

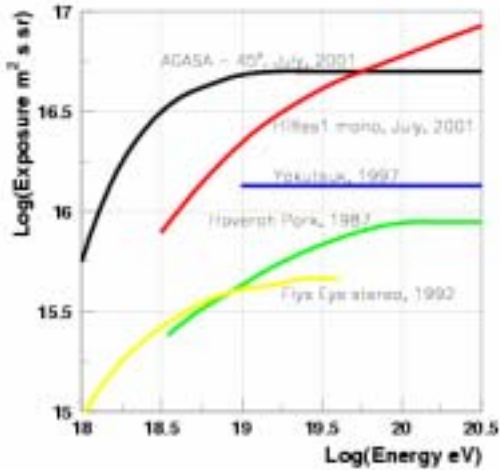
Evidence for point sources of EHE Cosmic Rays

Masahiro Teshima

On behalf of AGASA collaboration
ICRR, University of Tokyo



Exposures in various experiments



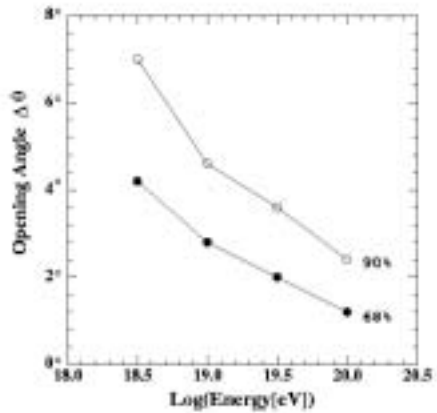
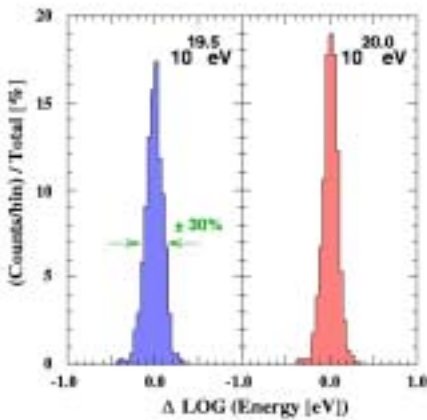
AGASA: Ground Array

HiRes: Air Fluorescence

AGASA

Energy Resolution

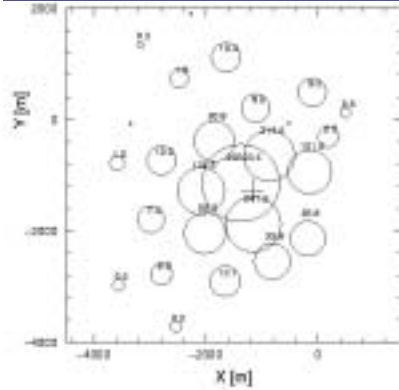
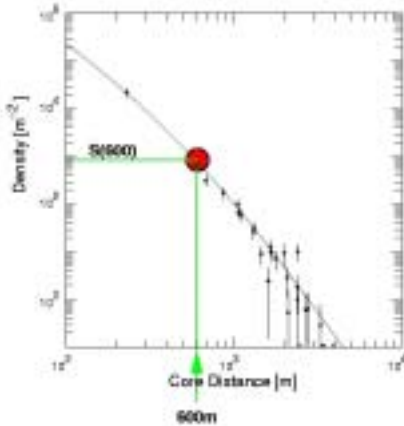
Angular Resolution



Energy Determination

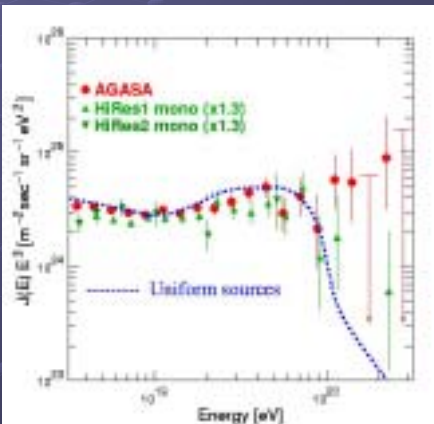
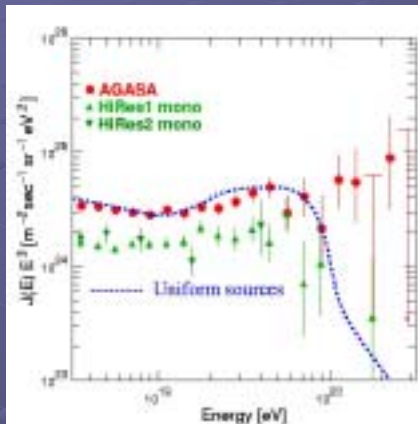
- Local density at 600m
 - Good energy estimator by M.Hillas

$$E = 2 \times 10^{20} \text{ eV}, E_{\min} = 1.6 \times 10^{20} \text{ eV}$$

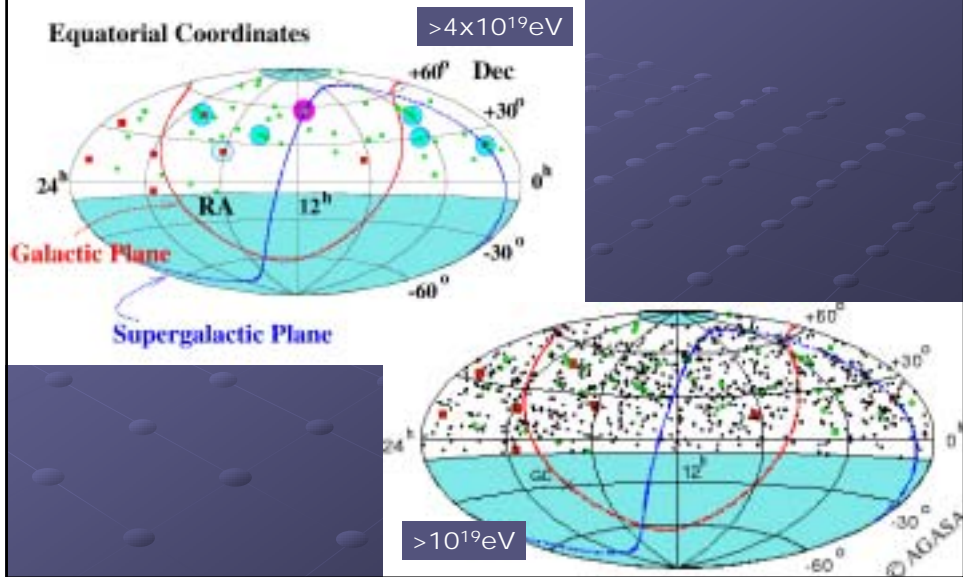


AGASA vs HiRes (astro-ph)

See new paper: Energy determination in AGASA (astro-ph/0209422)



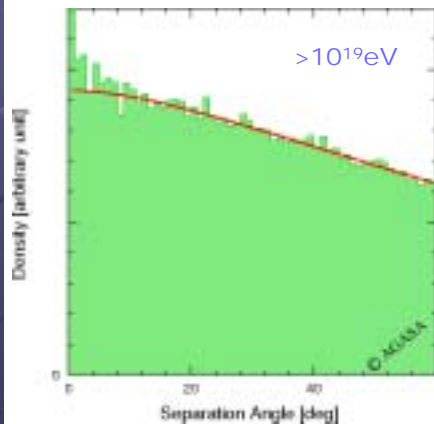
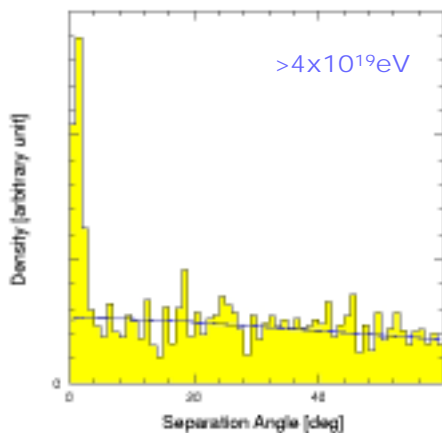
Arrival Direction Distribution of EHE cosmic rays



The distribution of Space angle between events Suggest compact sources!!

5 sigma effect

3 sigma effect



V_1-V_2 plot in Galactic coordinate

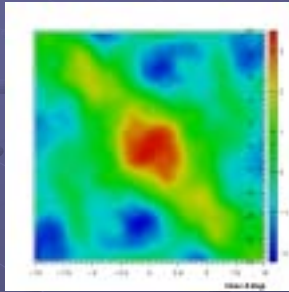
Outer Galaxy region

$|b_{II}| < 60, 90 < l_{II} < 180$

1. From $10^{19}eV$
2. Extended linearly

$20^\circ \times 20^\circ$

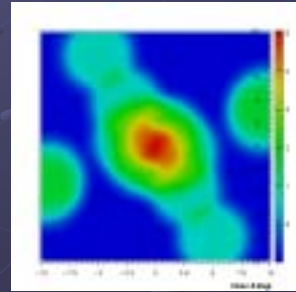
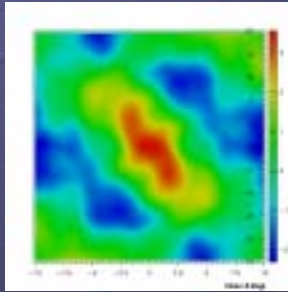
b_{II}



$\text{Log}(E) > 19.00$

l_{II}

19.15



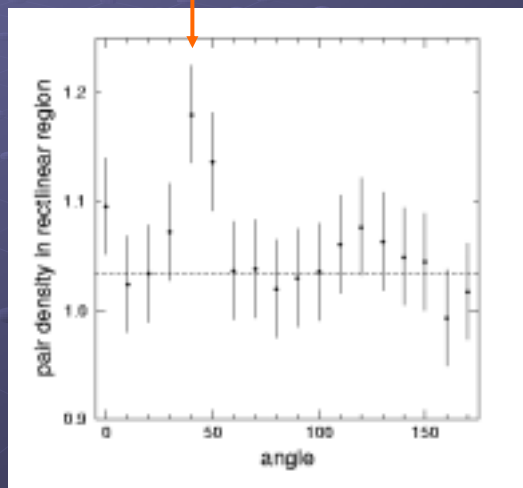
19.70

The polarization angle

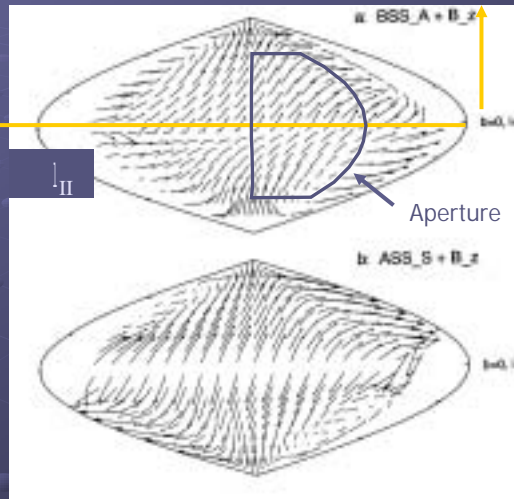
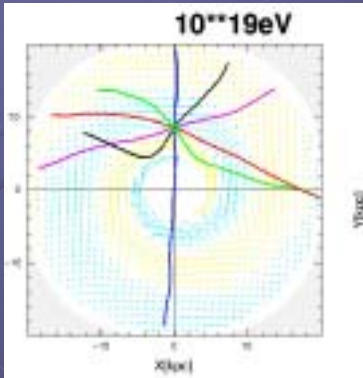
40 degrees

$10^{19}eV$

1.8 degree x 10 degree box



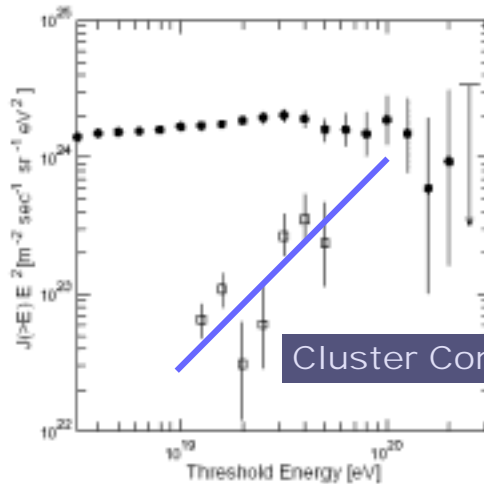
Cosmic Ray propagation in Galactic Magnetic Field



By T.Stanev

Energy spectrum of Cluster events

$$E^{-1.8 \pm 0.3}$$



Summary

- We found Clusters in the arrival direction distribution above 10^{19}eV
 - Evidence for EHECR point sources
 - Astronomy with Hadronic particles!!
- The energy spectrum looks very hard
 - Represent source spectrum?
 - Propagation effect?
 - Low energy particles are deflected by G.M.F.
- With next generation detector their origin will be clarified
 - TA, Auger ($>4 \times 10^{19}\text{eV}$ ~1000events/5yrs)
 - EUSO ($>4 \times 10^{19}\text{eV}$ ~6000events/3yrs)
 - We will see 10~20 events/source on average!!