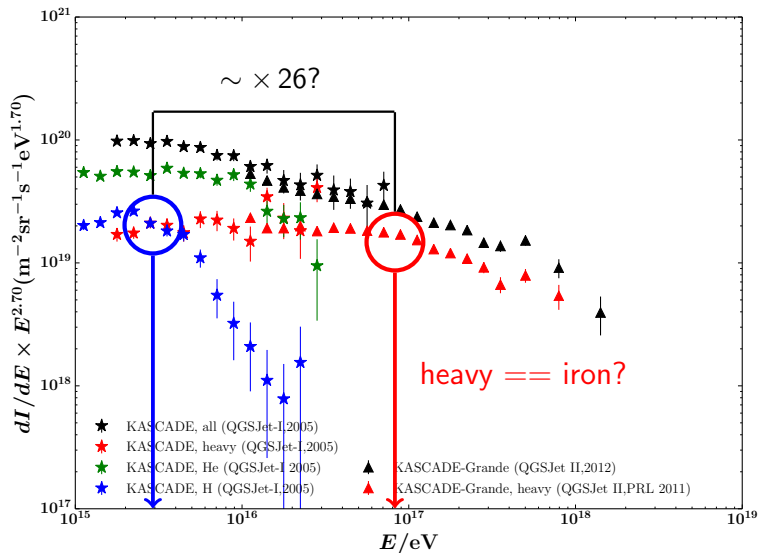
KASCADE/-Grande - composition



KASCADE/-Grande - composition



KASCADE/-Grande - composition



Tunka-133

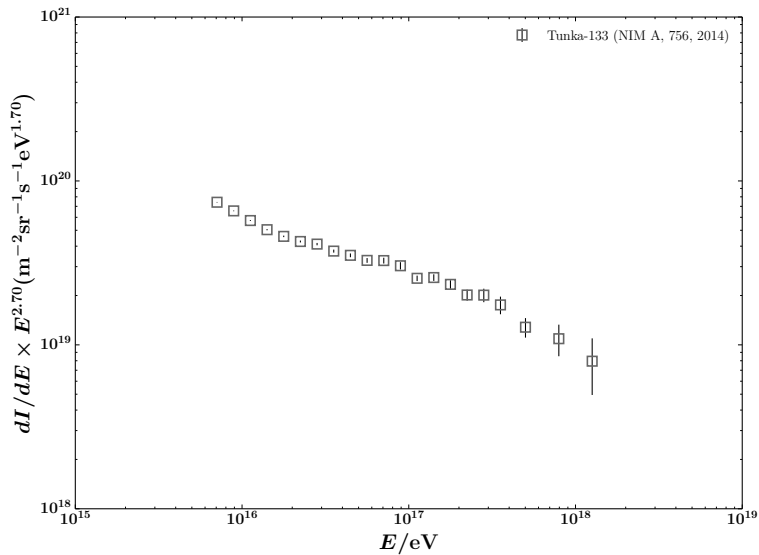


Tunka-133

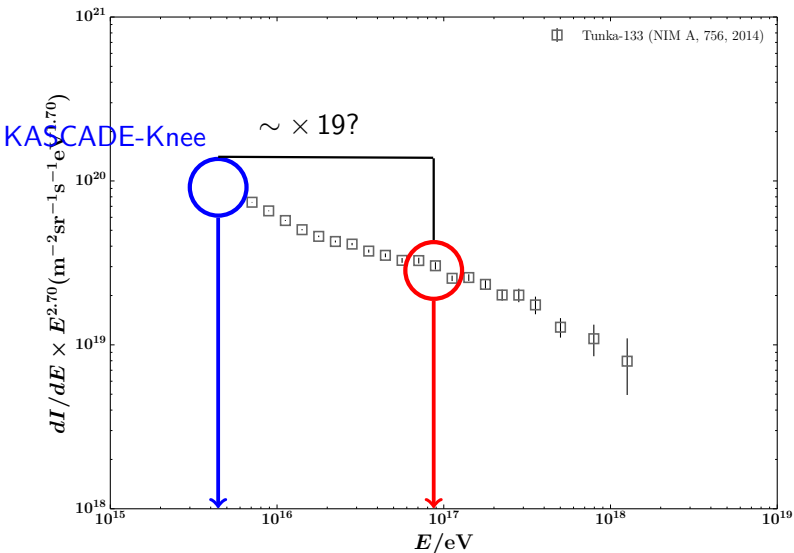
One of 133 stations



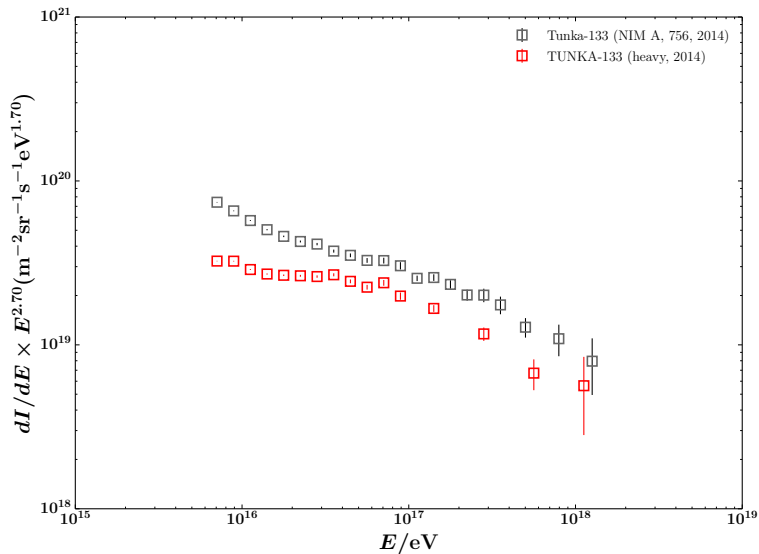
Tunka-133



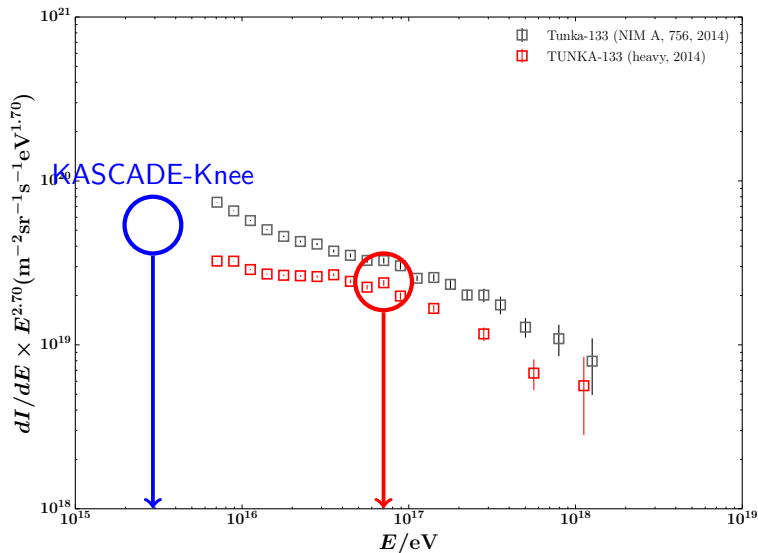
Tunka-133



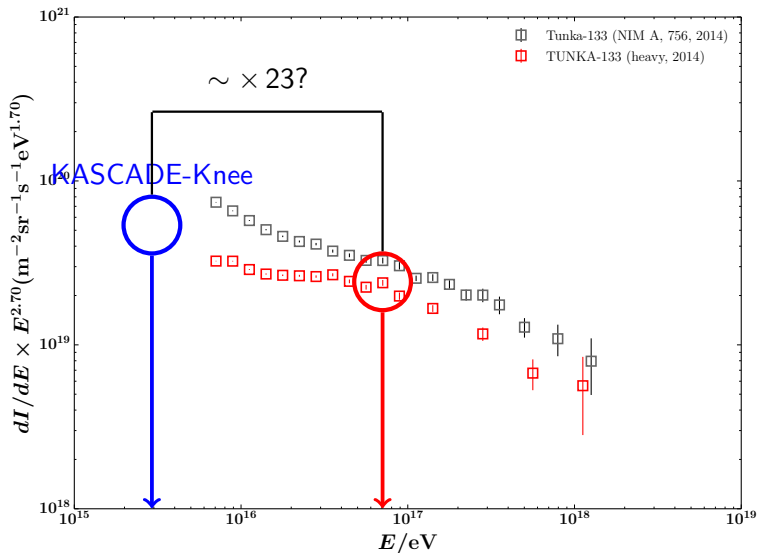
Tunka-133 - composition



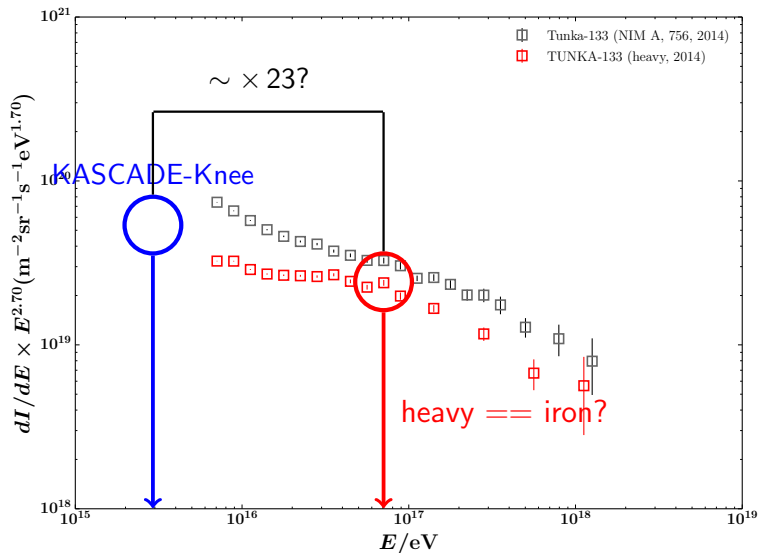
Tunka-133 - composition



Tunka-133 - composition

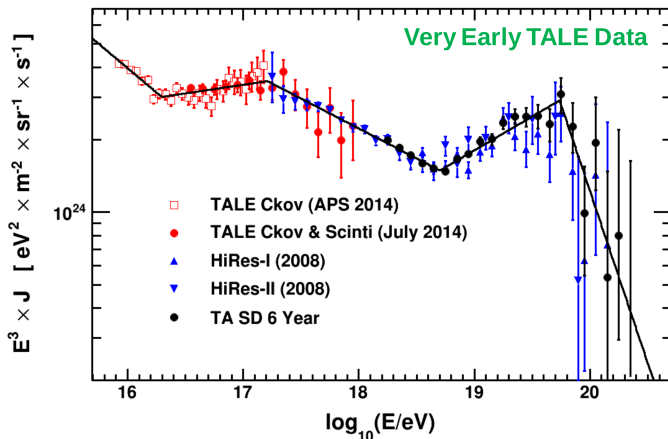


Tunka-133 - composition



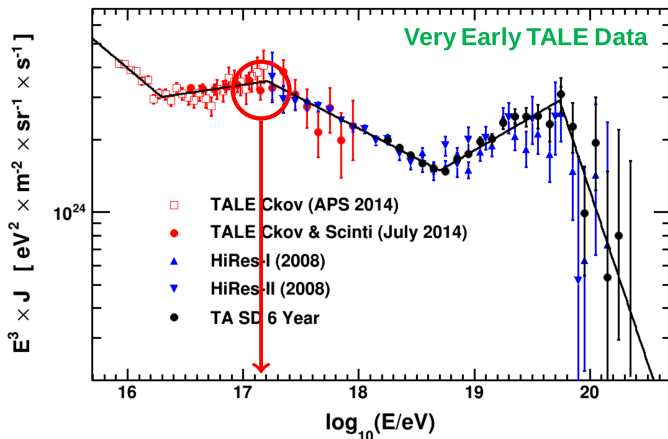
CR Spectrum

SD Data (6 Yrs: 20080511-20140511)
 + high elevation TALE telescopes (no MD so far)
 and events with large Cerenkov contribution

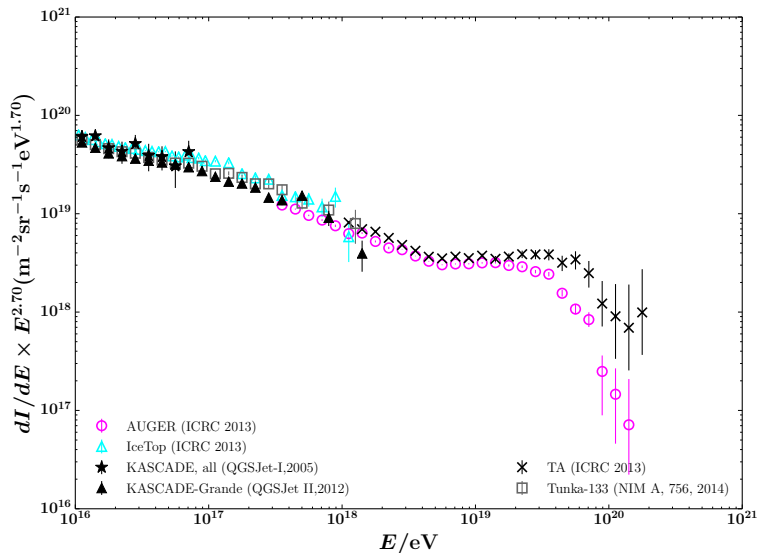


CR Spectrum

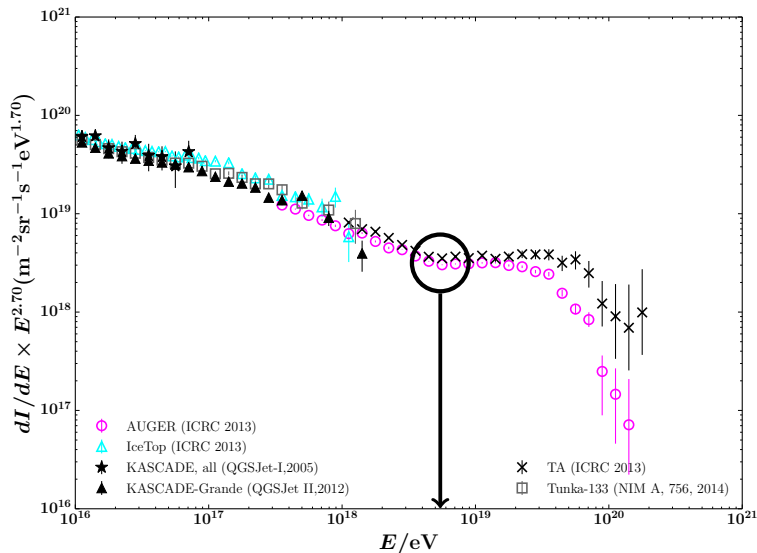
SD Data (6 Yrs: 20080511-20140511)
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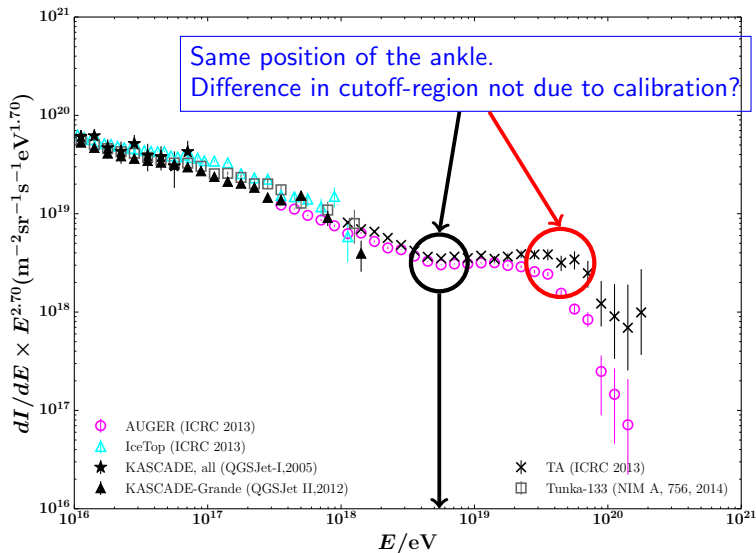
The Ankle Region



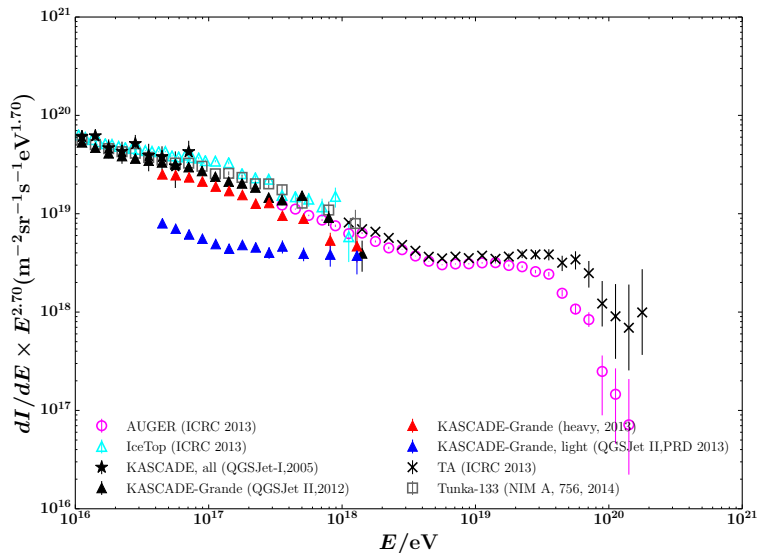
The Ankle Region



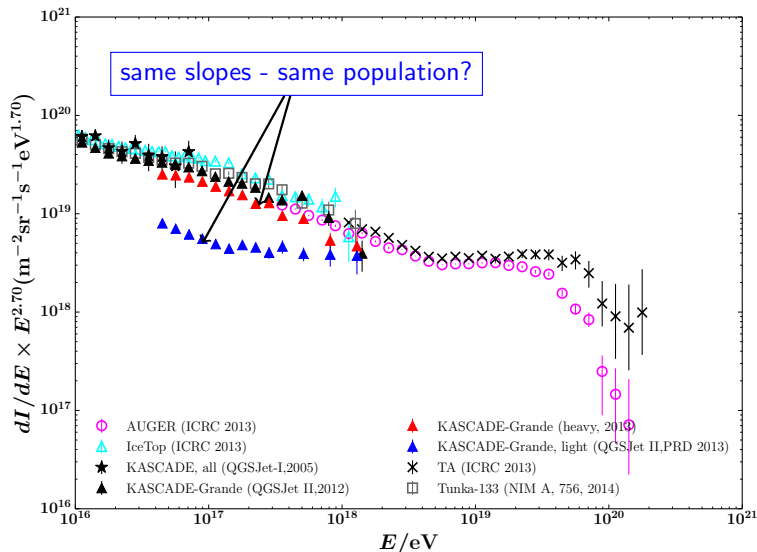
The Ankle Region



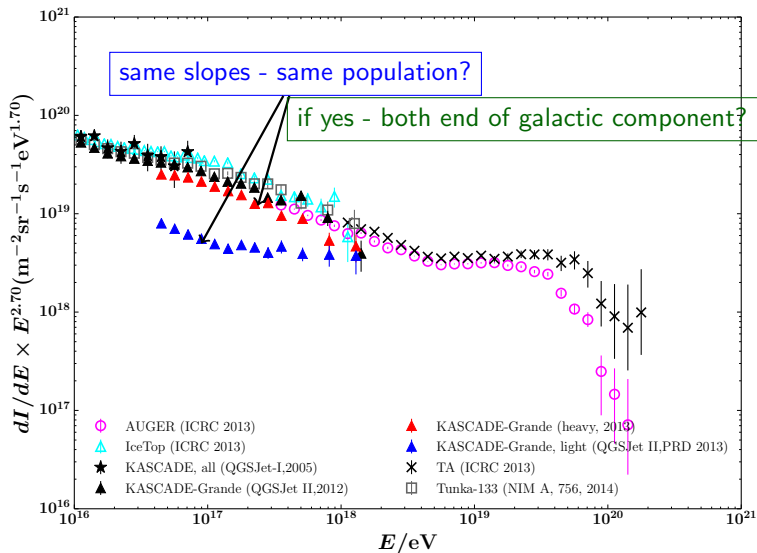
The Ankle Region - composition



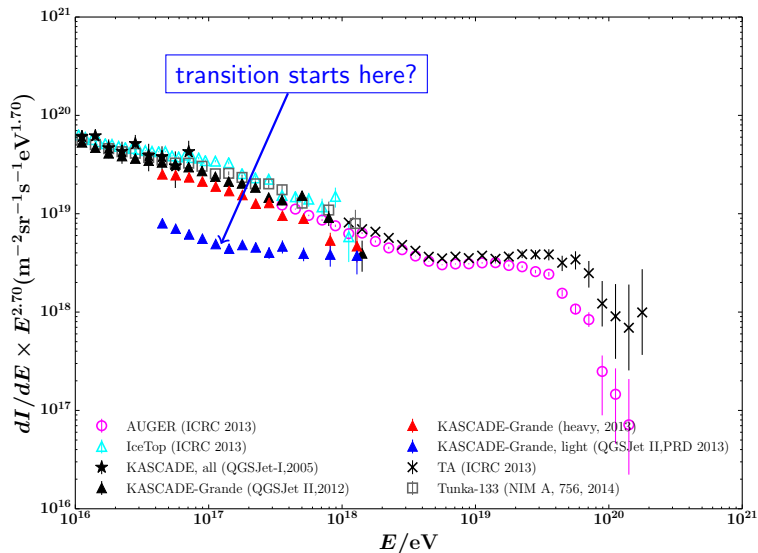
The Ankle Region - composition



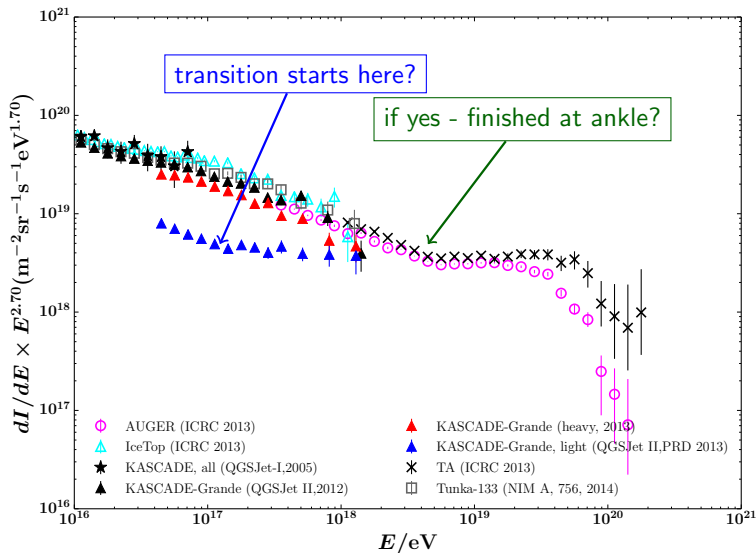
The Ankle Region - composition



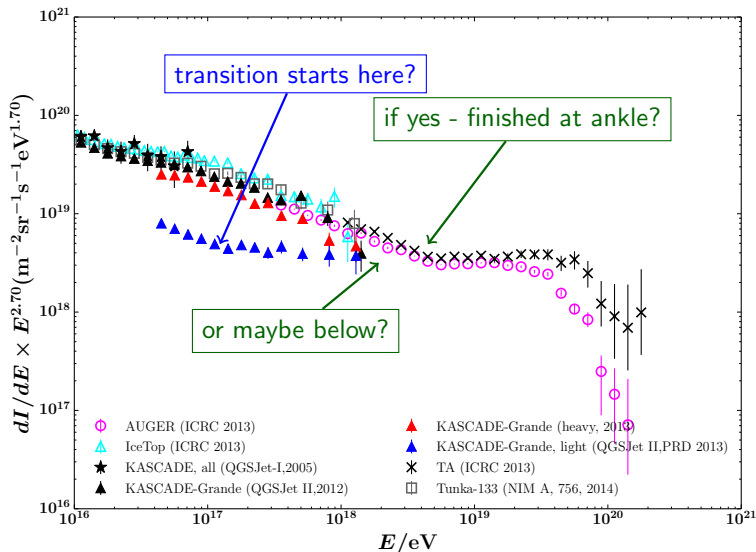
The Ankle Region - composition



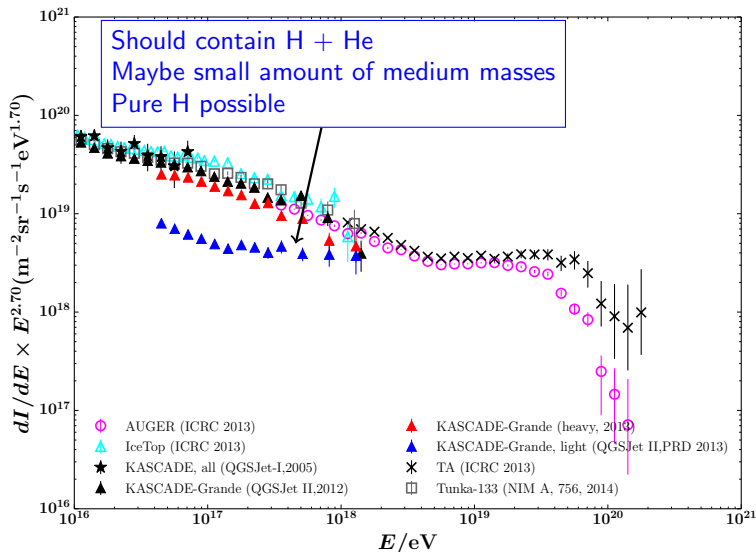
The Ankle Region - composition



The Ankle Region - composition



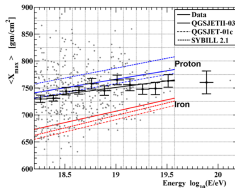
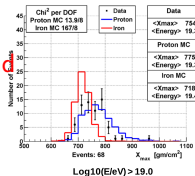
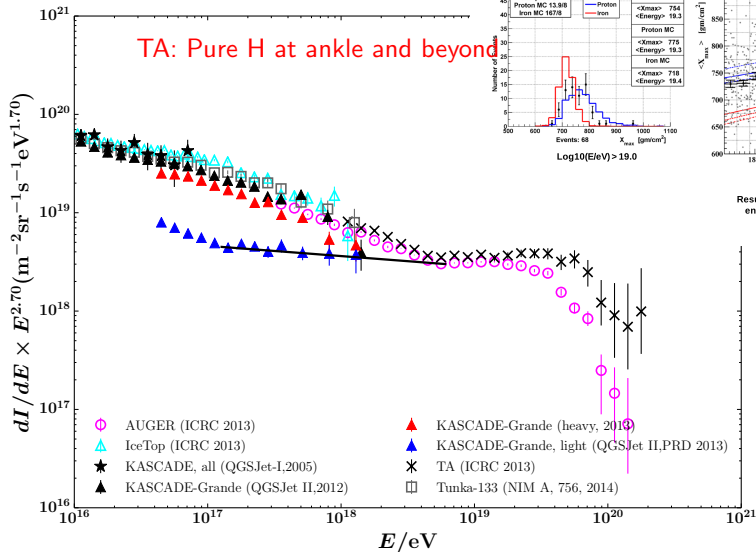
The Ankle Region - composition



The Ankle Region - compositio

Xmax in Energy Slices Comparison to p/Fe MC

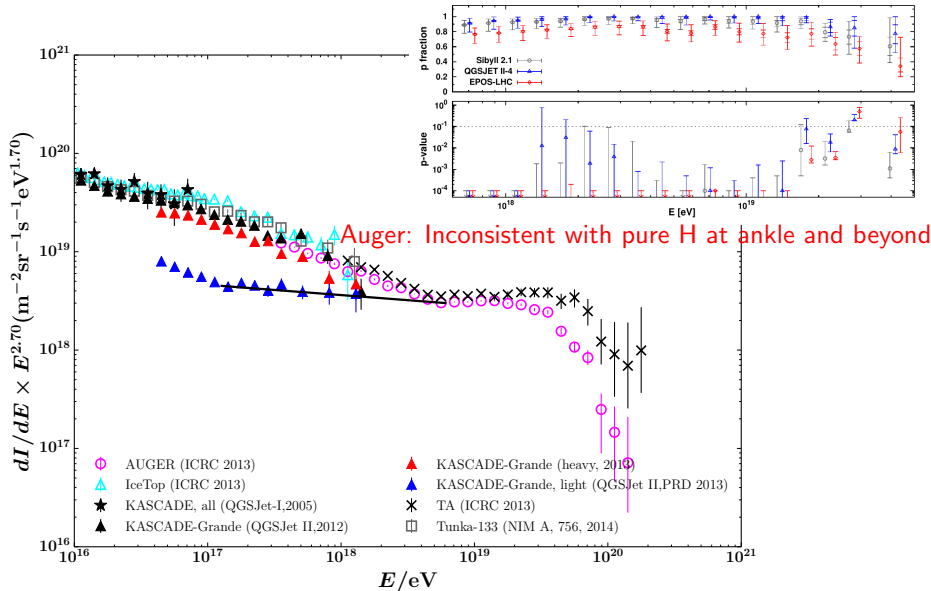
Masaki Fukushima, ISVHECRI2014



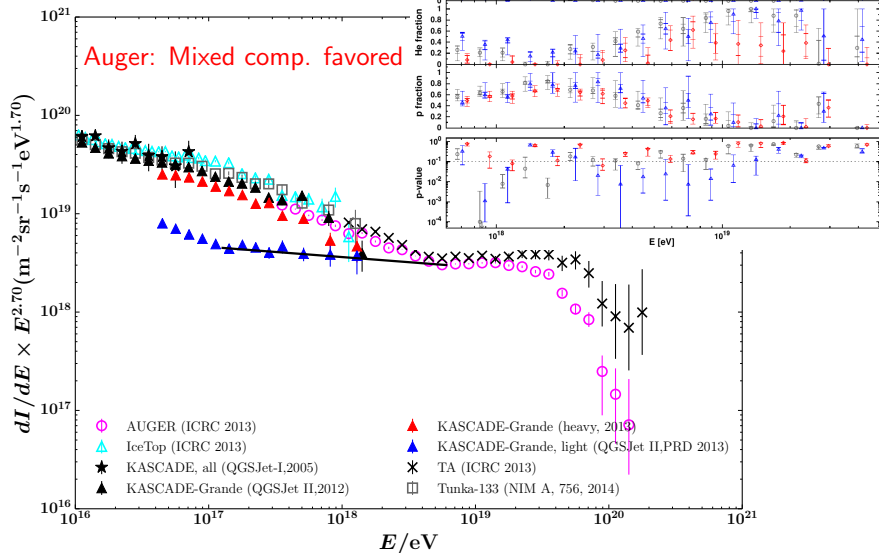
Results are consistent with proton at all energies and inconsistent with iron.

The Ankle Region - composition

Auger, arXiv:1409.5083



The Ankle Region - compo



Conclusion

- There is general agreement among the experiments about the features of the spectrum
- While the knee(s) seem to be connected in a charge-dependent way, the picture around the ankle is not so clear (e.g. GZK vs. source-cutoff)
- There is a strong need for more detailed information on the composition
- In the (near) future IceTop will hopefully provide us with additional data regarding the composition
- KASCADE is working on a combined analysis with KASCADE-Grande to gain the energy spectrum and composition from $\sim 10^{14-15}$ to 10^{18} eV using one consistent reconstruction procedure.
- Tunka added 19 KASCADE-Grande stations and there are plans for TAIGA (HiSCORE detectors, IACT, muon detectors)
- Auger is updating its detector setup for a better muon coverage/reconstruction.
- TALE is presenting first results, more will surely follow.