UHECR and Neutrinos

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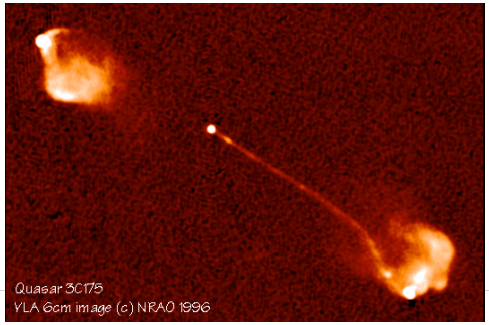

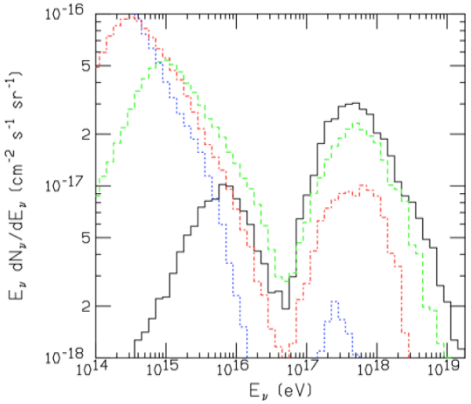

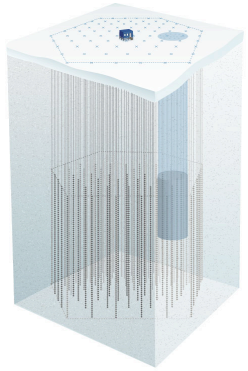

Sources

- Vast number of candidates: AGNs, SNRs etc.
- Acceleration mechanism unknown:
  Fermi 2: too slow; Fermi 1: not energetic enough
- Simulation hints at ability of radio lobes of AGNs to reach gamma factors of 10^{10}

Propagation

- Usually, have to invoke Monte Carlo simulations
- However, in ultra high energy limit, certain energy loss processes predominant
- Allows for analytical calculation of propagation of heavy nuclei, production of cosmogenic neutrinos etc.

Detection

- All detection relies on structure functions at small x
- Usual leading twist, linear parton evolution not accurate in this limit
- Need to take gluon saturation effects into account: color dipole models, Color Glass Condensate