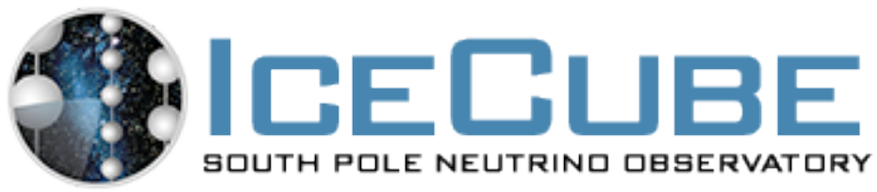
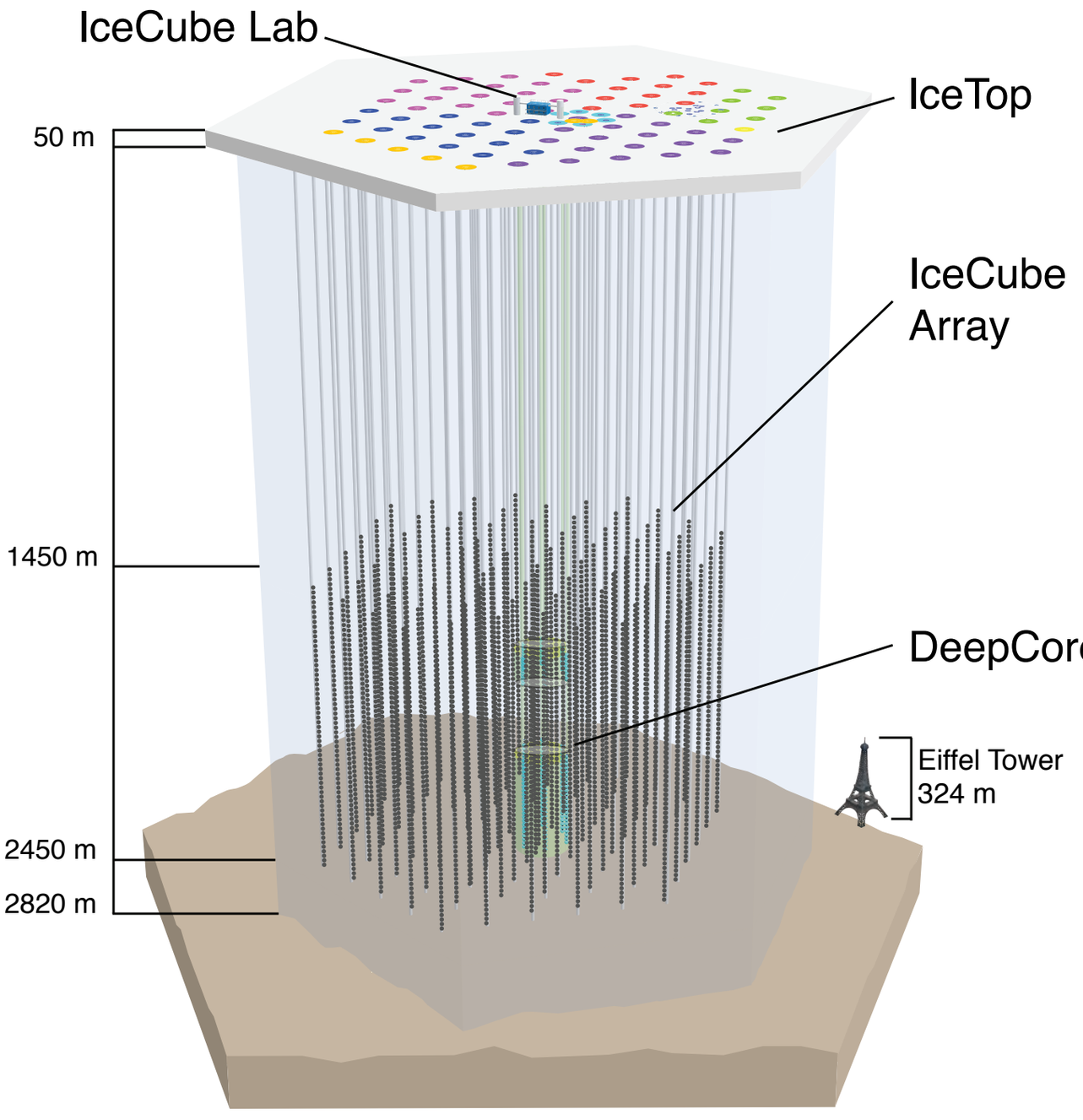
Recent Results from IceCube

Chris Weaver for the IceCube Collaboration

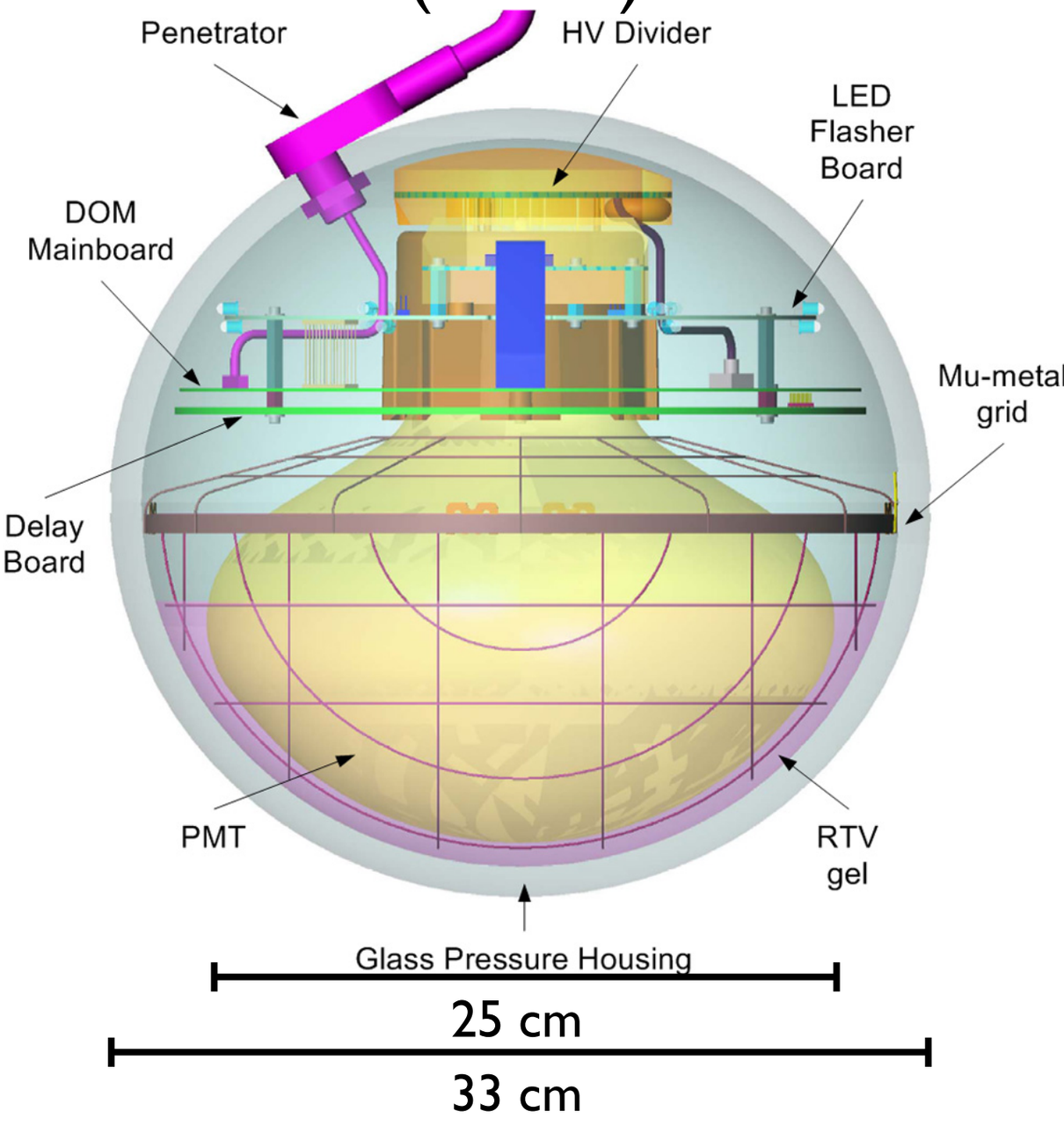


Detector Hardware

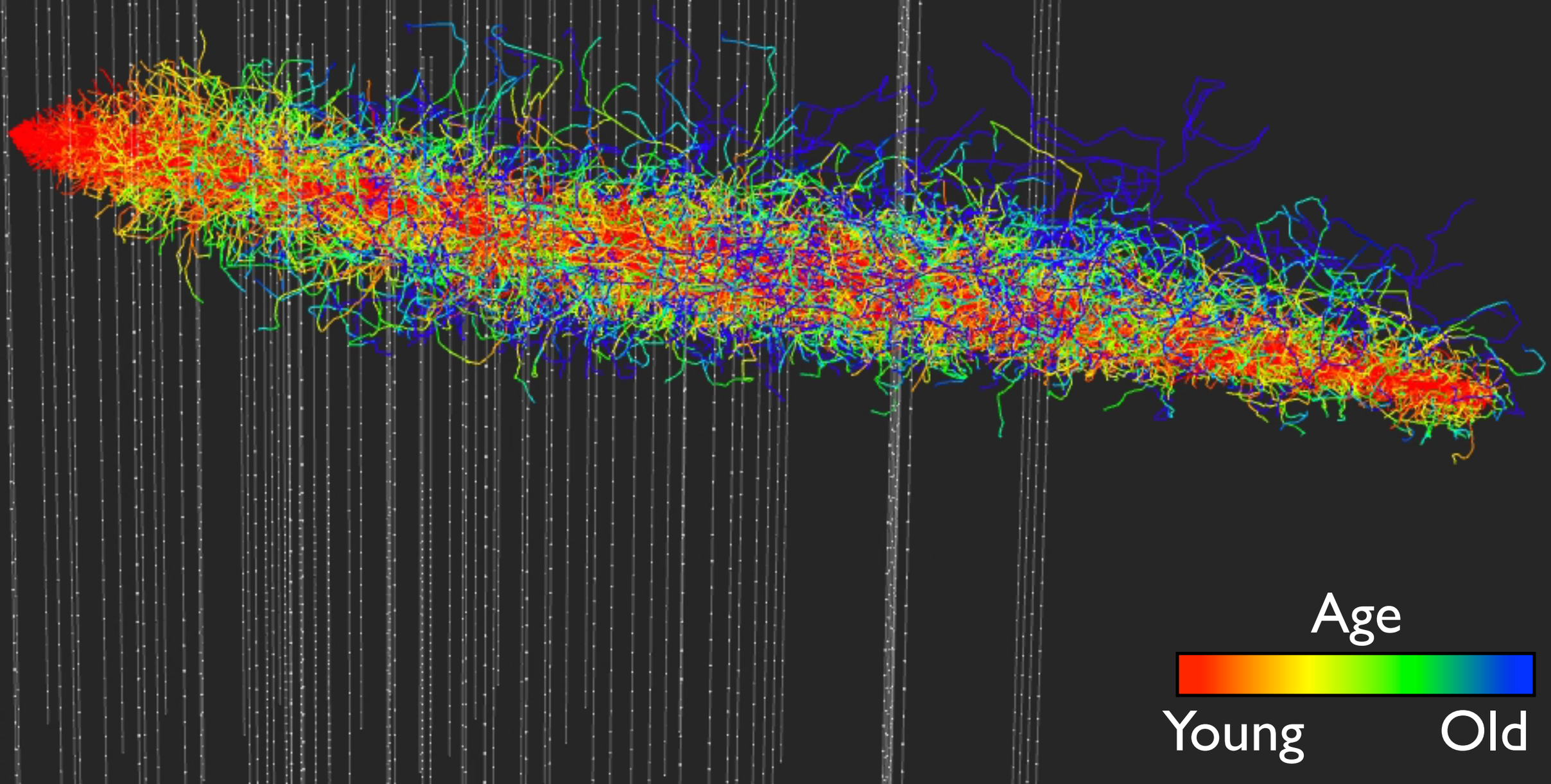
Detector Layout



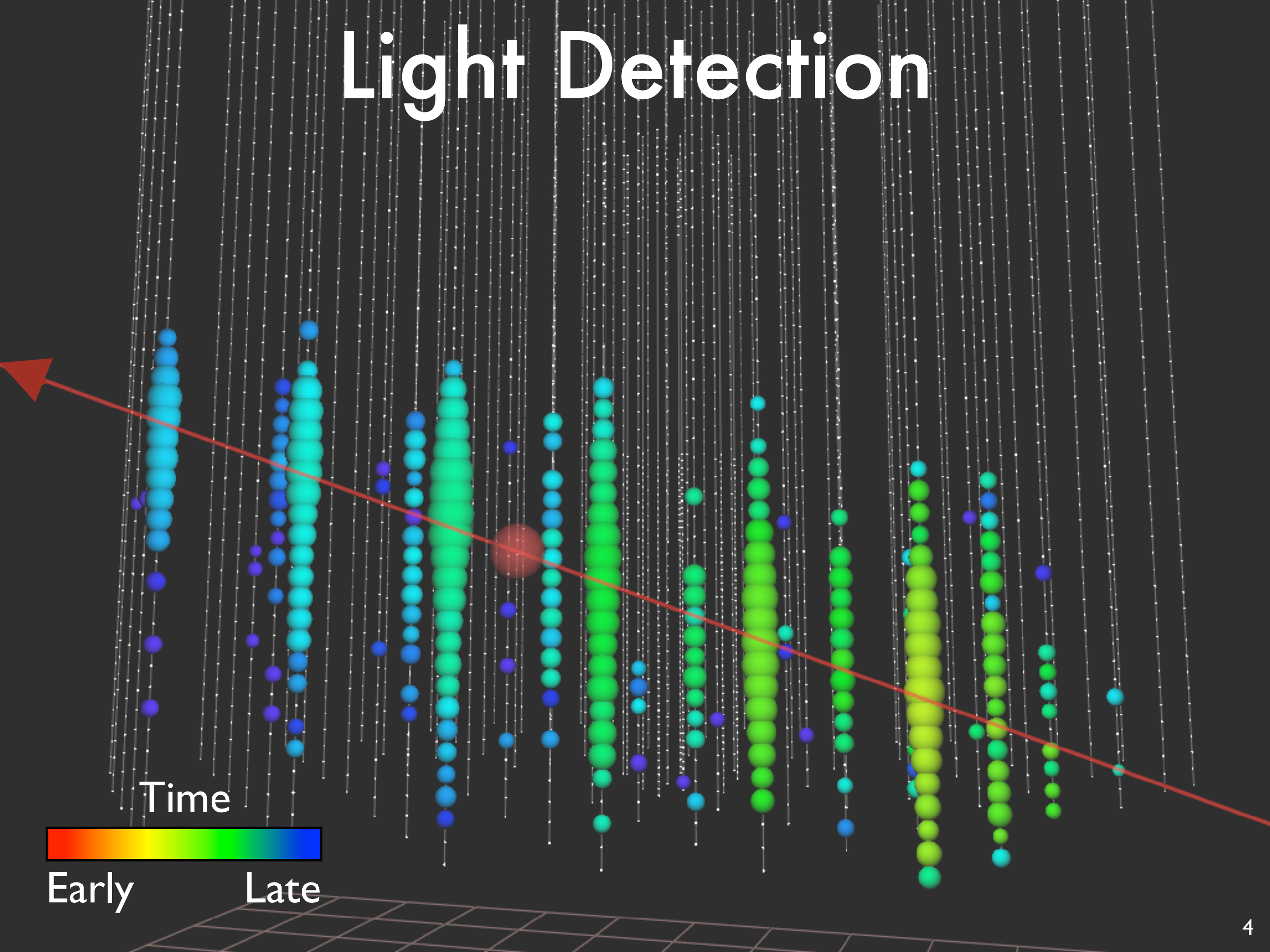
Digital Optical Module (DOM)



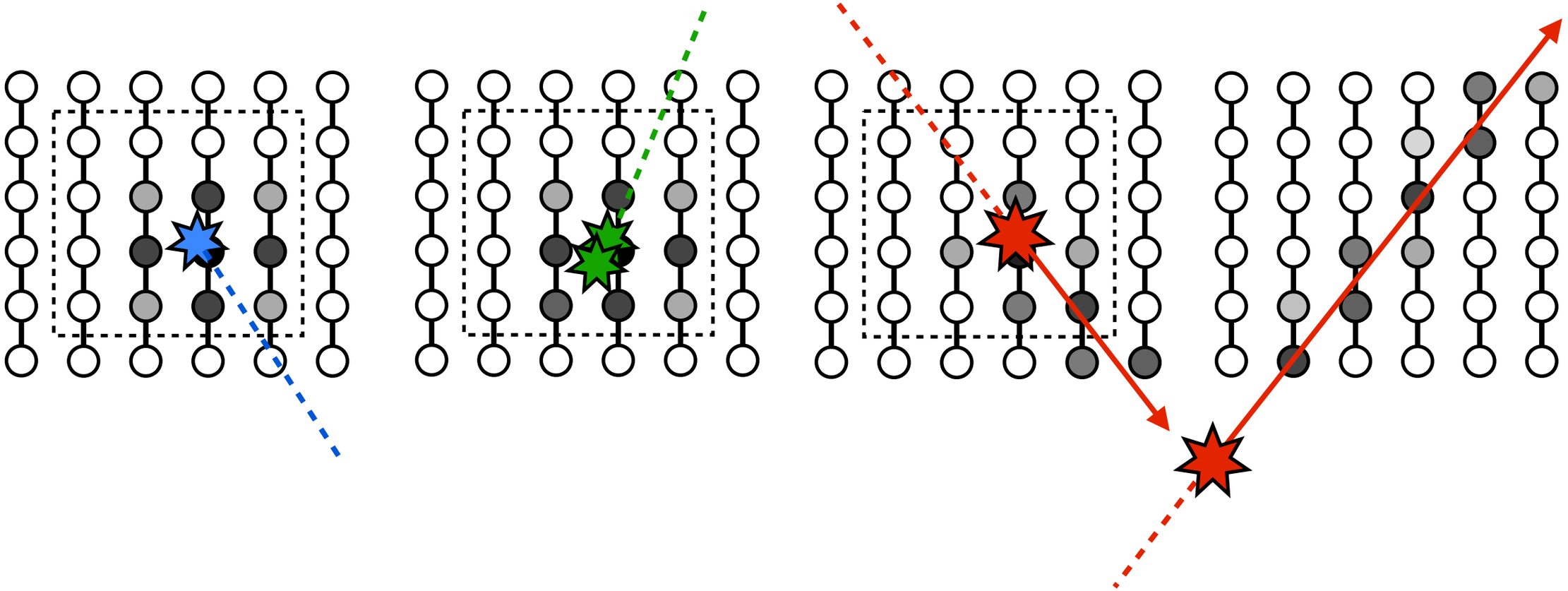
Particle Light Emission



Light Detection



IceCube Event Topologies



- Can select events starting in a fiducial volume or entering in a direction impossible for non-neutrinos
- Muons produce long tracks, almost everything else looks approximately point-like

Signals in IceCube

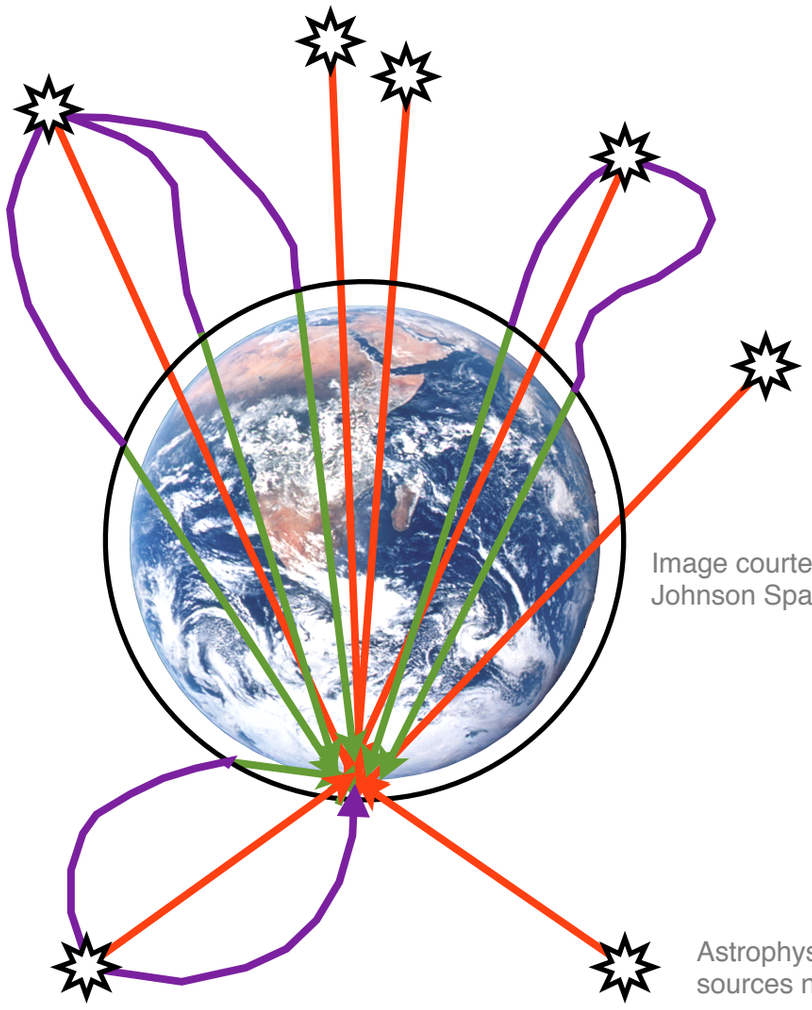
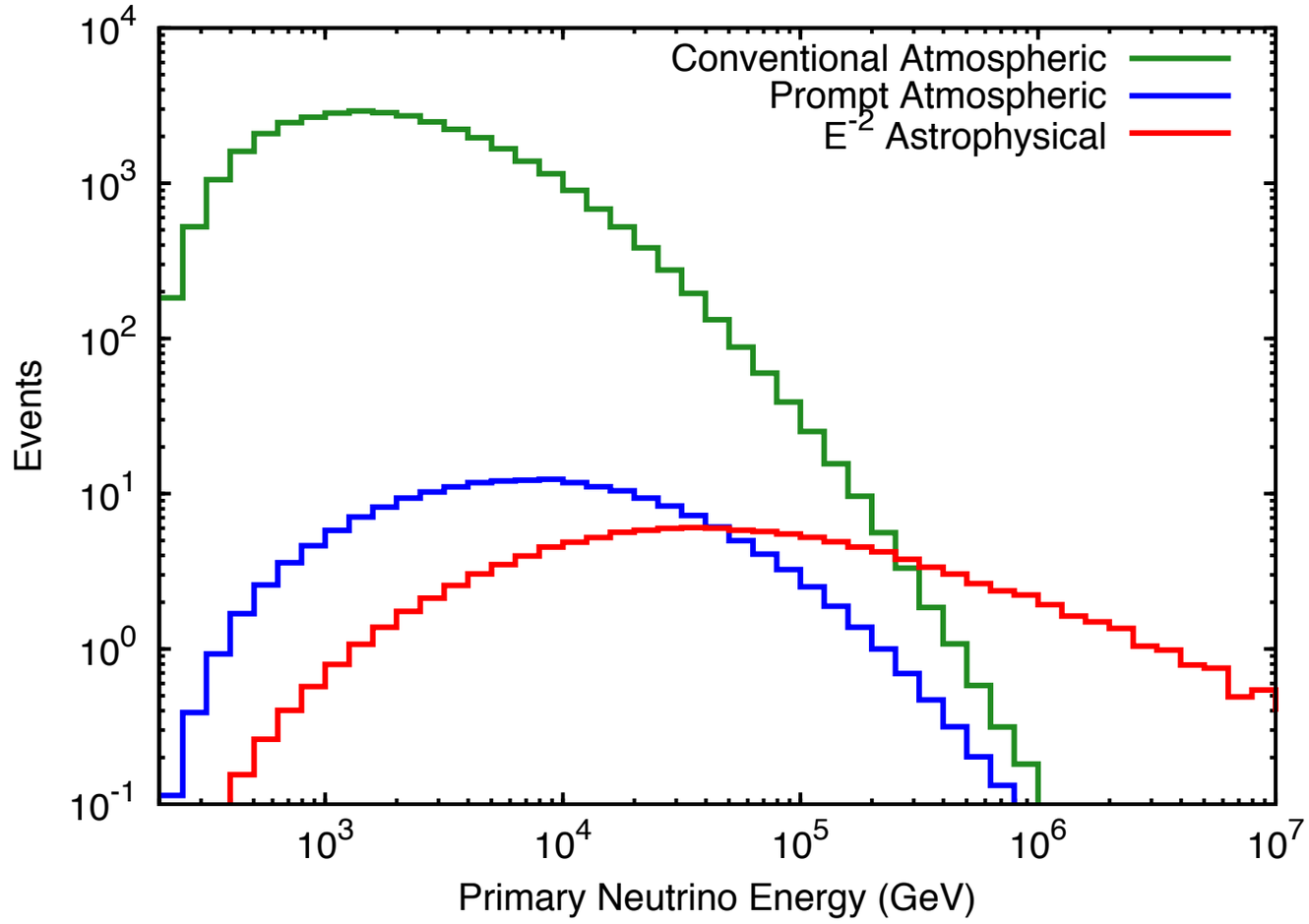


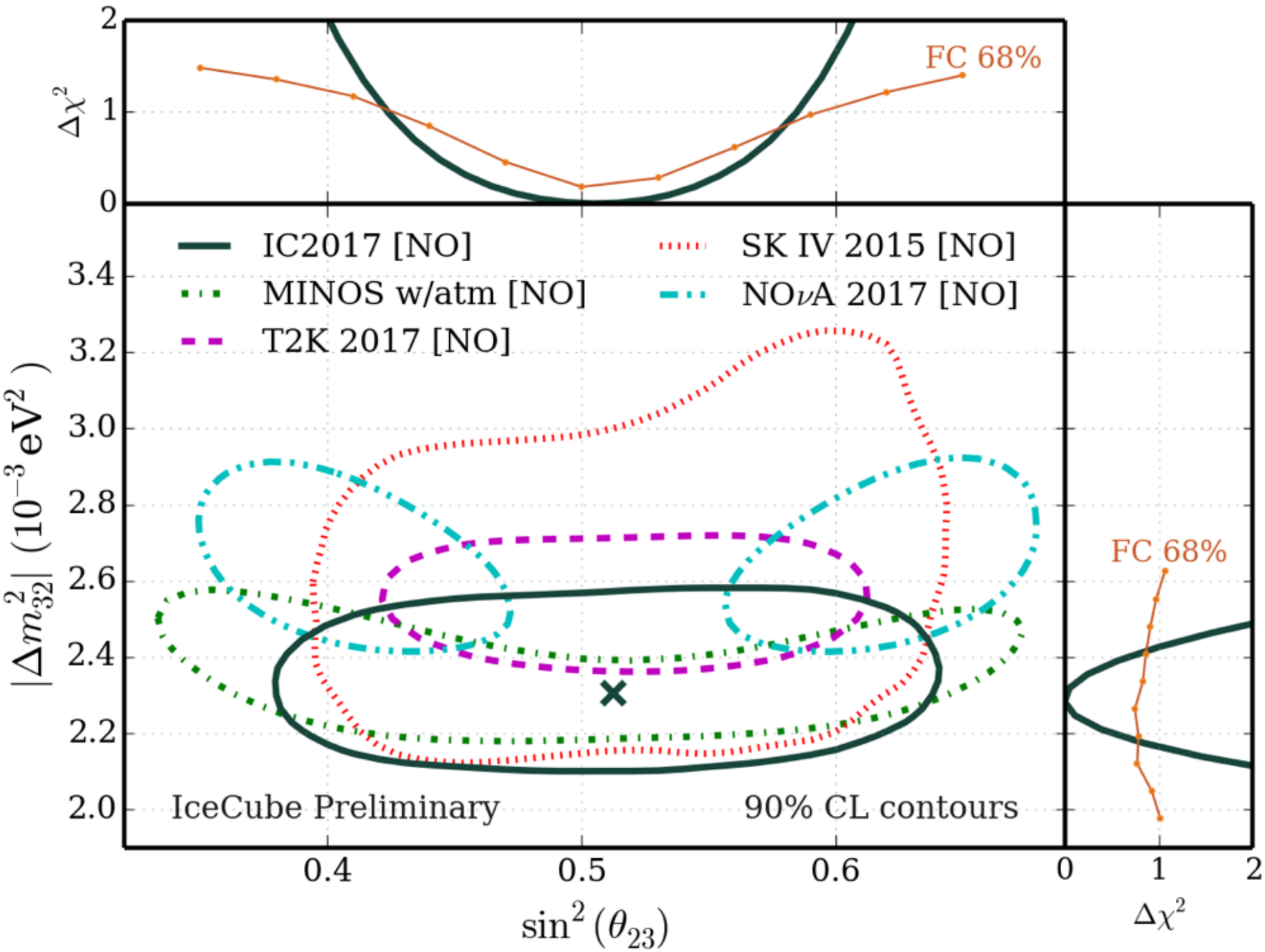
Image courtesy NASA
Johnson Space Center

Astrophysical
sources not to scale



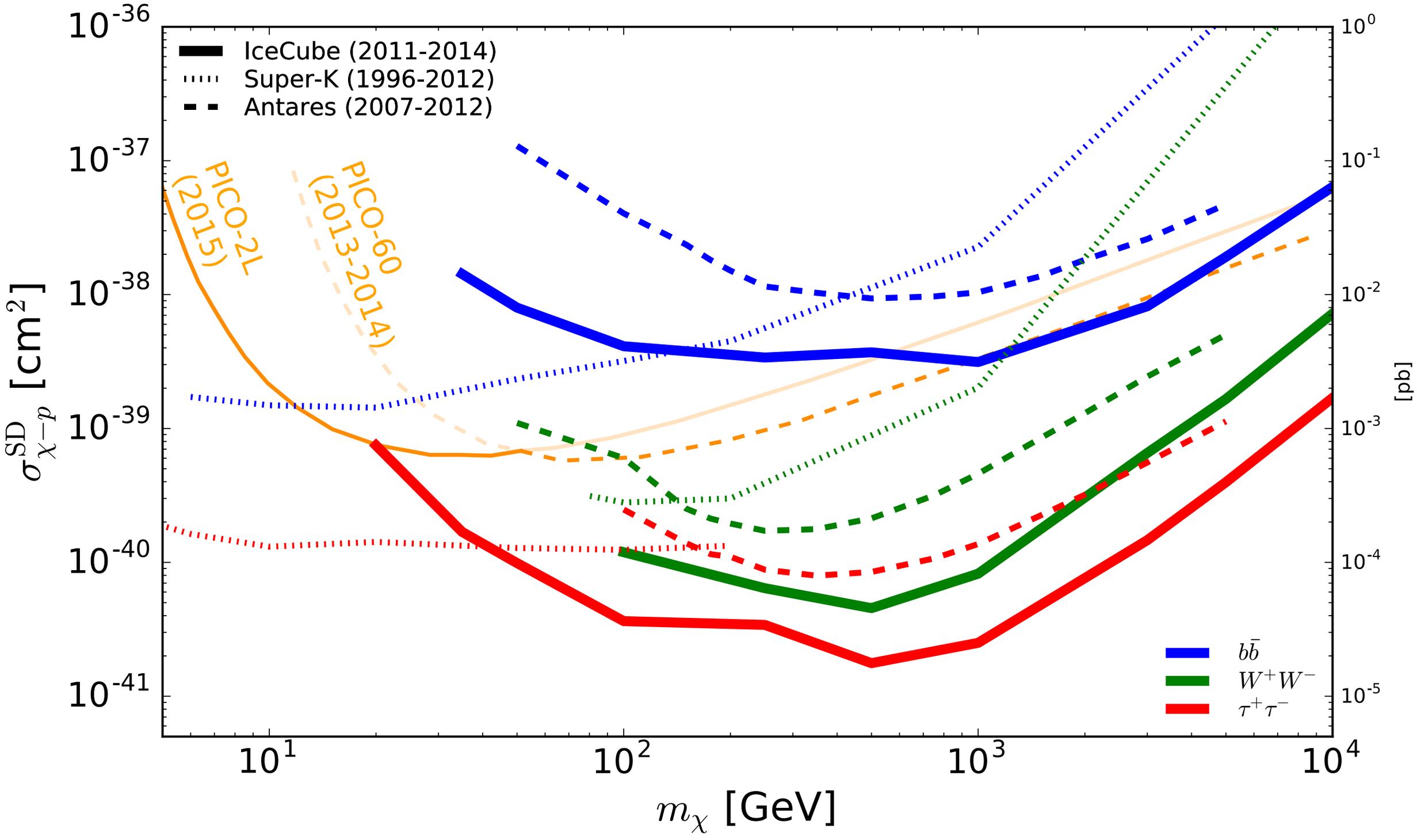
- Cosmic ray air showers
  - Atmospheric neutrinos—all directions, many ‘baselines’
- Astrophysical neutrinos

Neutrino Oscillation

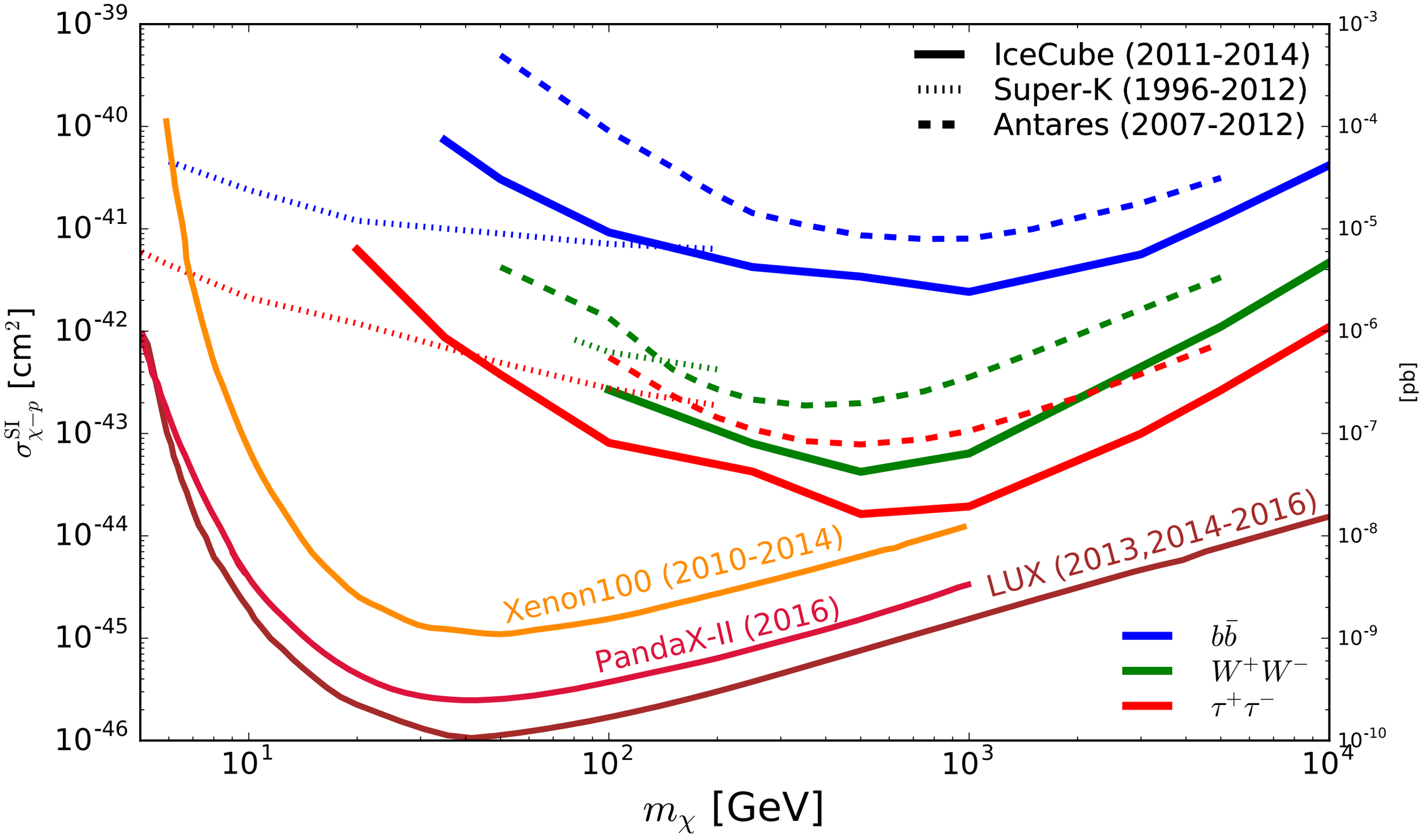


Atmospheric ν_μ disappearance—3 years of data
Results very similar for Inverted ordering

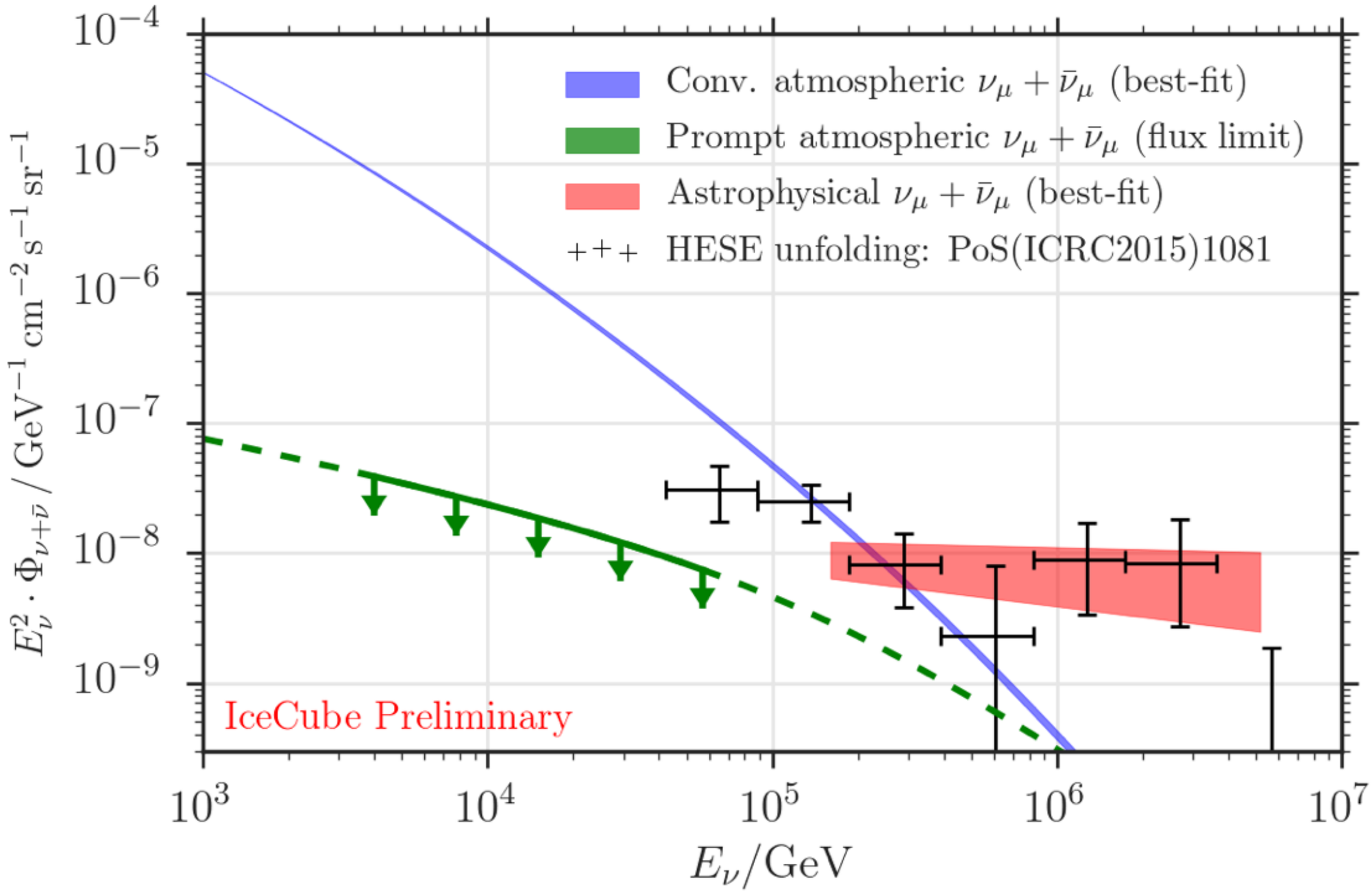
Solar WIMP Annihilation



Solar WIMP Annihilation

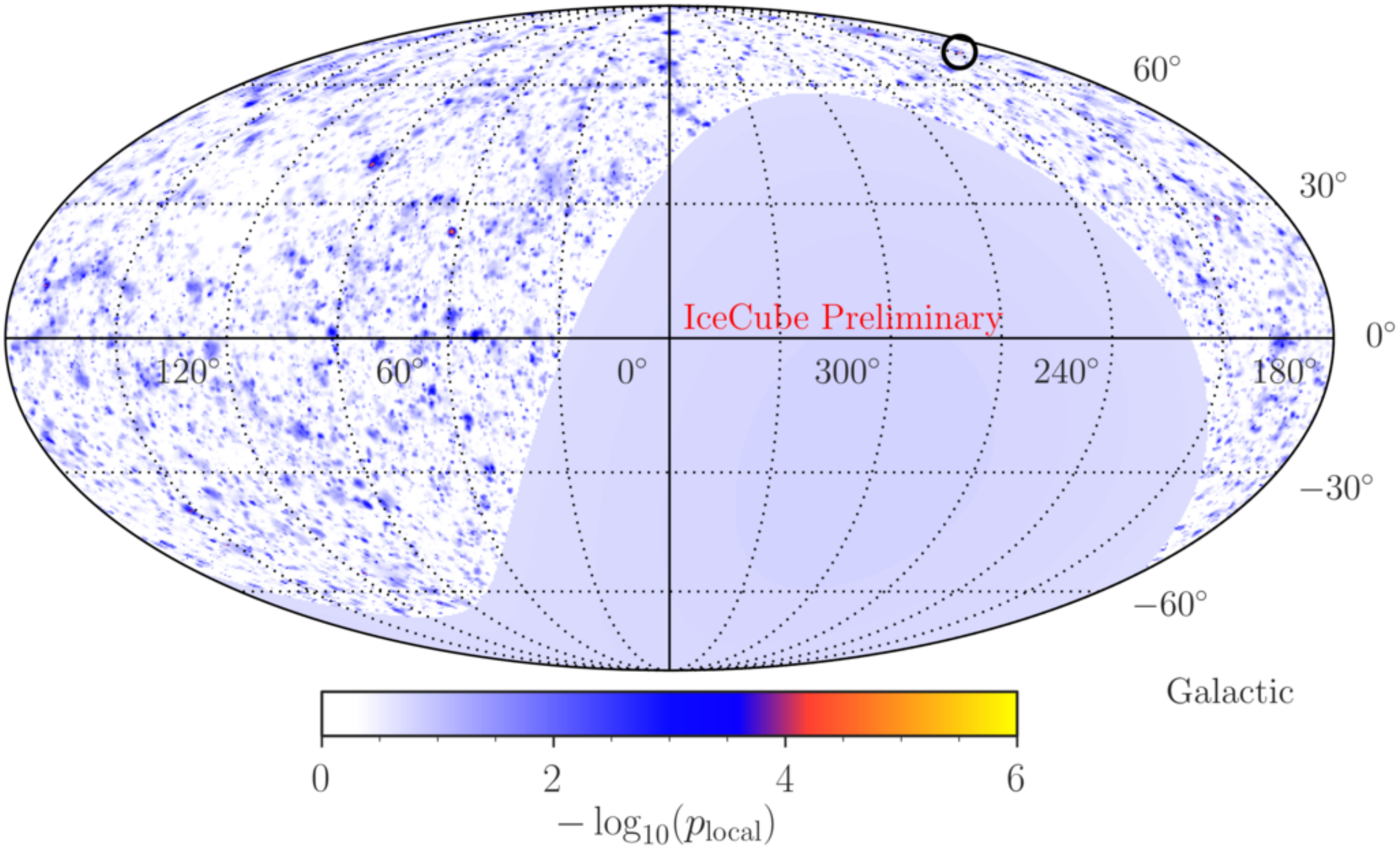


Astrophysical Neutrino Spectrum



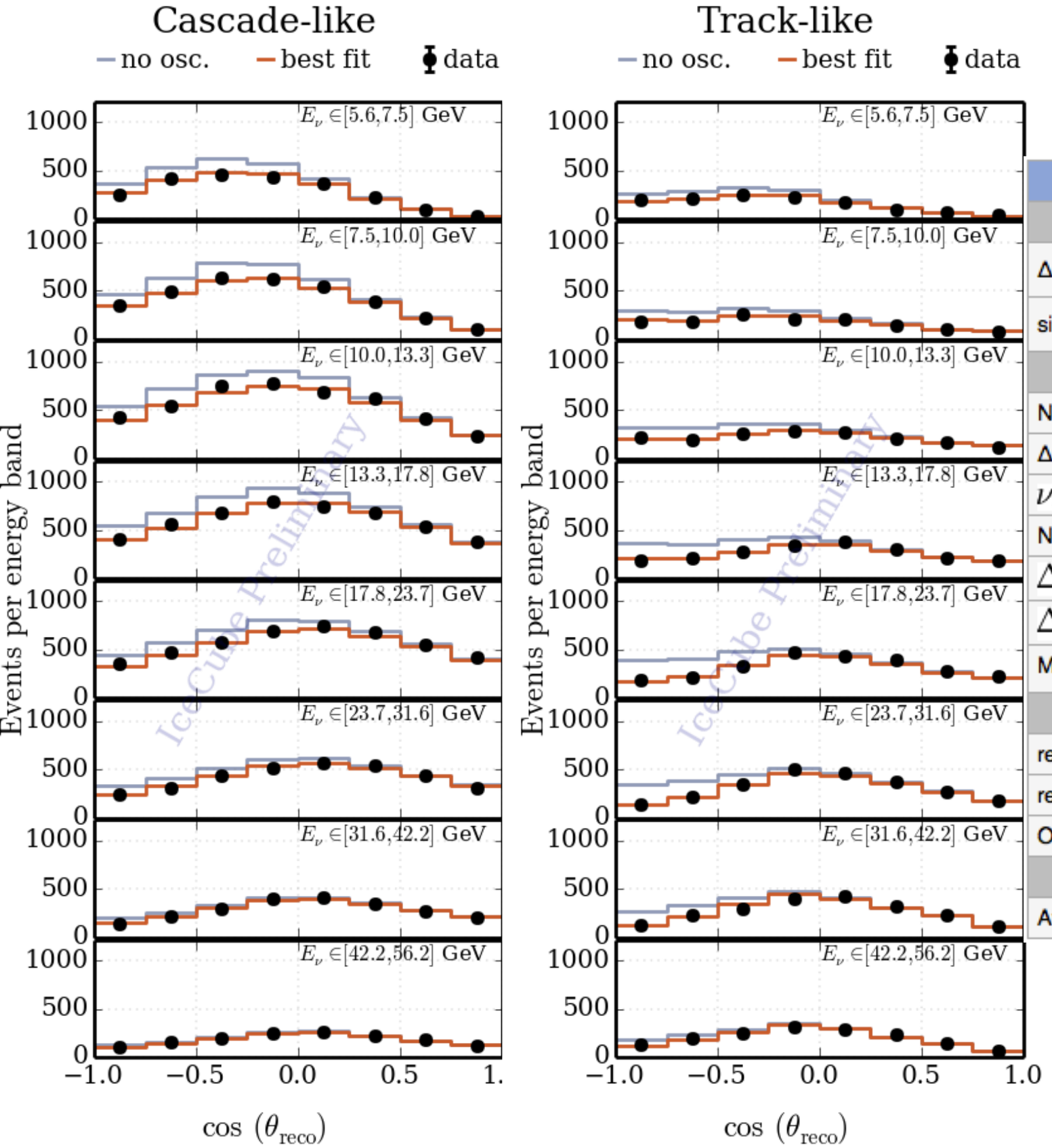
Now 7 years of through-going track data

Search for Astrophysical Sources

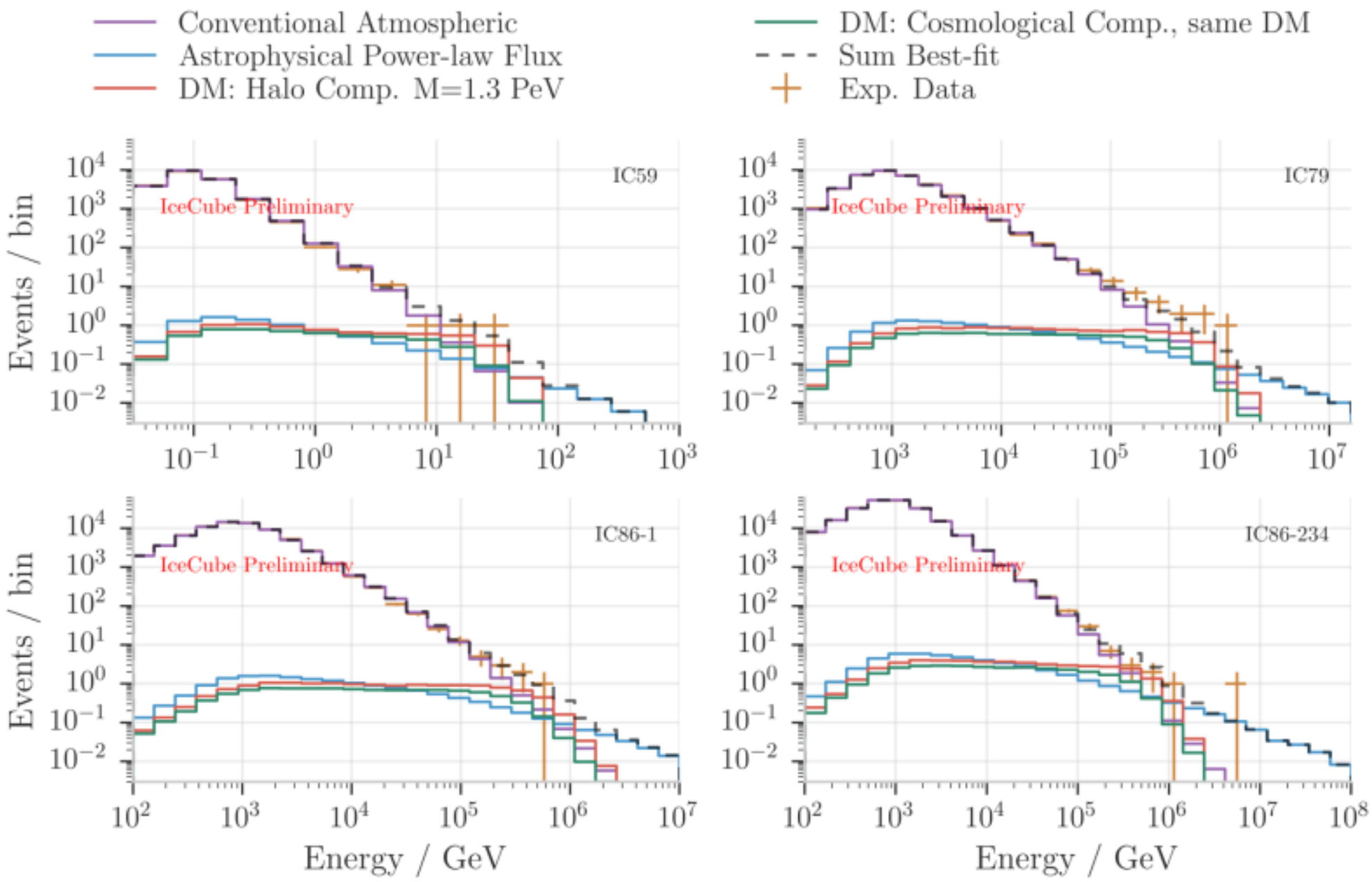


Thank You!

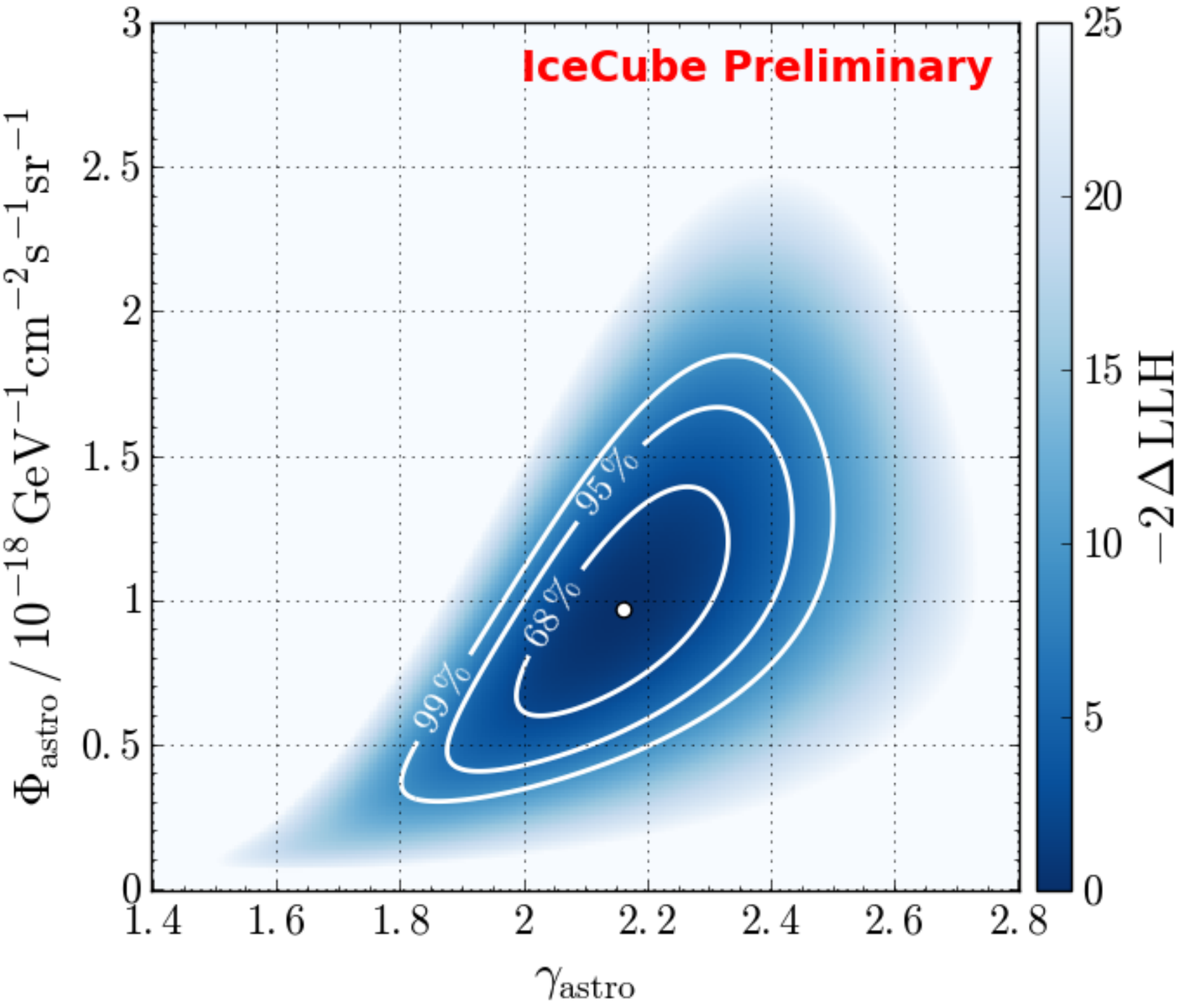
Questions?



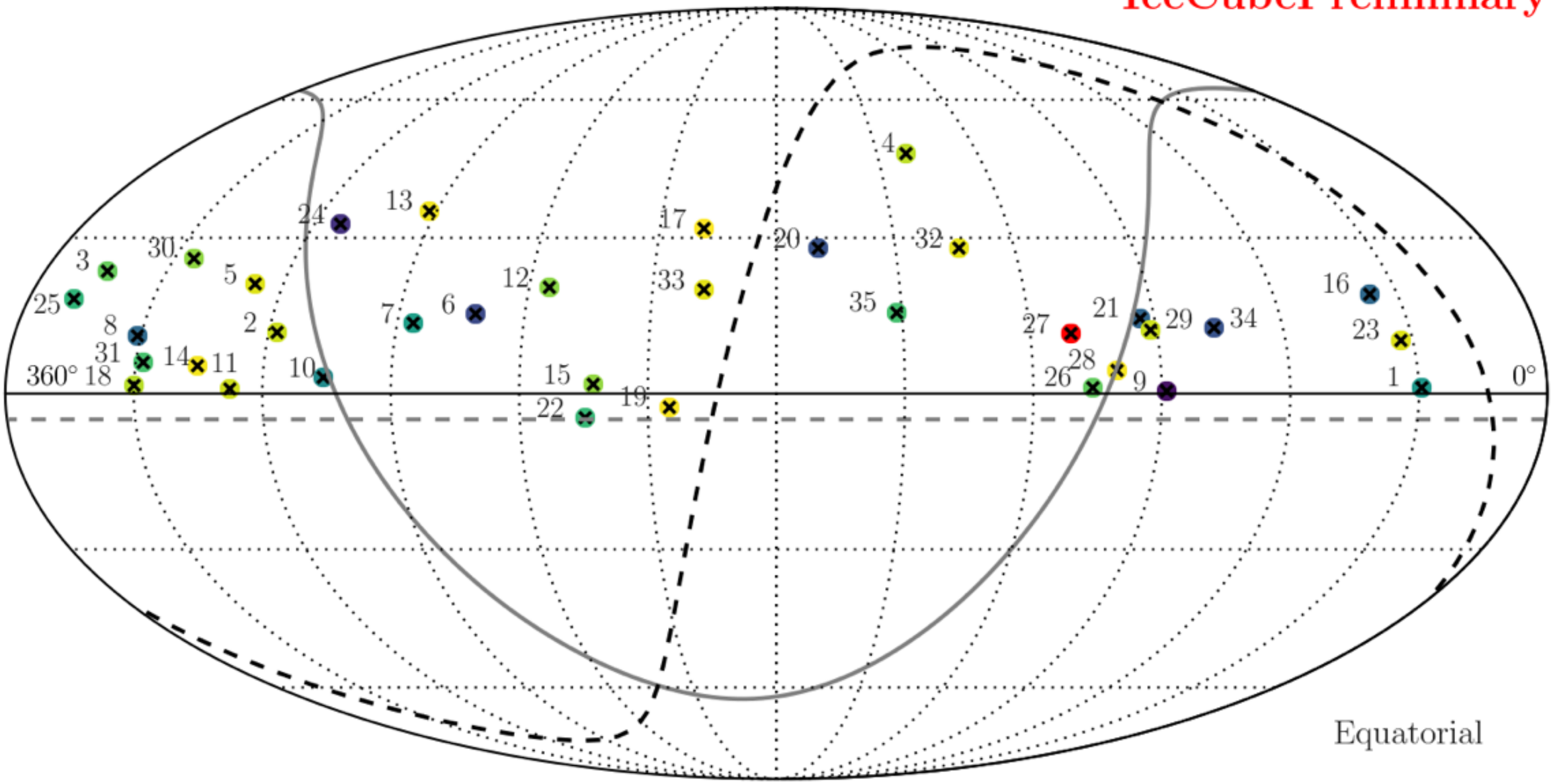
Parameter	Priors	NO
Standard mixing parameters		
Δm^2_{32} (10^{-3} eV^2/c^4)	no prior	$2.31^{+0.11}_{-0.13}$
$\sin^2 \theta_{23}$	no prior	$0.51^{+0.07}_{-0.09}$
Flux and cross section parameters		
Neutrino event rate [% of nominal]	no prior	85
Δγ (spectral index change)	0.00±0.10	-0.02
$\nu_e + \bar{\nu}_e$ relative normalization (%)	100±20	125
NC relative normalization	100±20	106
$\Delta(\nu/\bar{\nu})(\sigma)$, energy dependent	0.00±1.00σ	-0.56
$\Delta(\nu/\bar{\nu})(\sigma)$, zenith dependent	0.00±1.00σ	-0.55
M_A (resonance) (GeV)	1.12±0.22	0.92
Detector parameters		
relative DOM efficiency, lateral (σ)	0.0±1.0	0.2
relative DOM efficiency, head-on (a.u.)	no prior	-0.72
Overall DOM efficiency (%)	100±10	102
Atmospheric μ background		
Atmospheric μ contamination (% of sample)	no prior	5.5

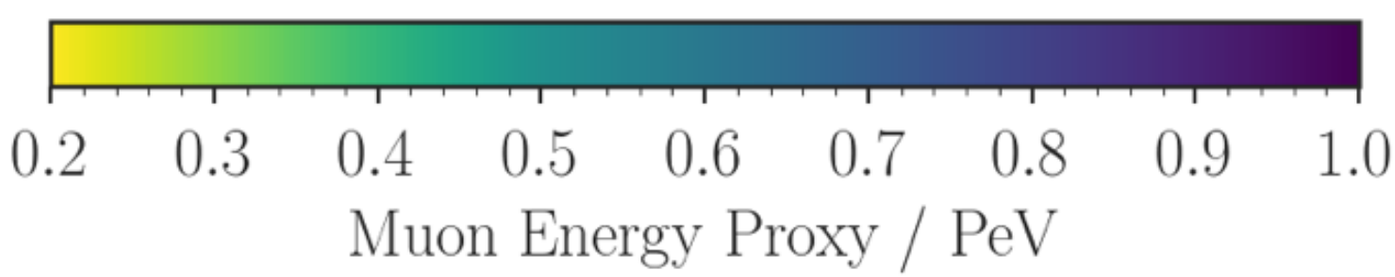


Non-zero DM contribution does not appear to be significant; only 1.8σ when compared to background-only trials


IceCube Preliminary
$\Phi_{\rm astro}$ / 10^{-18} GeV^{-1}cm^{-2}s^{-1}sr^{-1}
$\gamma_{\rm astro}$
-2ΔLLH
99 %
95 %
68 %
3
2.5
2
1.5
1
0.5
0
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
25
20
15
10
5
0

IceCubePreliminary





Galactic Halo Dark Matter