INTERNATIONAL SOLVAY INSTITUTES BRUSSELS

Solvay workshop on

SuGAR 2018

Brussels, 23-26 January

Searching•for•the•sources•of•galactic•and•extra•galactic•cosmic•rays

SUMMARY OF THE WORKSHOP

ULB

VUB VRIJE UNIVERSITEIT BRUSSEL

FONDATION DAVID ET ALICE VAN BUUREN

Loterie Nationale Loterij

FÉDÉRATION WALLONIE-BRUXELLES

SOLVAY

RICHTING MORGEN

16.15 x 24.02 in

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CLOSING REMARKS

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WHAT DID WE LEARN?

Lots of new things…

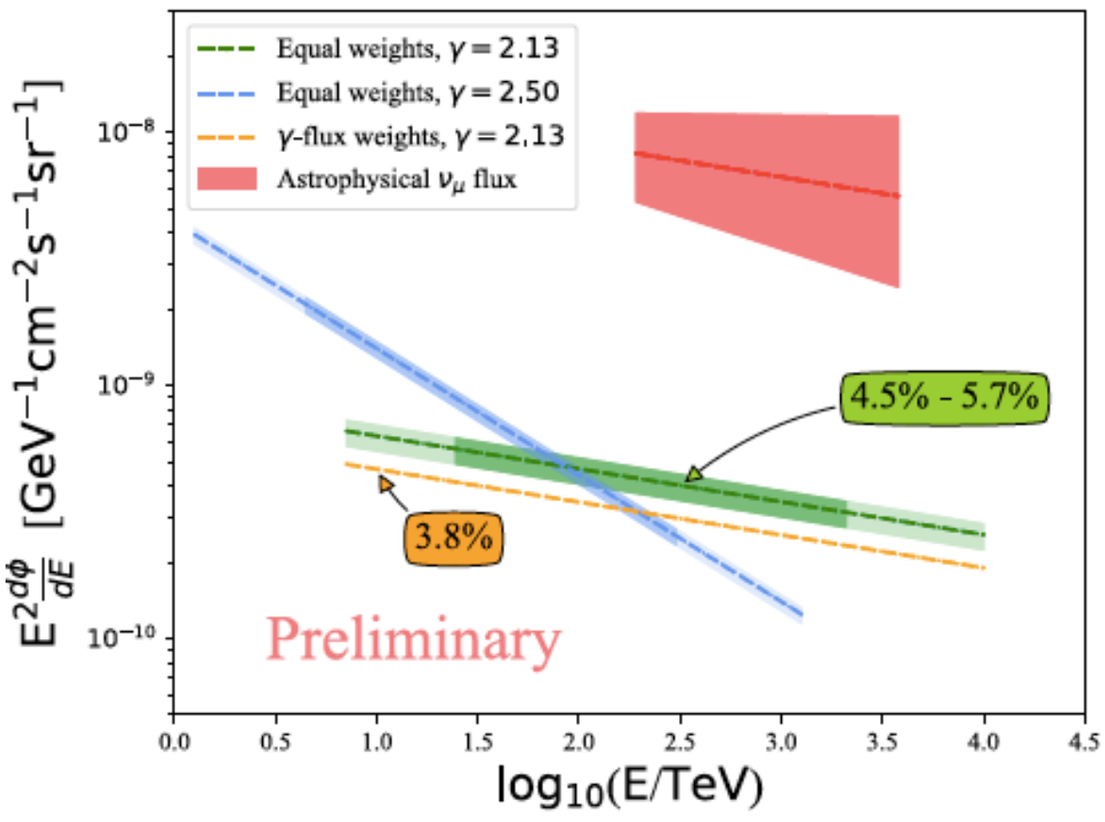
… but not necessarily answers.

QUESTION 1

- *Origin of the IceCube cosmic neutrinos and the connection with the diffuse gamma-ray flux ?*

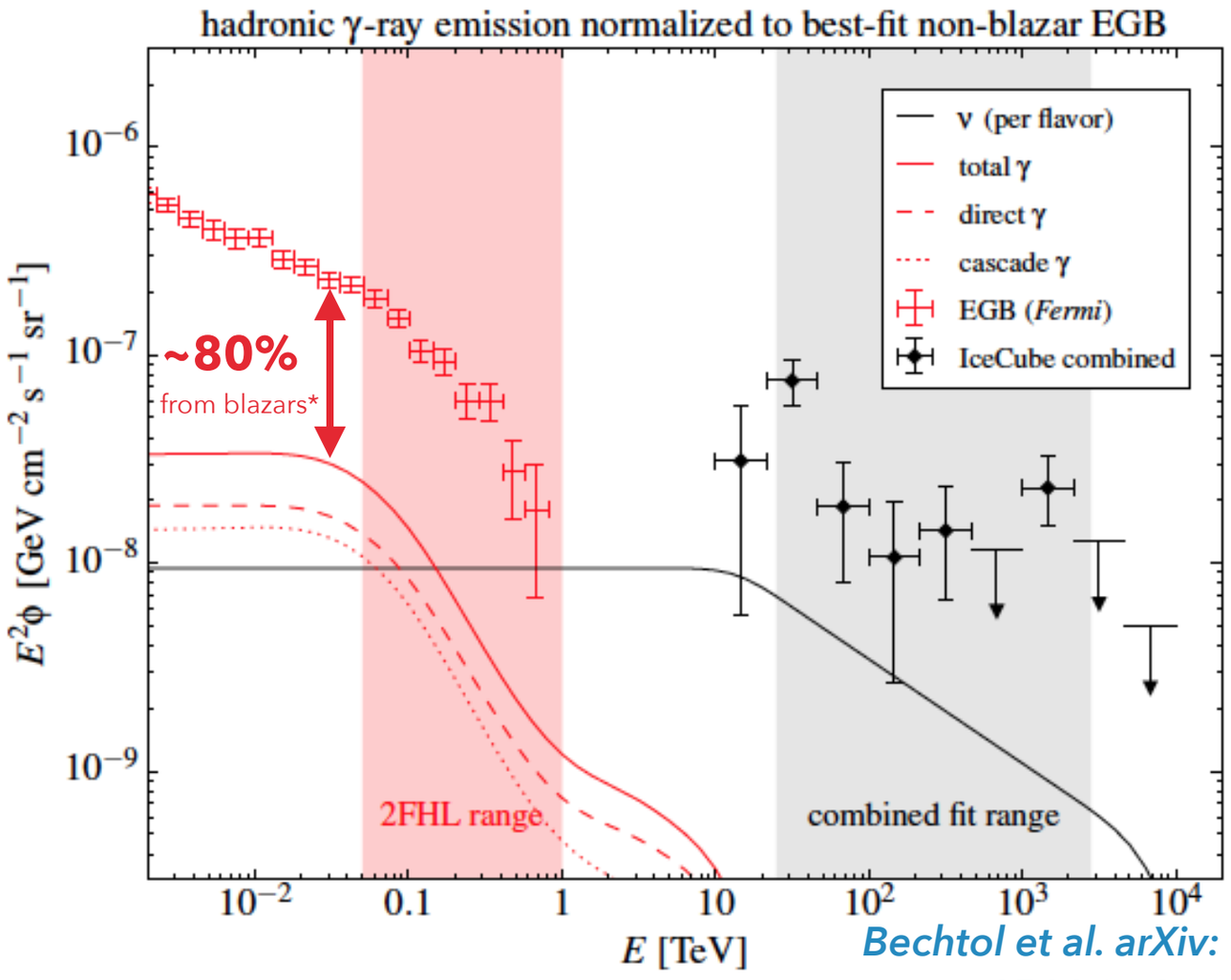
(Fermi) Blazars

Kowalski's talk



Startbursts

Alher's talk



Bechtol et al. arXiv: 1511.00688

*80% of Blazars only above 50 GeV → 30-50% at 10 GeV

Hay's talk

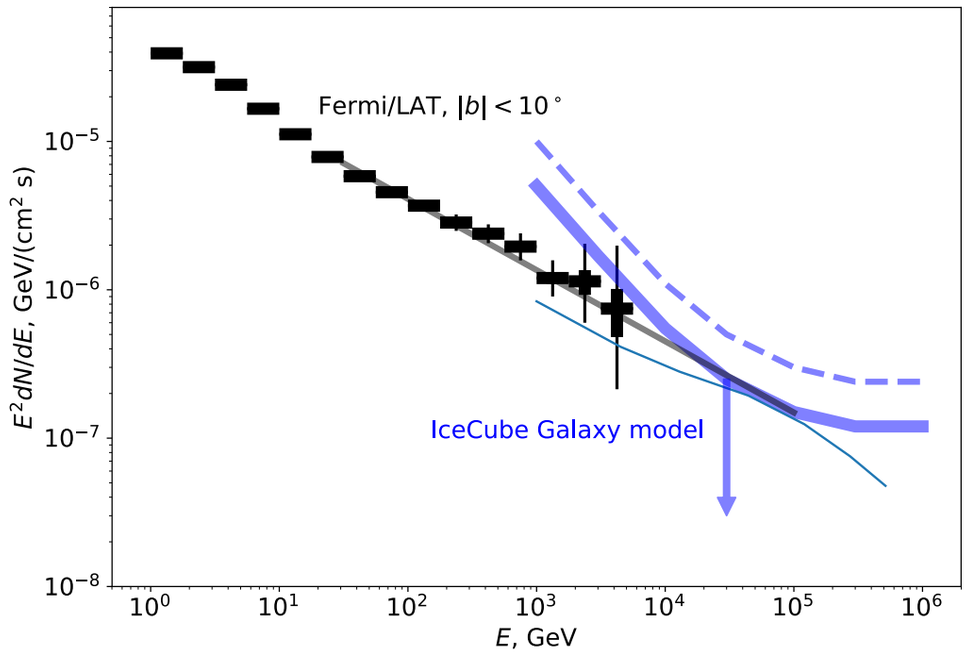
QUESTION 1

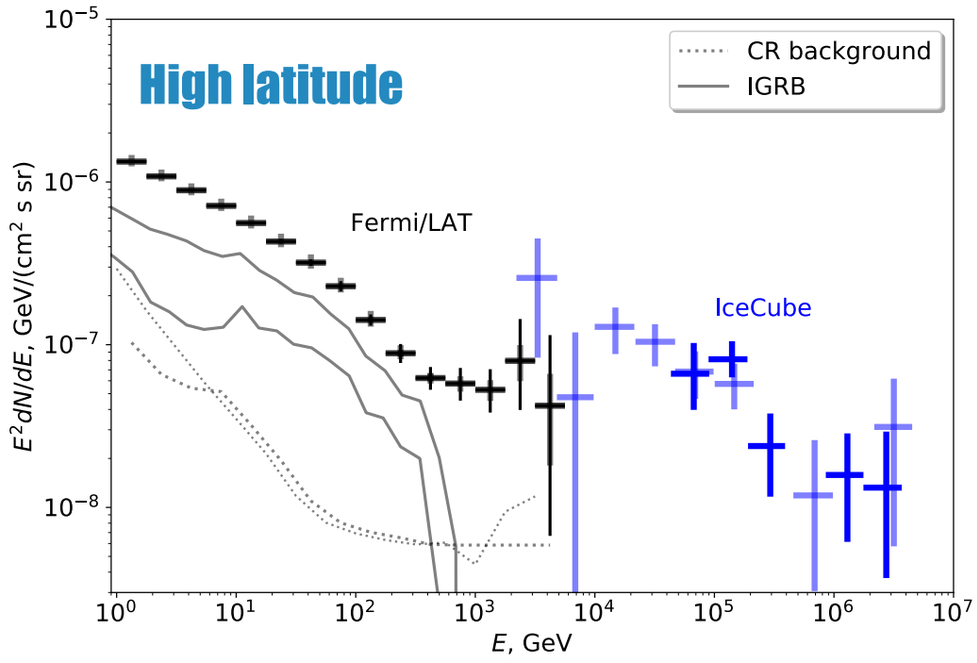
- Can we say that neutrinos sources are **dark in gamma-rays**?
- Another blazar population peaking at PeV? Same problem cascading down outside the FERMI band.
- Can blazars explain only the high energy (PeV neutrinos) component and plus a Galactic component?
- MeV Blazars? (Mannheim's talk)
- How this relates with the neutrino + Blazar flare coincidence? (Prandini's talk)

QUESTION 1

- A possible neutrino source would be detected in the multi-TeV band with Fermi (extrapolation of the Fermi/LAT data) up to 10 TeV

Neronov's talk





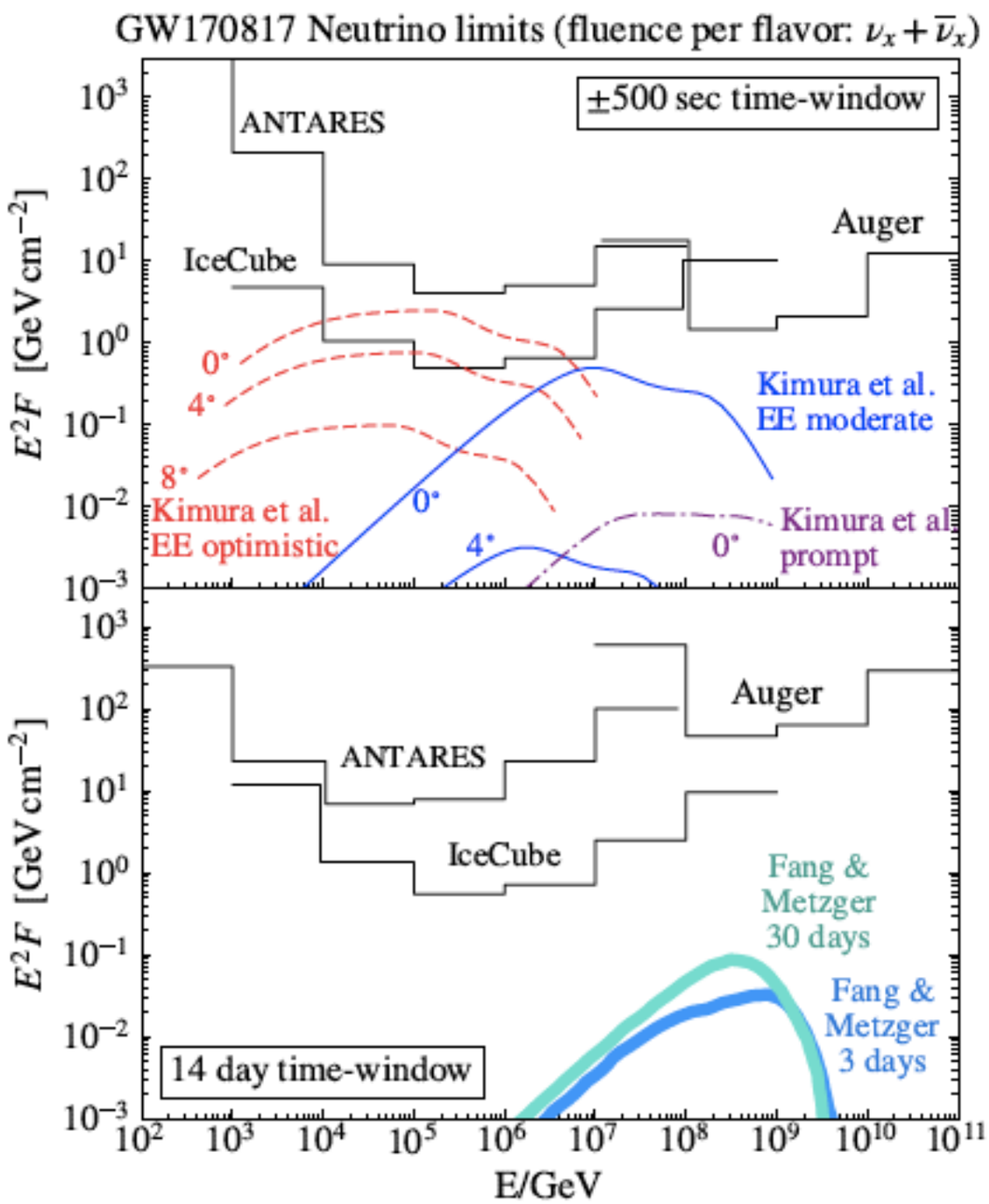
But we haven't seen any neutrino point-source nor a galactic emission in neutrinos. Do we need KM3NeT? (Hernandez's talk)

The answer might come from gamma-rays: HAWC limits on the diffuse gamma-ray emission at 10 TeV will constrain this picture→ Multimessenger Dingus' talk

QUESTION 2

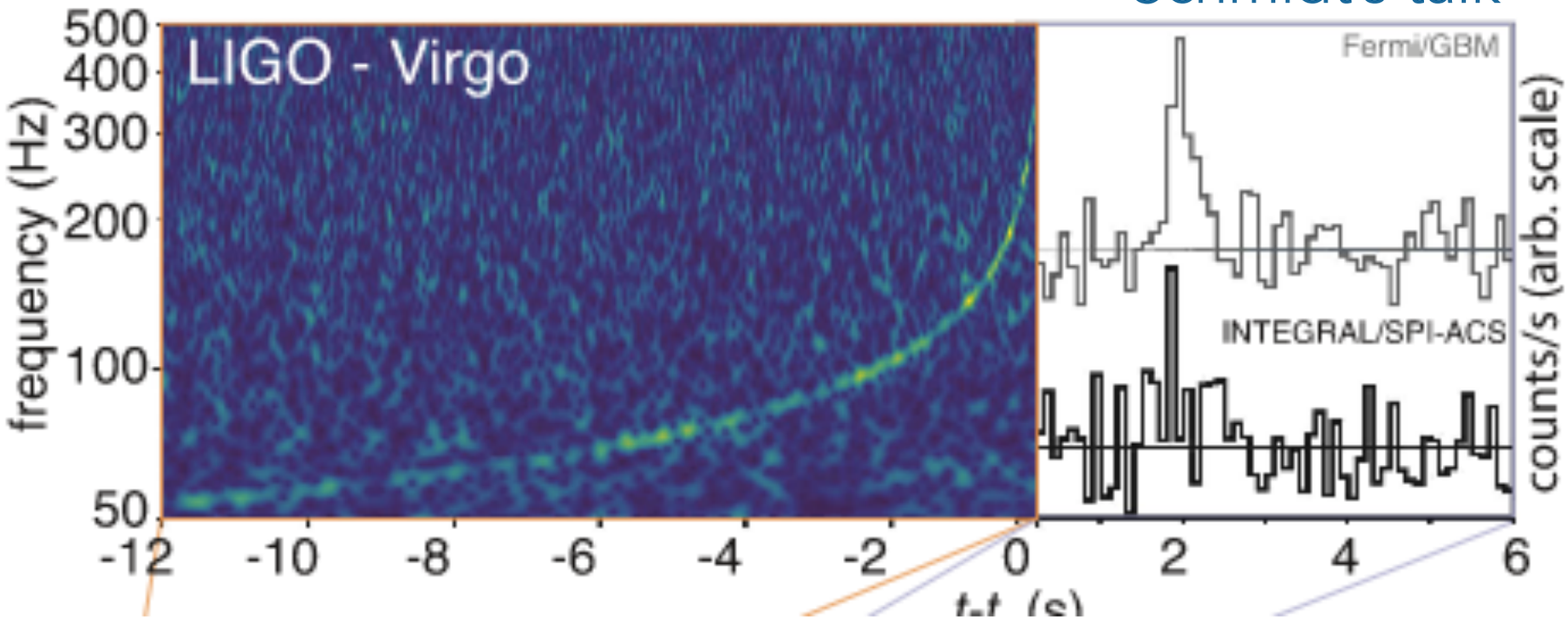
- *GW counterparts for experimental source confirmation?*
  - Do BNS/NSBH mergers produce a neutrino counterpart? According to some models, yes!
  - Was it or not a regular sGRB? Too dim for such a close GRB -> off-axis.
  - We don’t know if in this case we had GeV gamma-ray emission (LAT was off)

Neutrinos or not neutrinos, will it change our search strategies? No, but it can drive a future MeV neutrino detector instrumentaion.



QUESTION 2

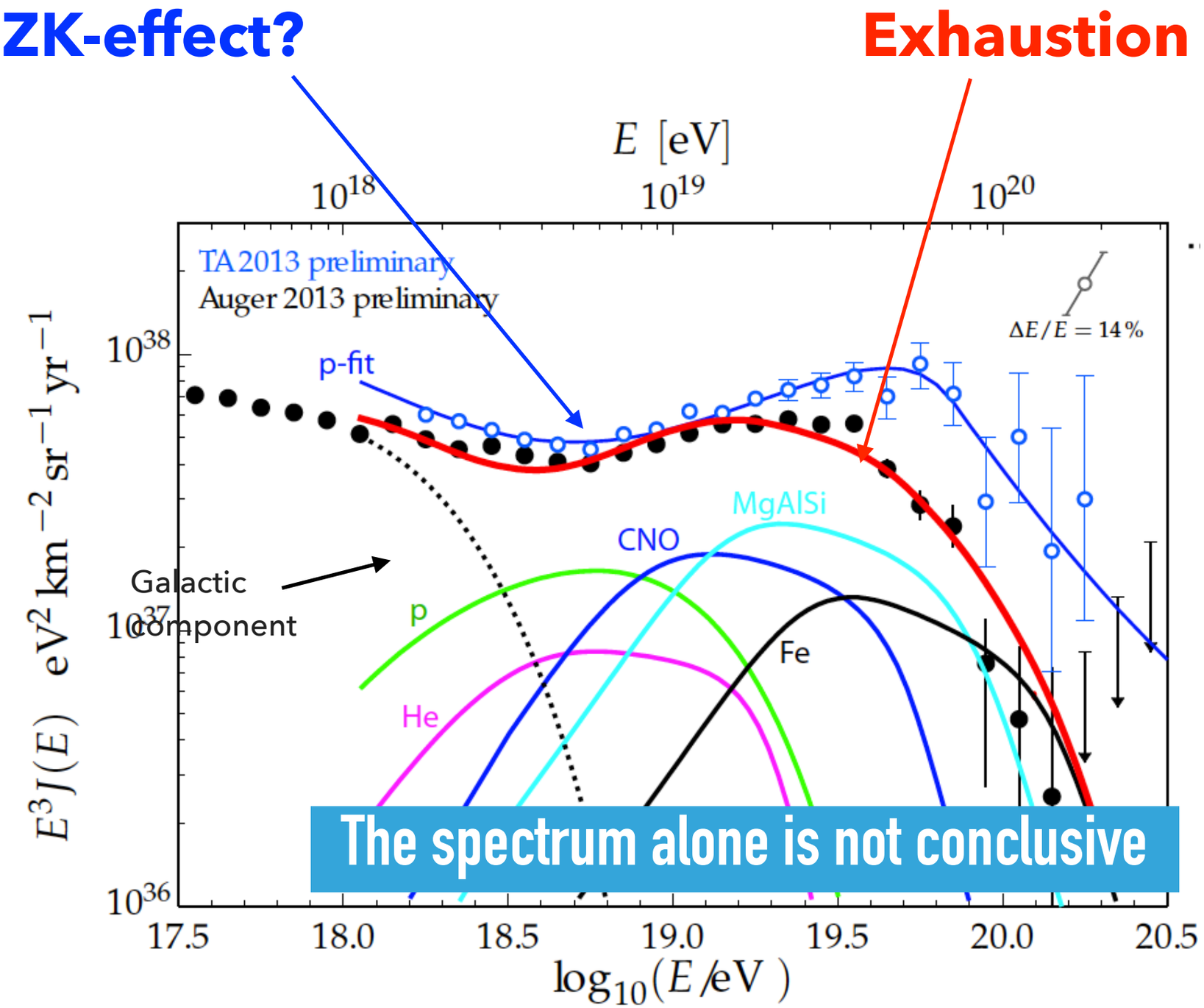
Schmidt's talk



- Is the gamma-ray/GW delay expected Δt ~ 2 sec.?
- Can we better constrain the progenitors by folding in EM/ neutrino information? Einstein Telescope (SNR ~ 6 weeks before the coalesce of NS mergers) -> **Multimessenger**

QUESTION 3

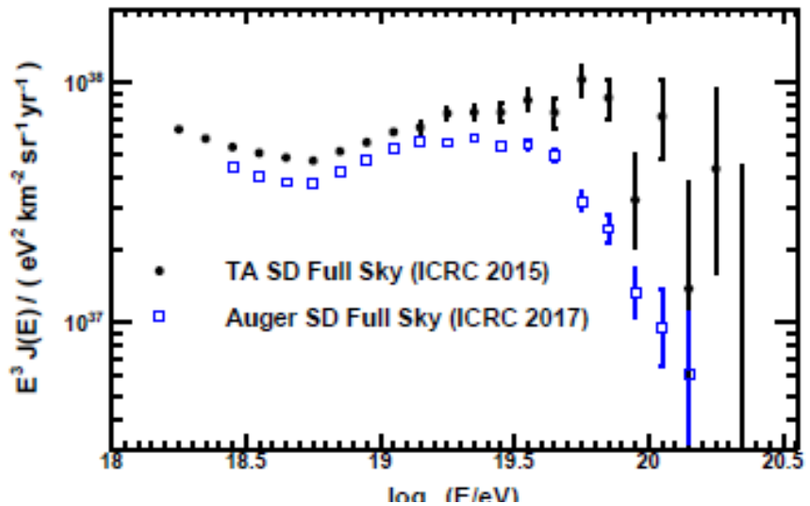
- *Do we see the GZK cut-off or just E_{max} in the Auger/TA data?*

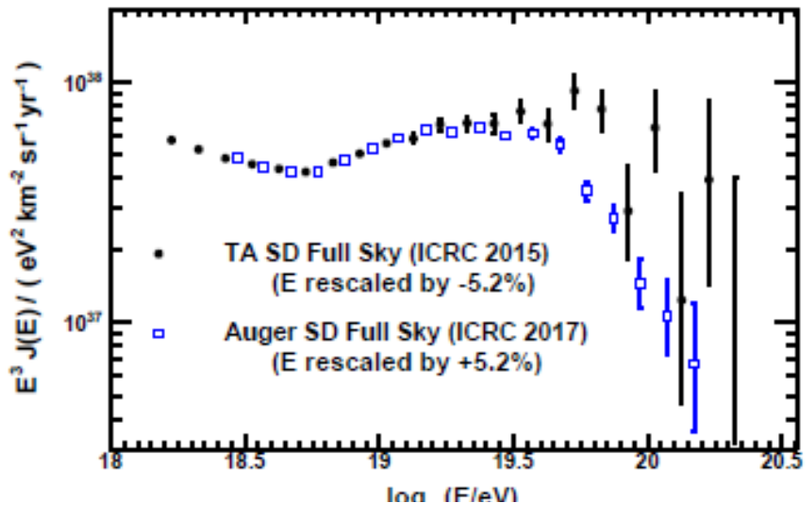


QUESTION 3

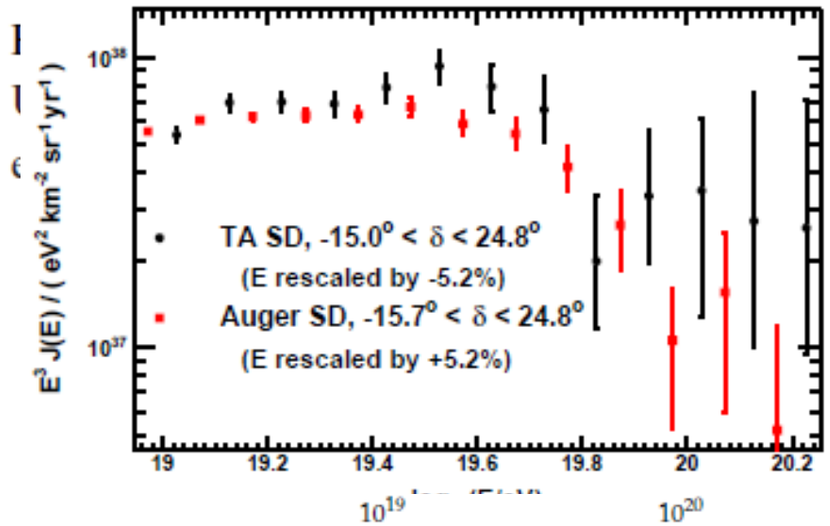
, Unger's talk, Jui's talk

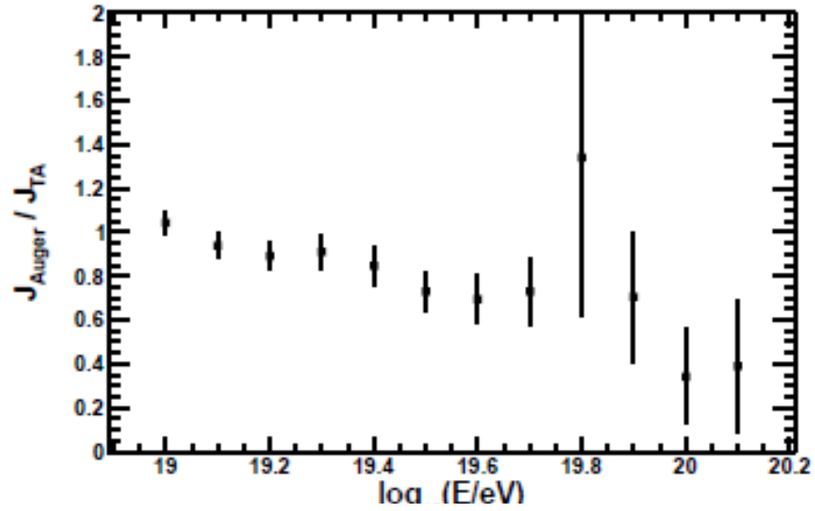
All Sky



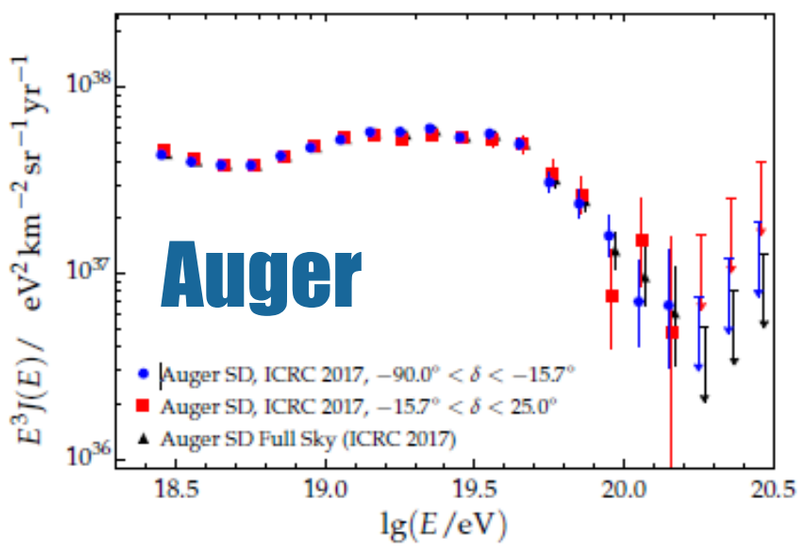


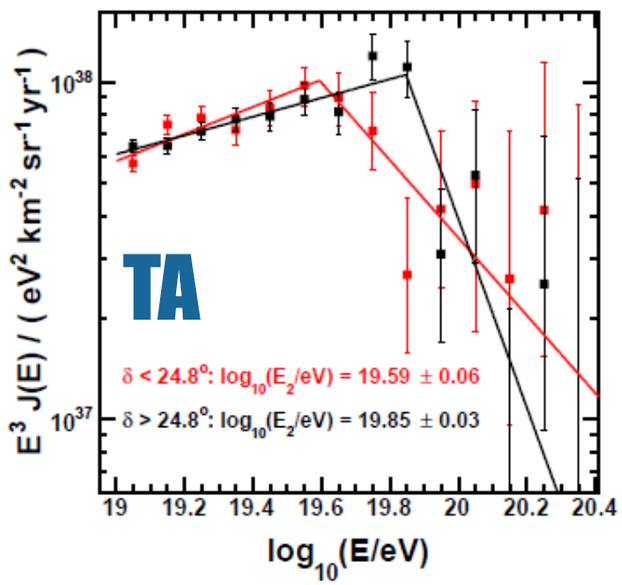
Same dec band





By dec Band





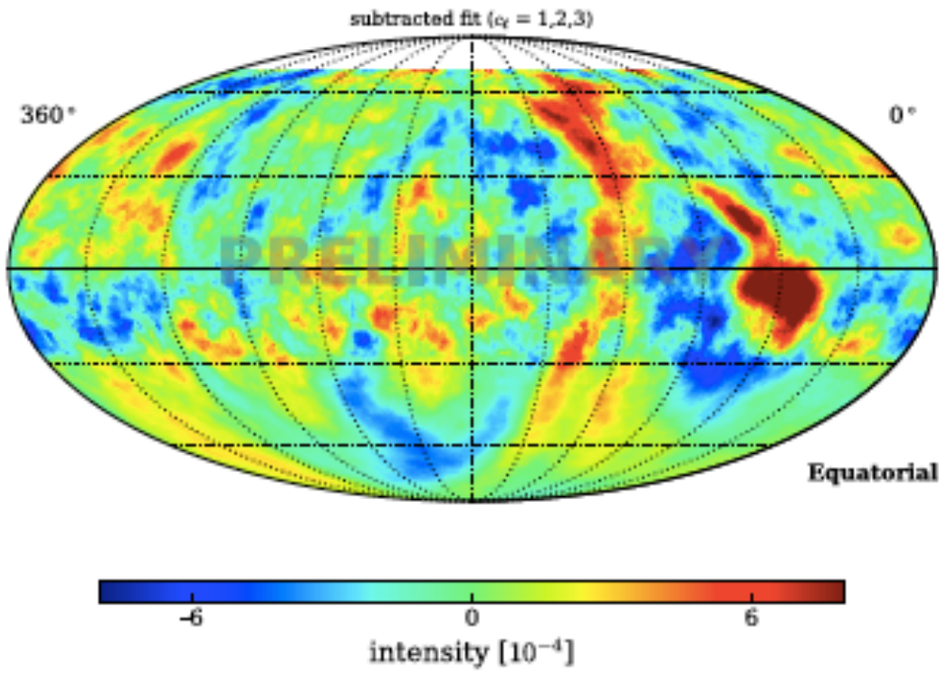
QUESTION 3

- None of close sources (Cen A, SBs) show evidence of particles with trans-GZK energies.
- Models of protons at highest energies are threatened by absence of neutrinos – and the diffuse gamma-ray background above 50 GeV could all be from blazars.
- We need a precise picture of the UHECR composition
- How this all affect GZK neutrino experiments (GRAND, ARA, ARIANNA)? (Nelles', Mase's, de Jong's talks) There is also direct EeV neutrinos (Kotera's talk)

QUESTION 4

- *What might be the source of the CR anisotropy?*

Small scale anisotropy



The last diffusion step (not-integrated)?
Local effect of sources?

Dipole anisotropy

Why is the dipole anisotropy so small? Something local is making it small

Experimental to do list

full-sky observations: surface IceCube-HAWC & satellite observations -> **Multimessenger**

Measure the vertical component of the anisotropy?

determine anisotropy vs. rigidity (i.e. for different CR particle masses)

Diaz-Velez, Zweibel, Desiati's talks

AND MORE QUESTIONS?

- Is there PeVatron at the galactic center? (Gabici's talk)
- Is diffusion space dependent? (Blasi's talk)
- Why $p/e^+/\bar{p}$ have the same spectrum? Why secondary CR have a change in spectrum at 200 GV? (Paniccia's talk)
- Auger and TA hotspots? (Unger's, Jui's talks)

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Is it all dark matter?

CONCLUSIONS

- Too many open questions… we need another workshop!

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SuGAR 2020: Aquila, Berlin, Madison (?)

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