

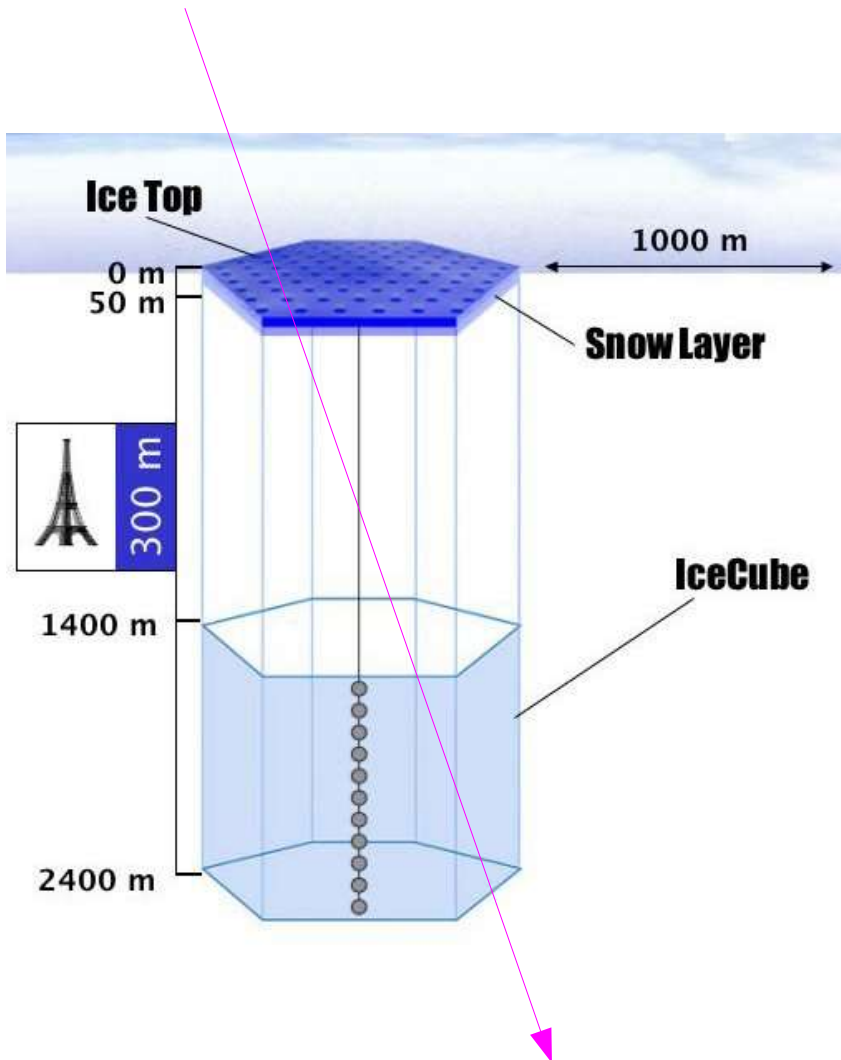
# IceTop as Veto Shield for Downgoing Neutrino Events

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12/16/05

- IceCube 80 string AMASIM data were used for this study.
- Multiplicity trigger: 24
- Local coincidence by Coincify in Icetray.
- The codes I used can be found in sandbox:  
<http://code.icecube.wisc.edu/svn/sandbox/mu-bundle>

# Down-going Neutrino Events



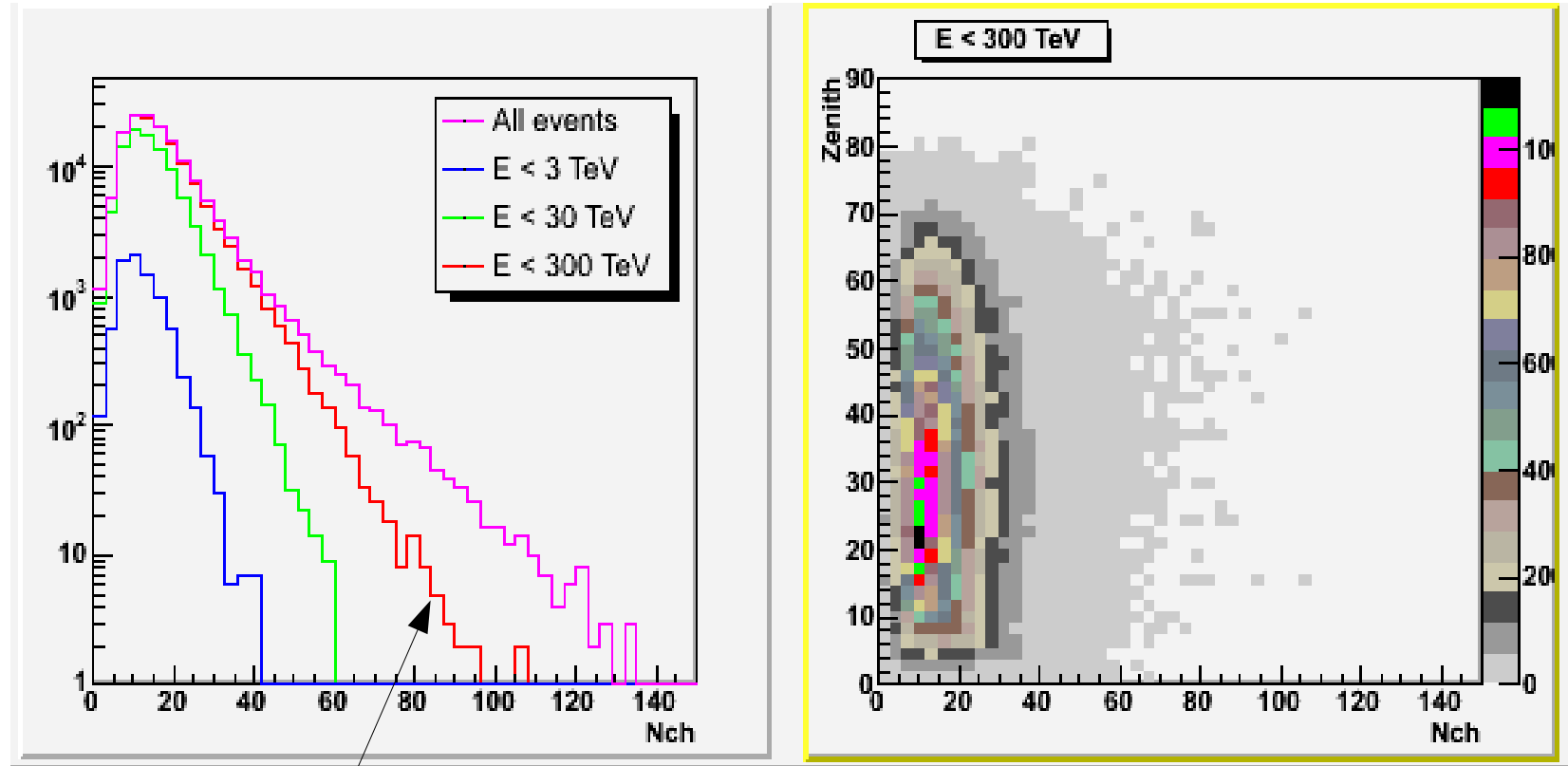
## Down-going events

Particles	IceTop trig	IceCube trig	Geo reco
Cosmic rays	Yes	Yes	Hybrid
Gamma rays	Yes	No	IceTop
Neutrinos	No	Yes	IceCube

(above certain energy threshold)

# How To Distinguish...

IceTop threshold energy: 300 TeV



Expected  $n_{ch}$  distribution for background

# Air Shower Generation

- There is only muon information in MC data.
- From true energy and zenith angle, particle density at the surface can be calculated by using NKG function.
- No IceTop tank simulation (but not too wrong!).

## NKG function

$$S = N R^{-1.2} (1 + R)^{1.2 - e} (1 + (r/1000)^2)^{-0.6}.$$

$$R = r / R_{\text{Moliere}}$$

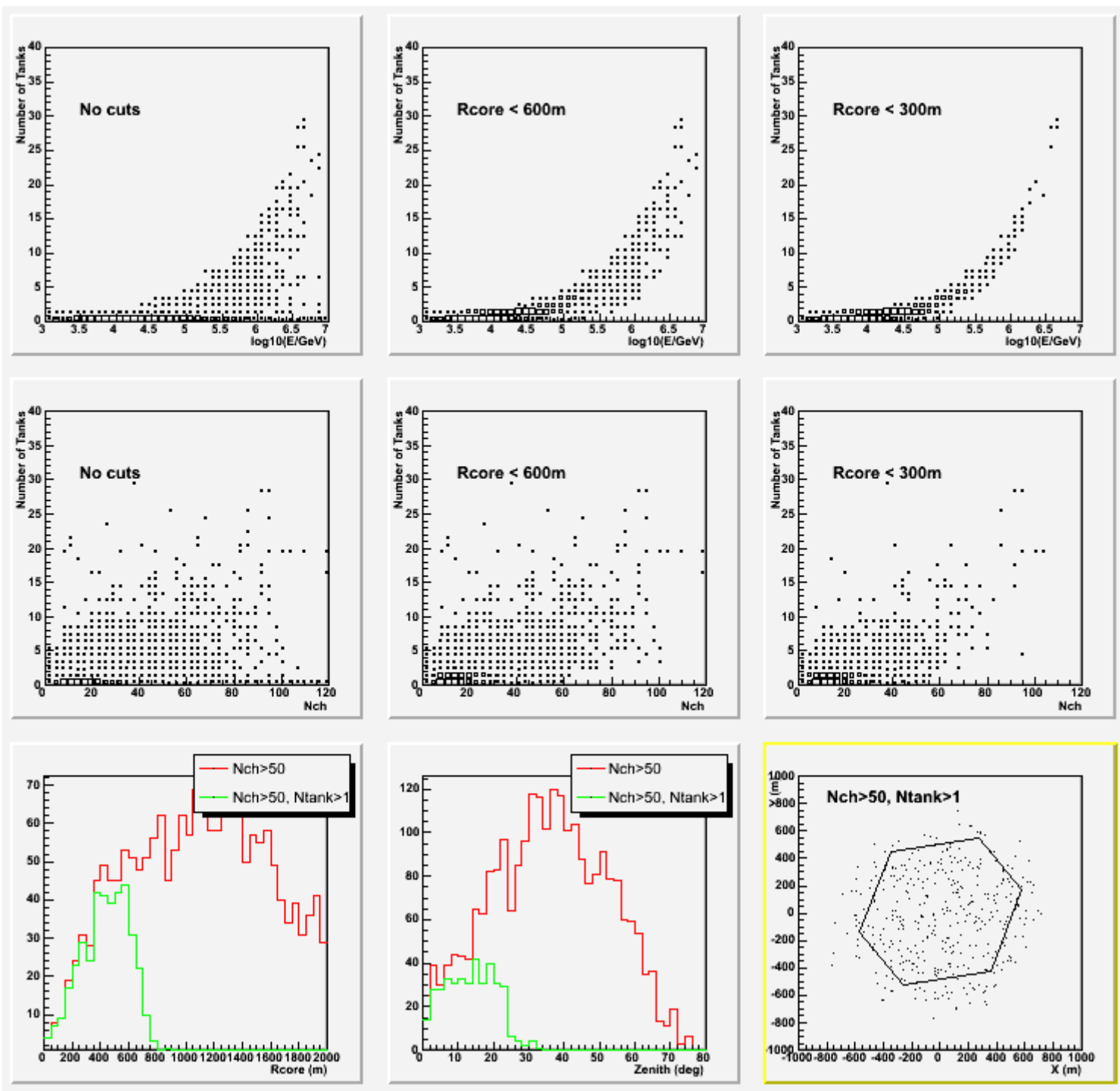
$$e = 3.97 - 1.79(\sec(\theta) - 1)$$

## Energy determination

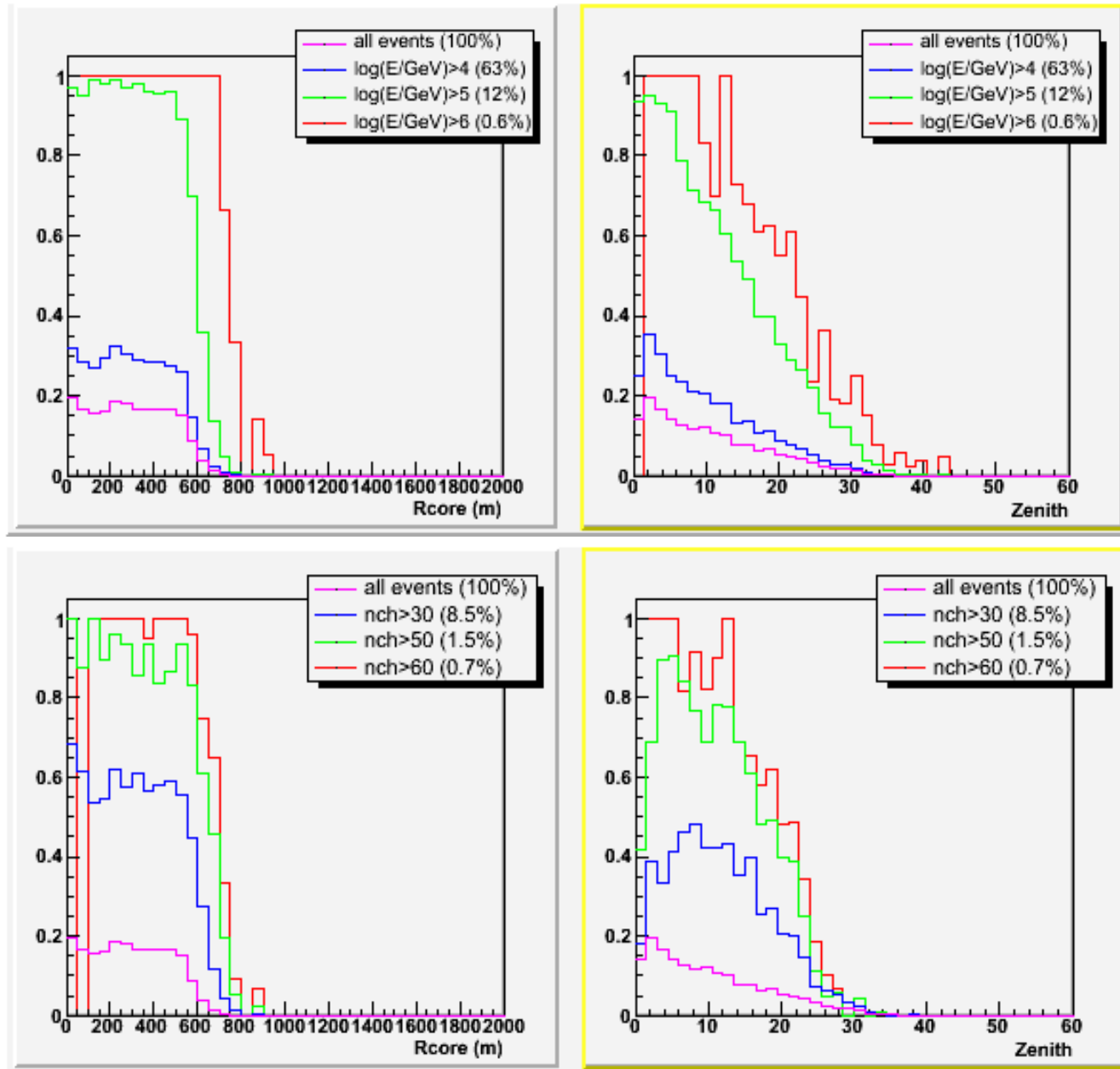
$$E = 3 \cdot 10^{17} S(600 \text{ m})$$



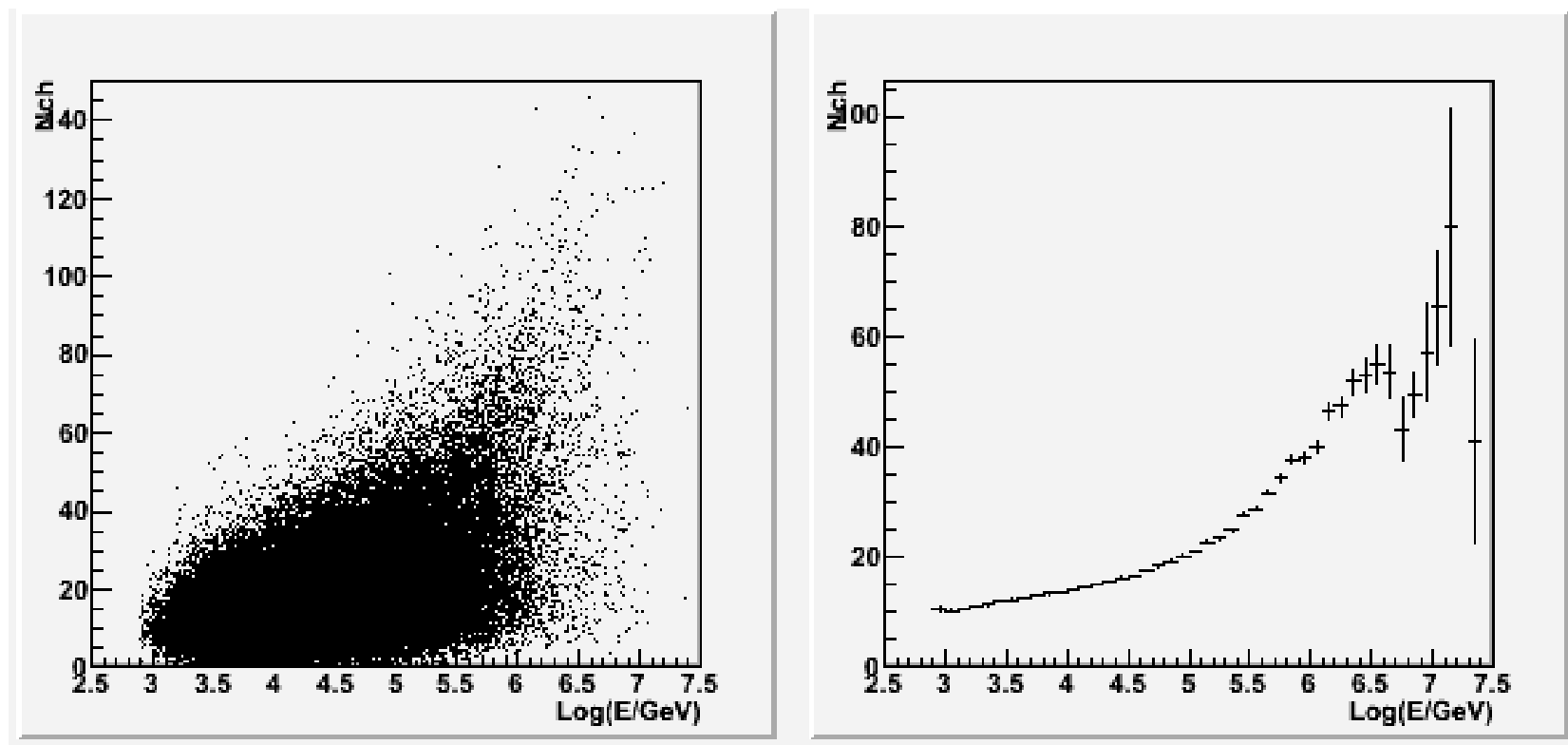
$$S = f(E, r, \theta)$$



# IceTop trigger efficiency

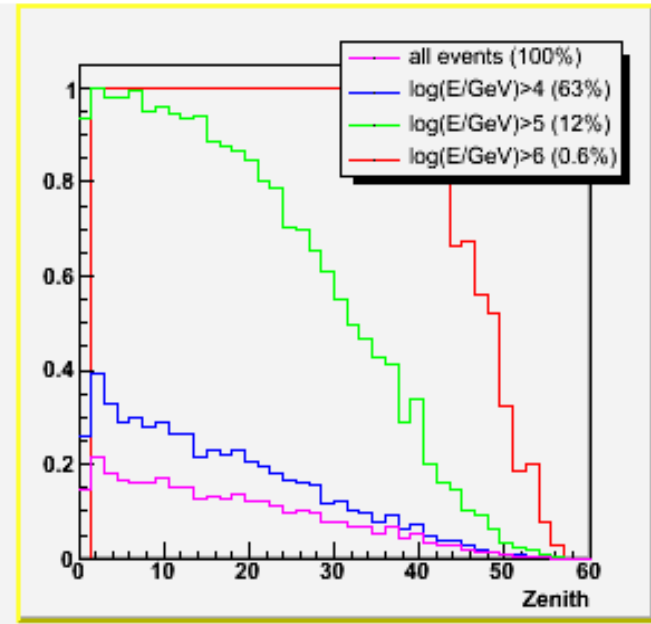
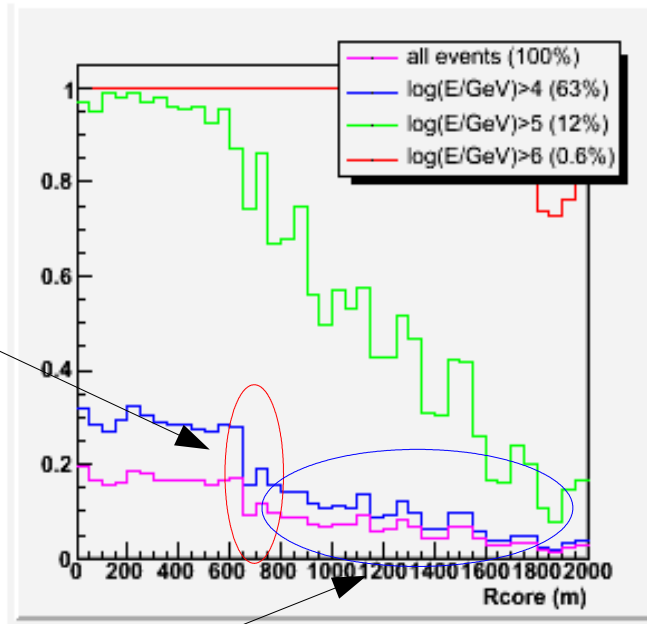


# Nch Vs. Energy

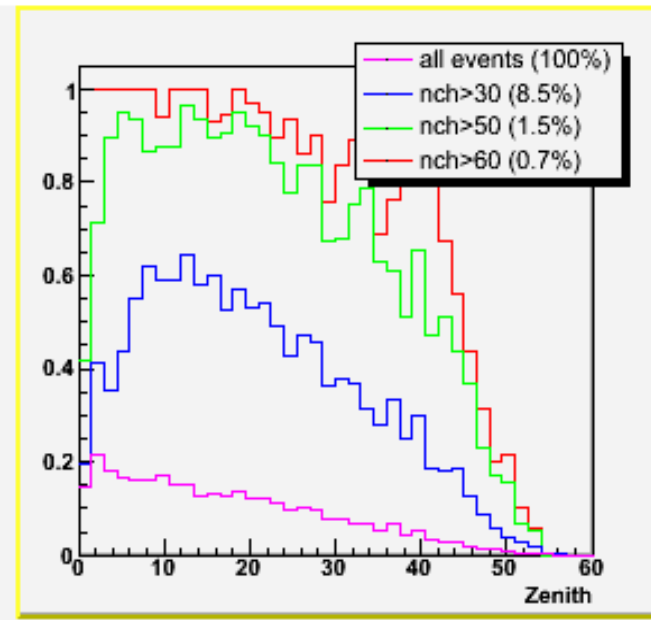
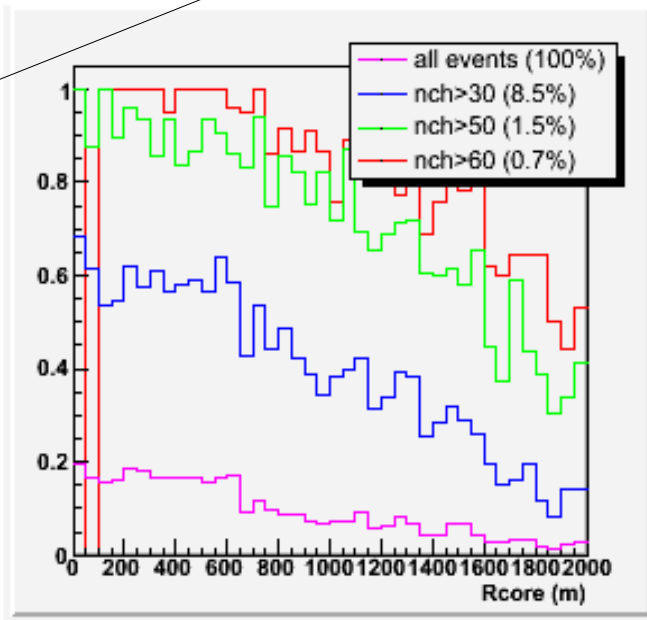


# Extension of IceTop to 2 km in radius

Discontinuity at edge of the array

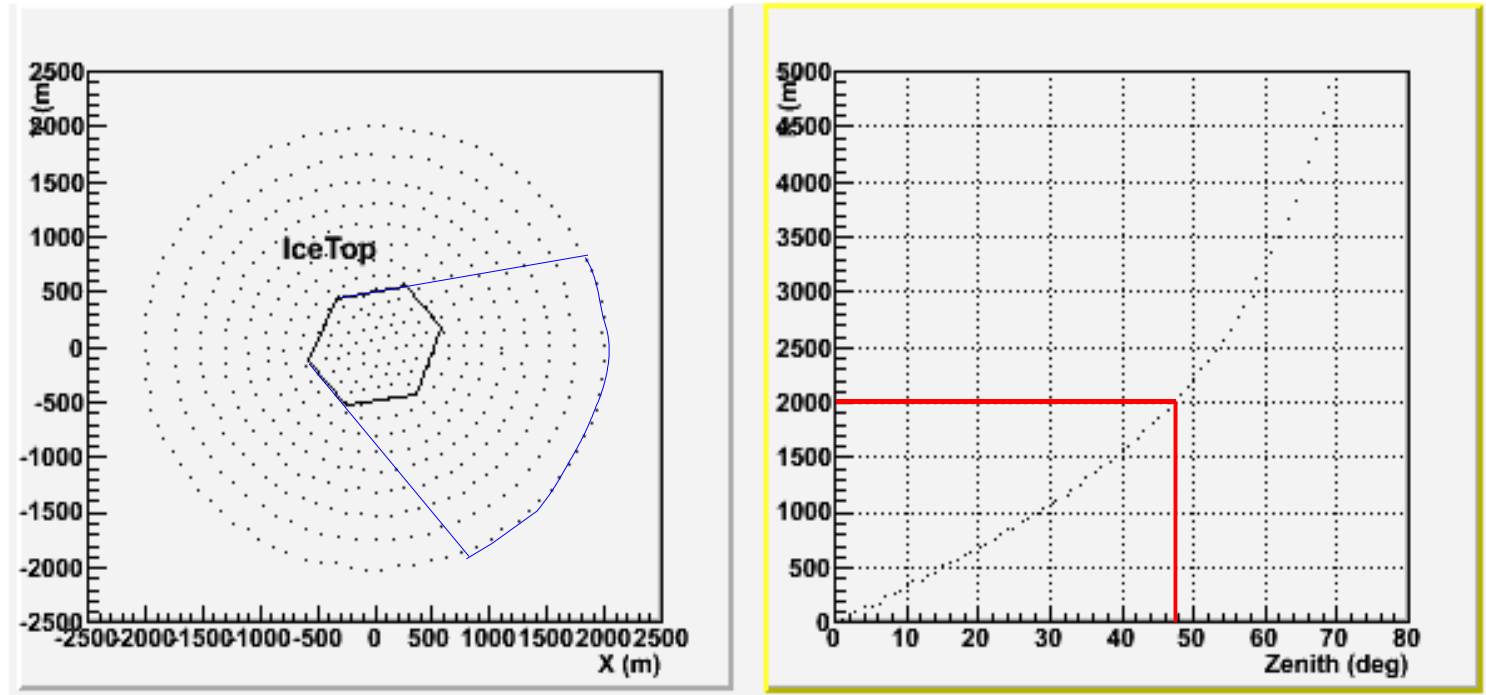


Only high energy events are triggered by the outer rings





# Extension of IceTop



Zenith angle from IceCube center