

Atmospheric ν_e Search II

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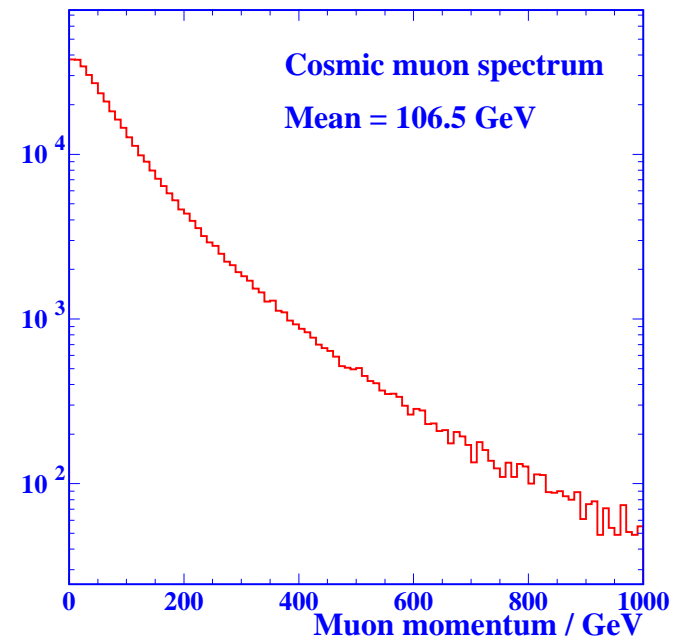
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- Reminder: was attempting to identify atmospheric ν_e CC events
Use for normalization of flux for ν_μ analysis
- Found cosmic MC underestimates background by factor ~ 5
- Expected/observed numbers of events for 2.52kty:

	ν_e CC	ν_μ CC	NC	MC cosmics	Data
Before shield cuts	12.6	4.7	4.0	17 ± 10	112
After shield cuts					27

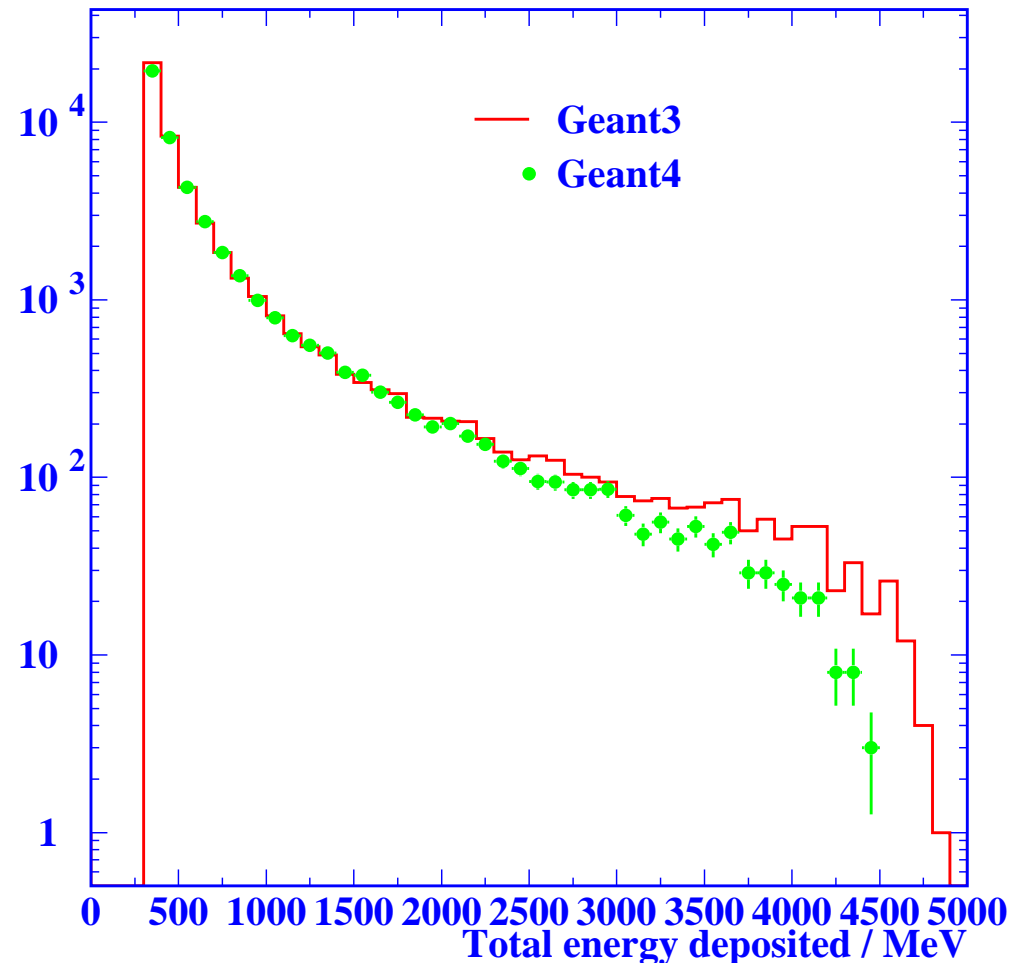
Atmospheric ν_e

- Know that simulation of muon nuclear interactions is poor in Geant3
- How about EM interactions at high energies?
- Compare Geant3 and Geant4 using CALDET simulation
As DRW studies: energy deposited in each strip for each particle type
- Geant3: use usual GMINOS settings (DRAY 1, LOSS 1) with 100keV cuts
- Geant4: use equivalent processes; cuts 0.3mm
⇒ same energy deposited by muon
- Results for 1M 100 GeV μ^-
N.B. data sample \equiv 11.4M cosmics
- Only keep those with deposited energy
>300 MeV
G3: 47720; G4: 44892



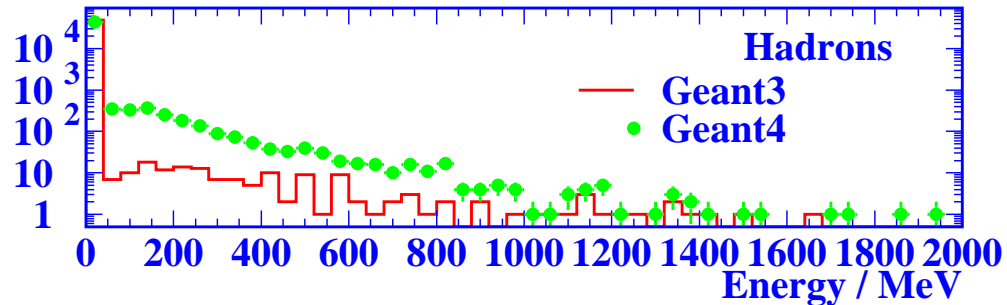
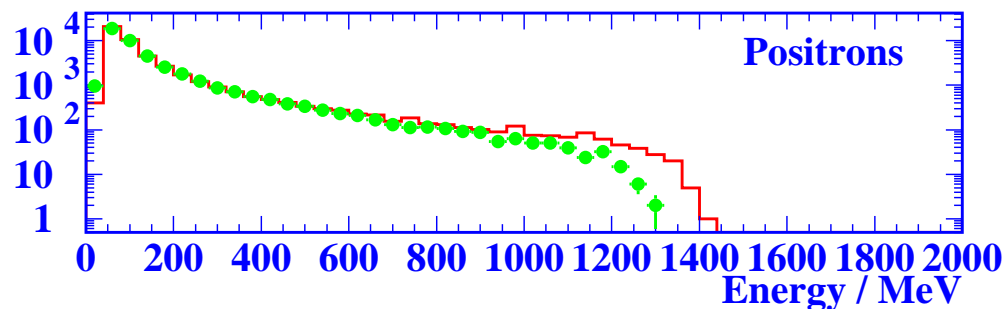
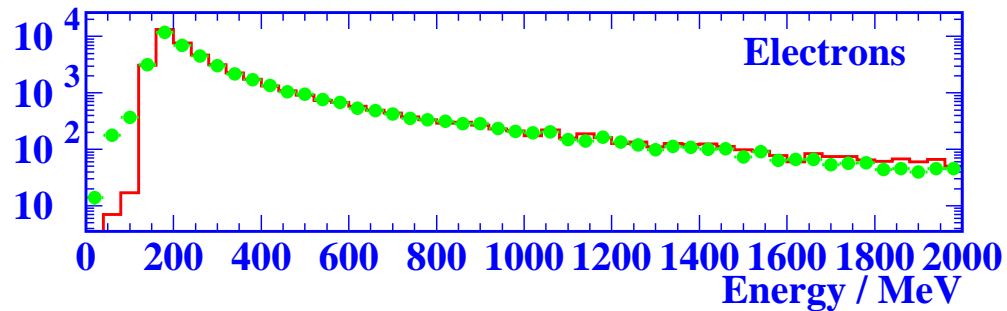
Total Energy Deposited

- Total energy deposited tends to be lower in Geant4
G3: $\langle E \rangle = 653 \pm 3$ MeV
G4: $\langle E \rangle = 632 \pm 3$ MeV
- Geant4 has fewer events at very high energy (> 3 GeV), and distribution cuts off at somewhat lower value
- Have not yet understood this



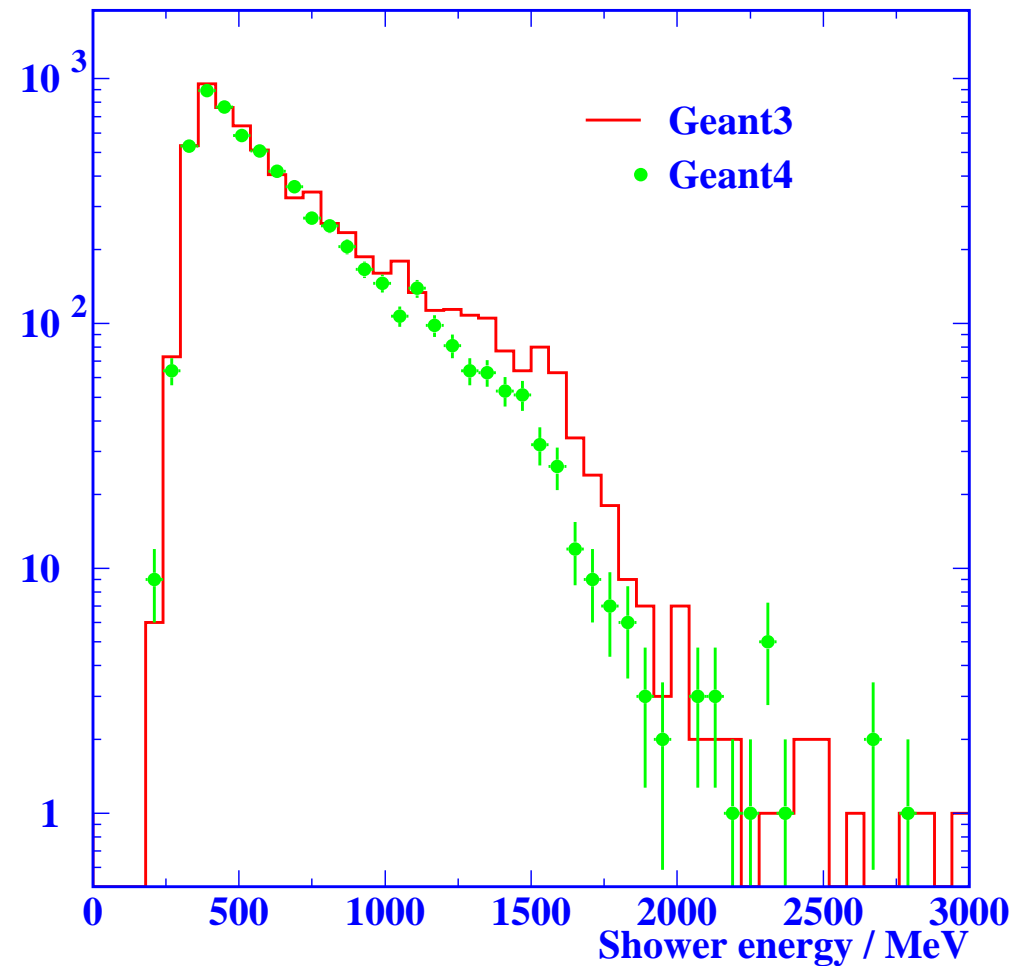
Energy Deposited by Different Particles

- Geant4 has more events with hadronic energy
G3: 166 events
G4: 2578 events



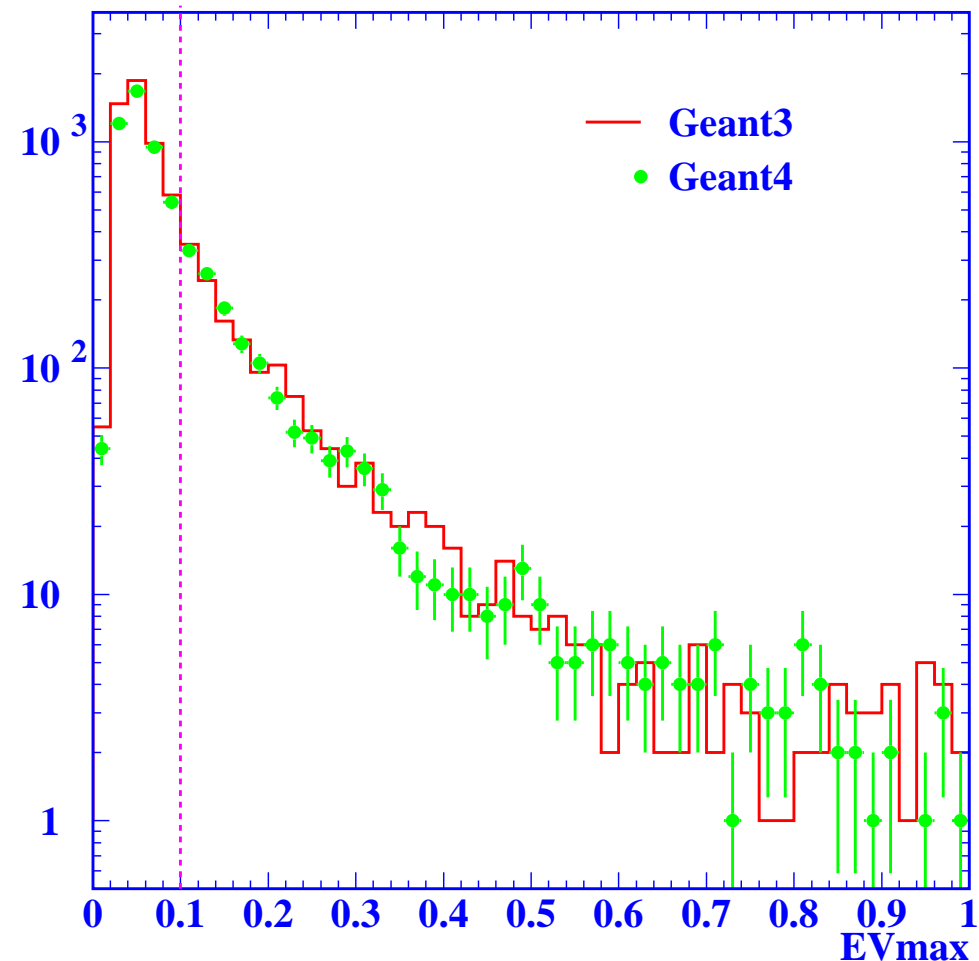
Shower Events

- Try to find events with showers; consider events with $E_{\text{tot}} > 1 \text{ GeV}$
- Count energy in strips WITHOUT muon hits only
- High energy tail still bigger in Geant3



Shower Events

- Using strips without muon hits, form 'moment of inertia' tensor, normalized to total 'shower' energy, and find eigenvalues and eigenvectors (as in ν_e selection)
- To remove track-like events, ν_e analysis requires largest eigenvalue < 0.1



Shower-like Events

- Select those with largest eigenvalue < 0.1

G3: 4966

G4: 4412

- Geant3 still tends to have more at high energies
- No sign (yet?) that Geant4 would simulate excess events seen in data
- Next step:
More events??
Higher energy??
Better ideas??

