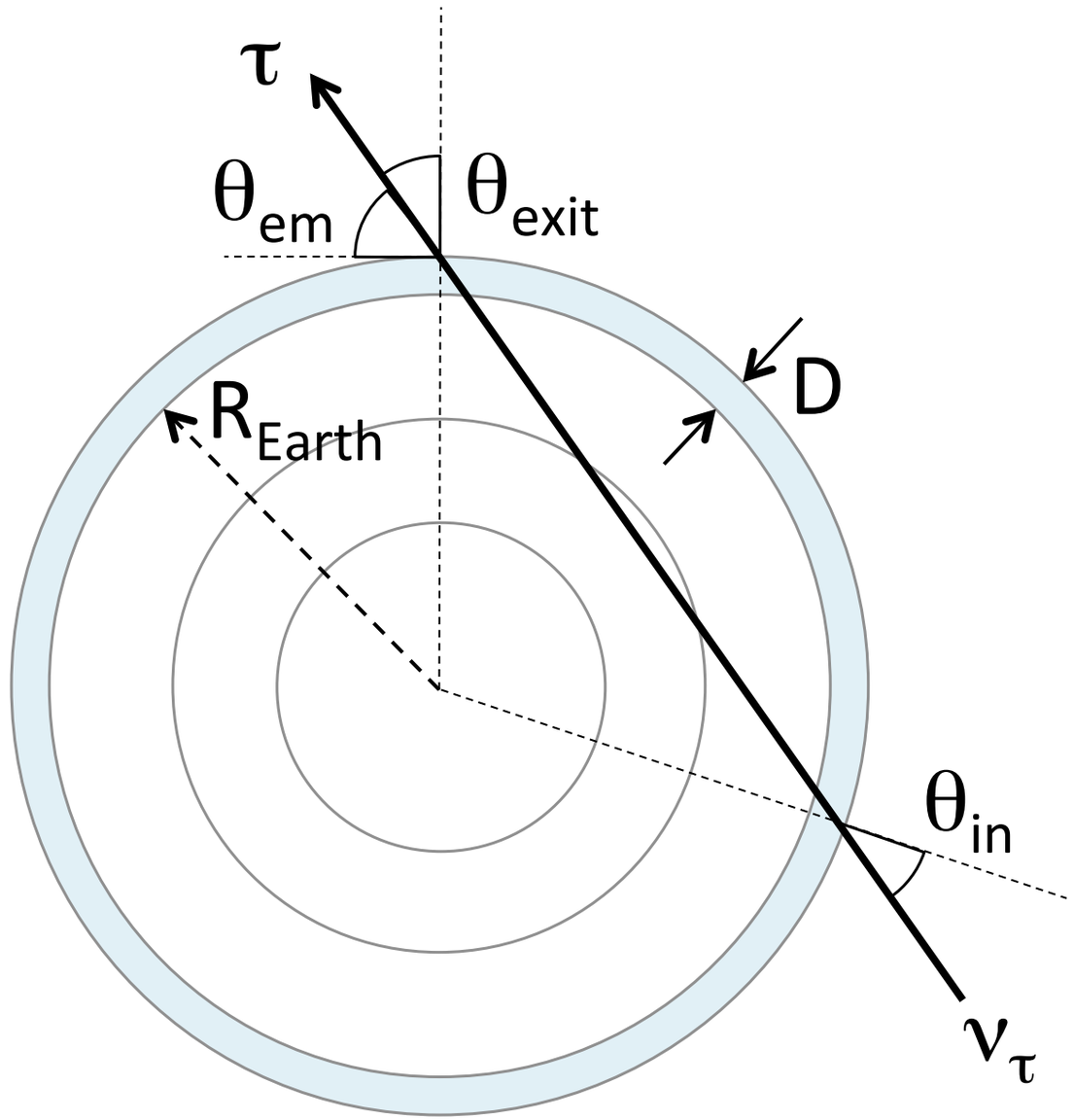
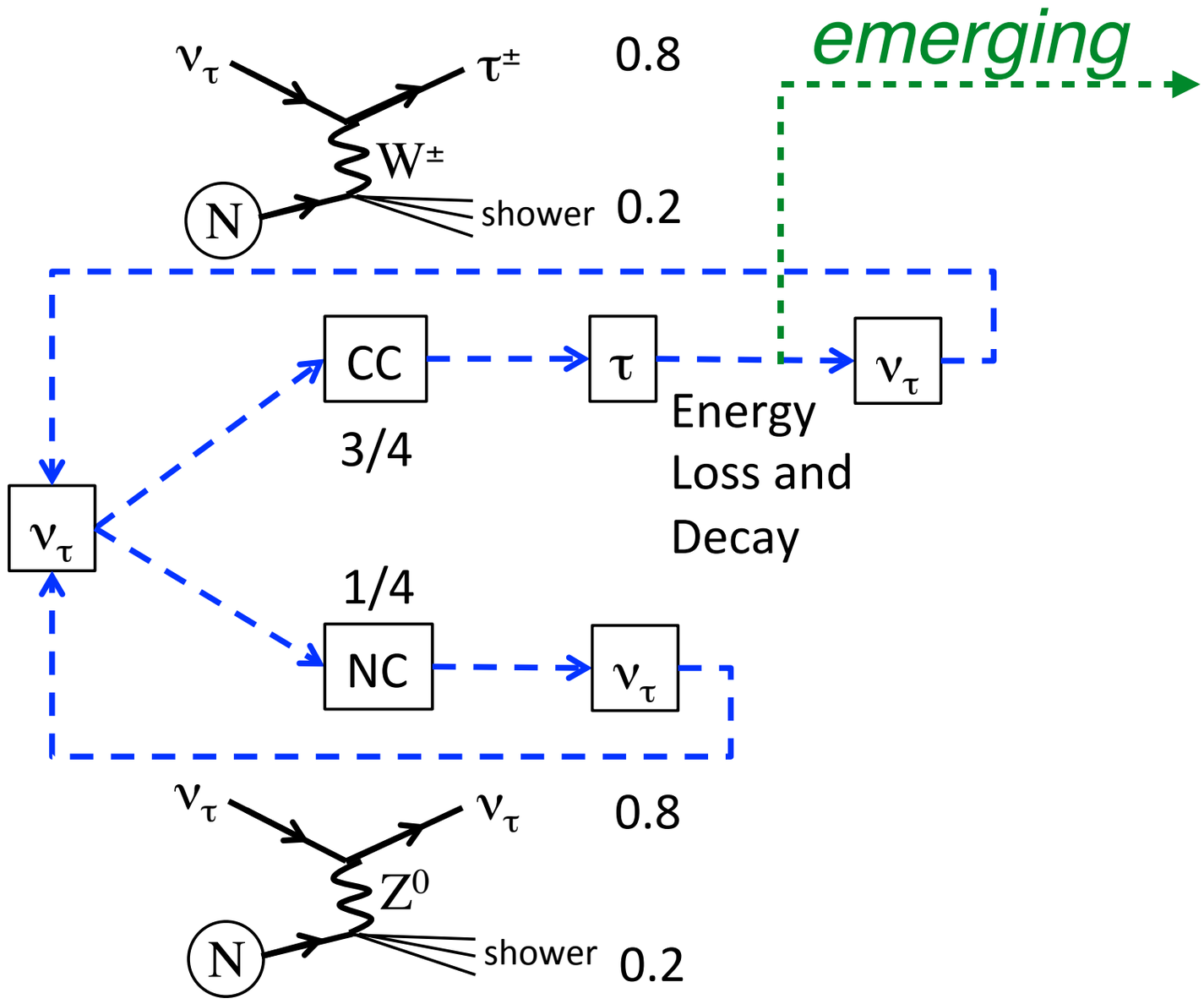
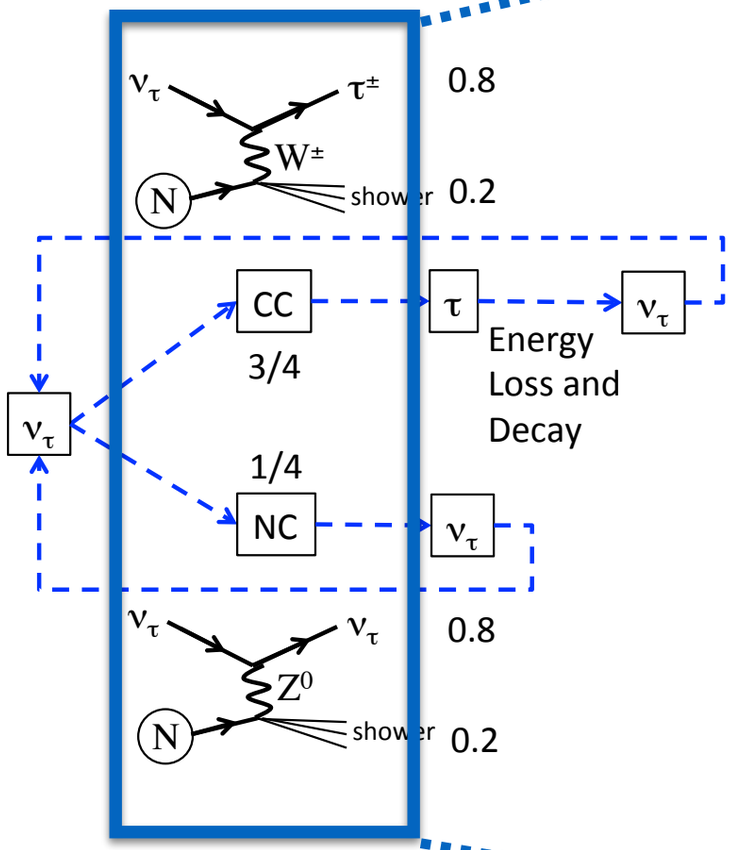
NuTauSim: *A comprehensive approach to tau-lepton production by Ultra-High-Energy Tau Neutrinos Propagating through Earth*

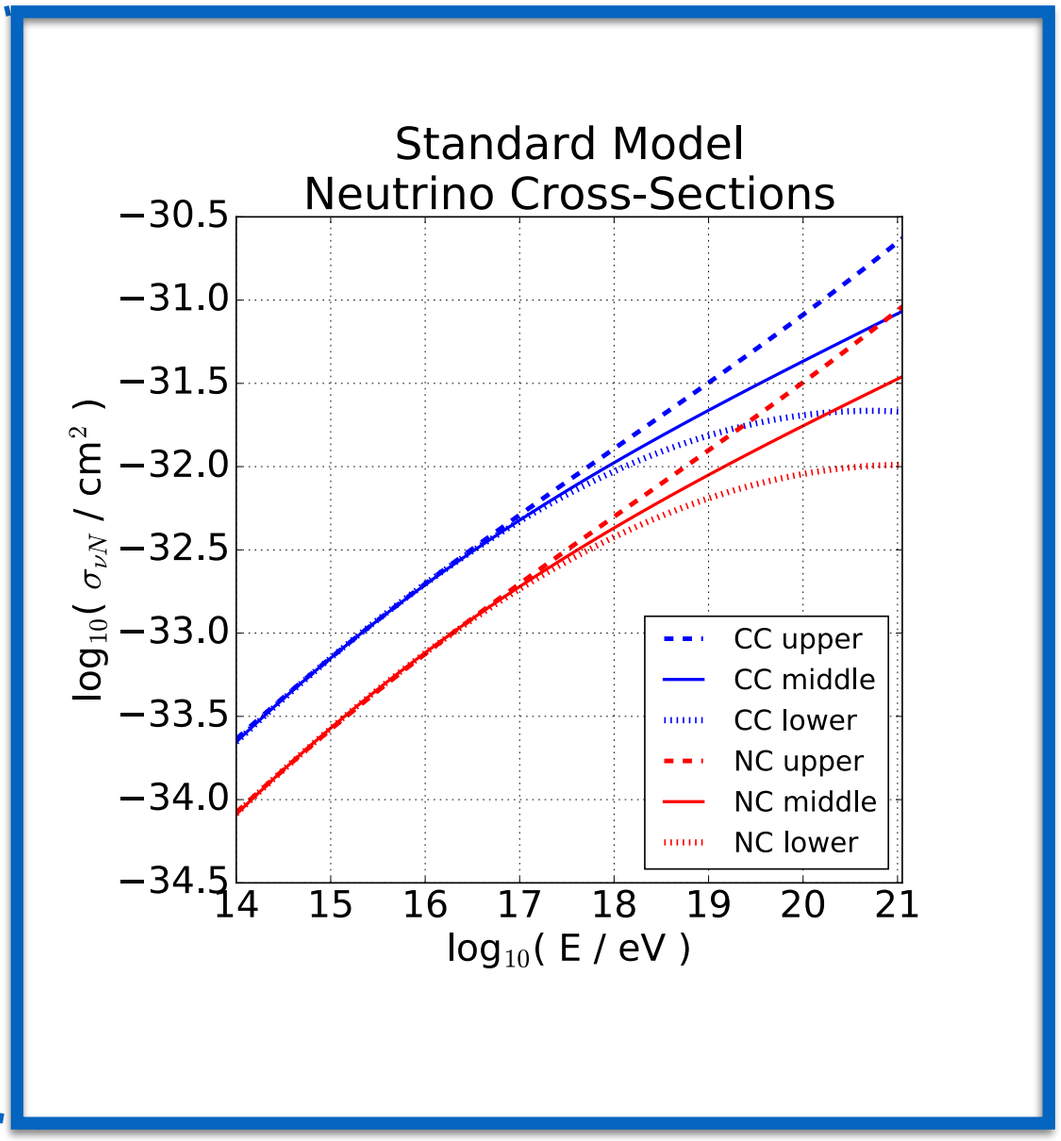
Jaime Alvarez-Muñiz, Washington R. Carvalho Jr., Kévin Payet, Andrés Romero-Wolf, Harm Schoorlemmer, Enrique Zas


τ
θem
θexit
D
REarth
θin
ντ

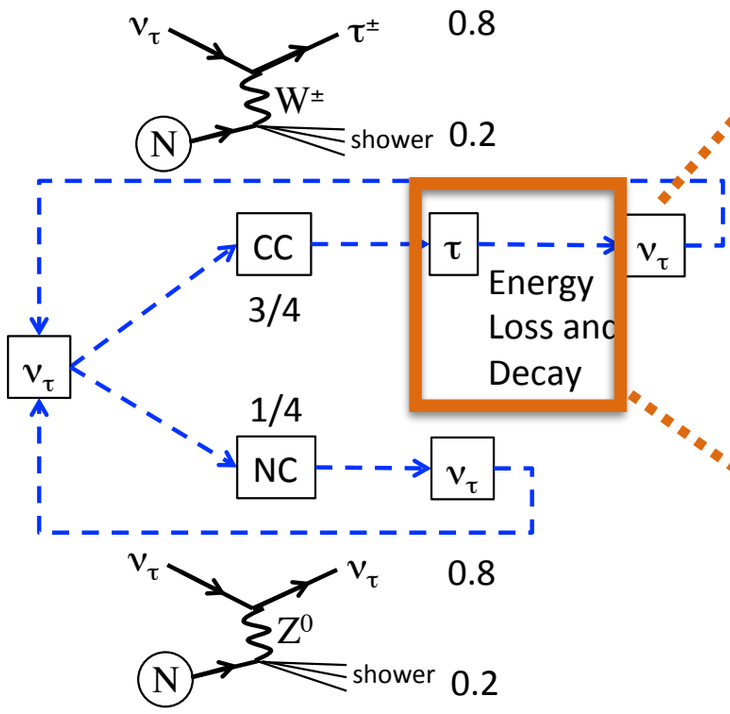

ν_τ
$\tau^\pm$
0.8
emerging
$W^\pm$
N
shower
0.2
CC
τ
ν_τ
3/4
Energy
Loss and
Decay
ν_τ
1/4
NC
ν_τ
ν_τ
ν_τ
0.8
Z^0
N
shower
0.2

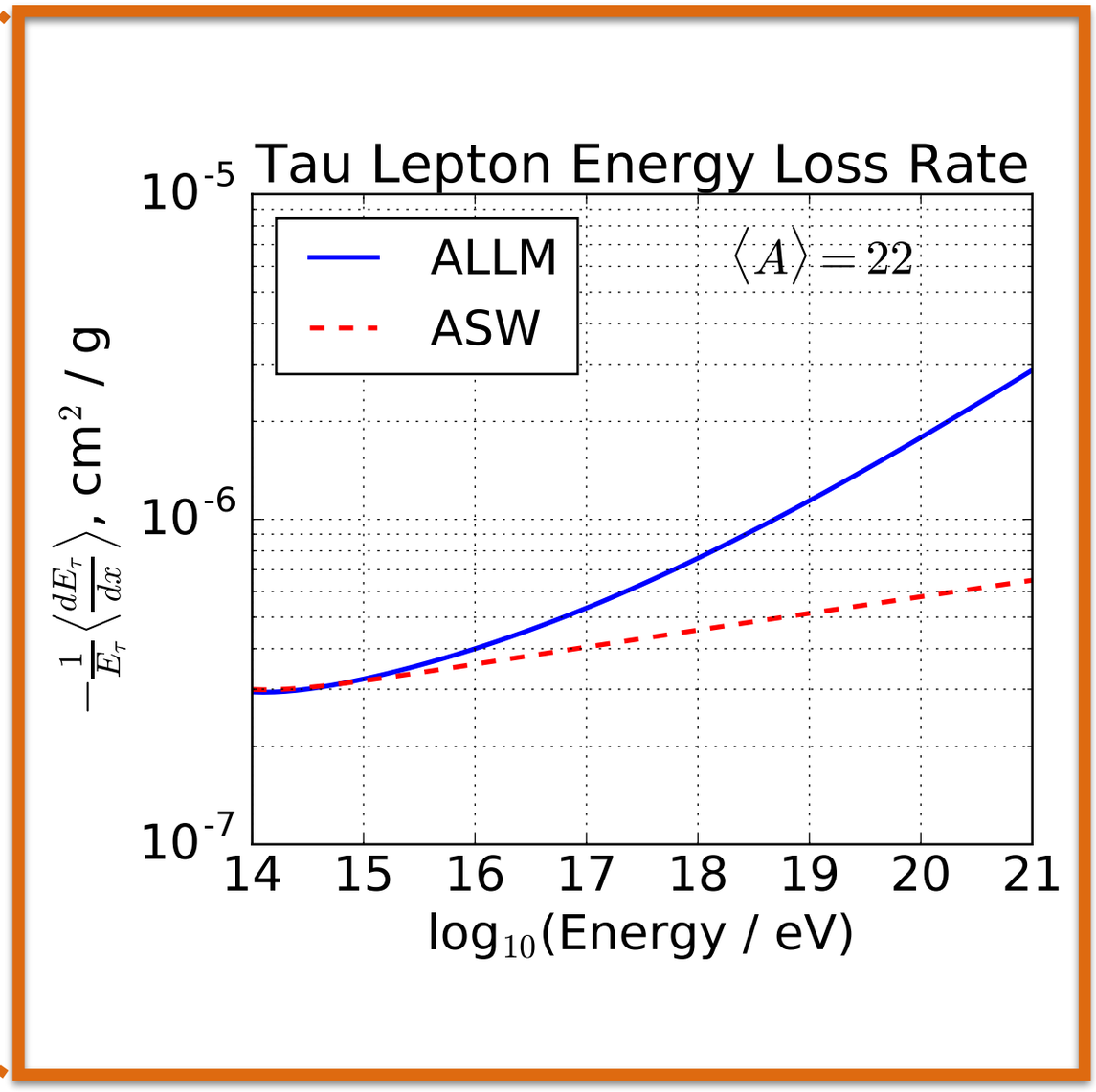
$\lambda = 170$ km in rock for $\sigma = 10^{-32}$ cm^2



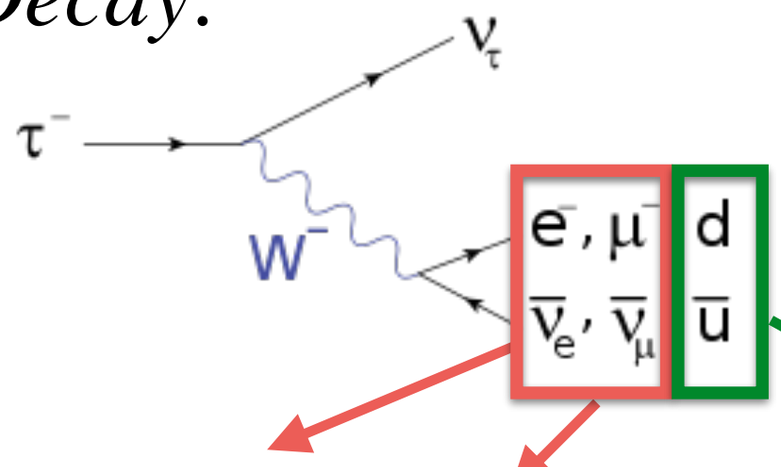


Models constrain upper and lower bounds on the standard model neutrino cross sections at Ultra High Energies.





Decay:

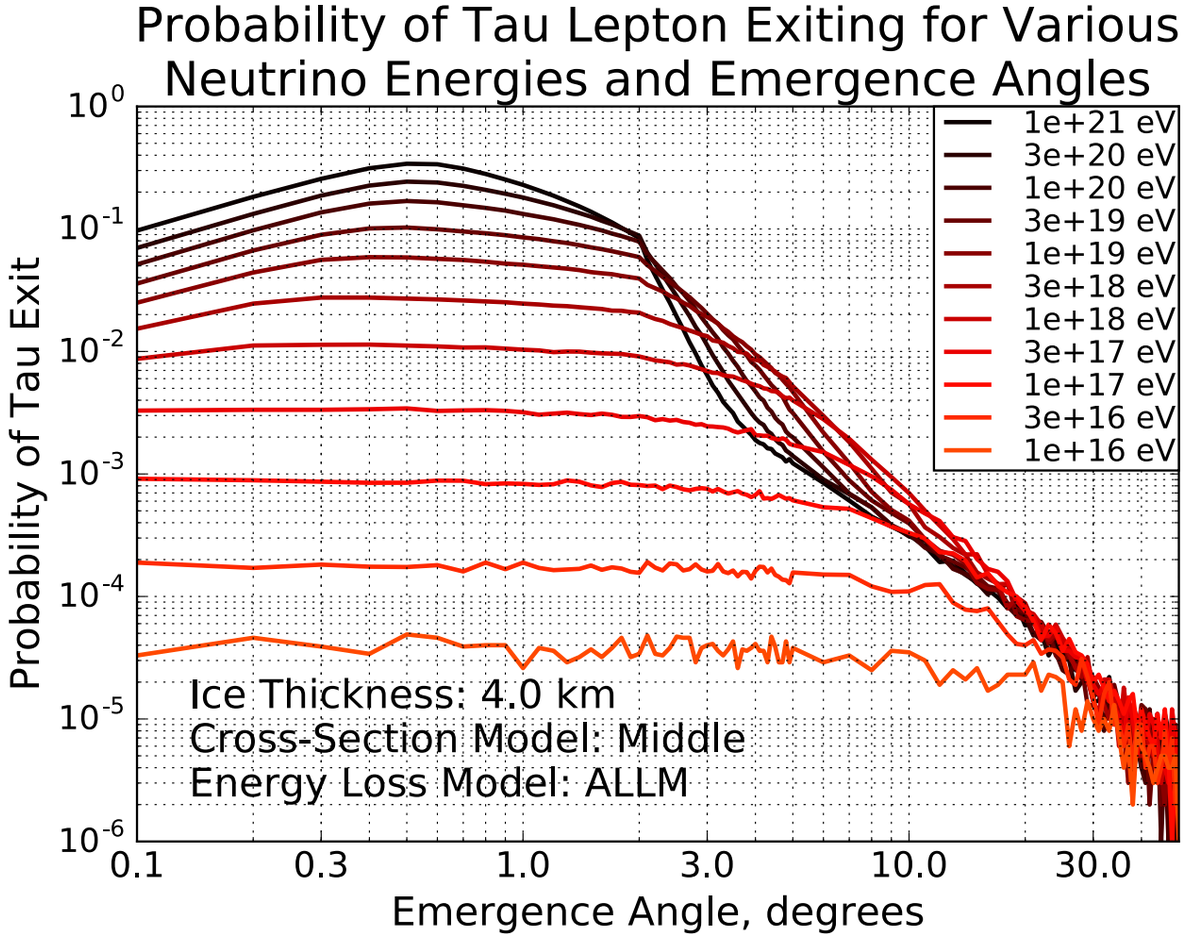


leptonic:18% + 18%

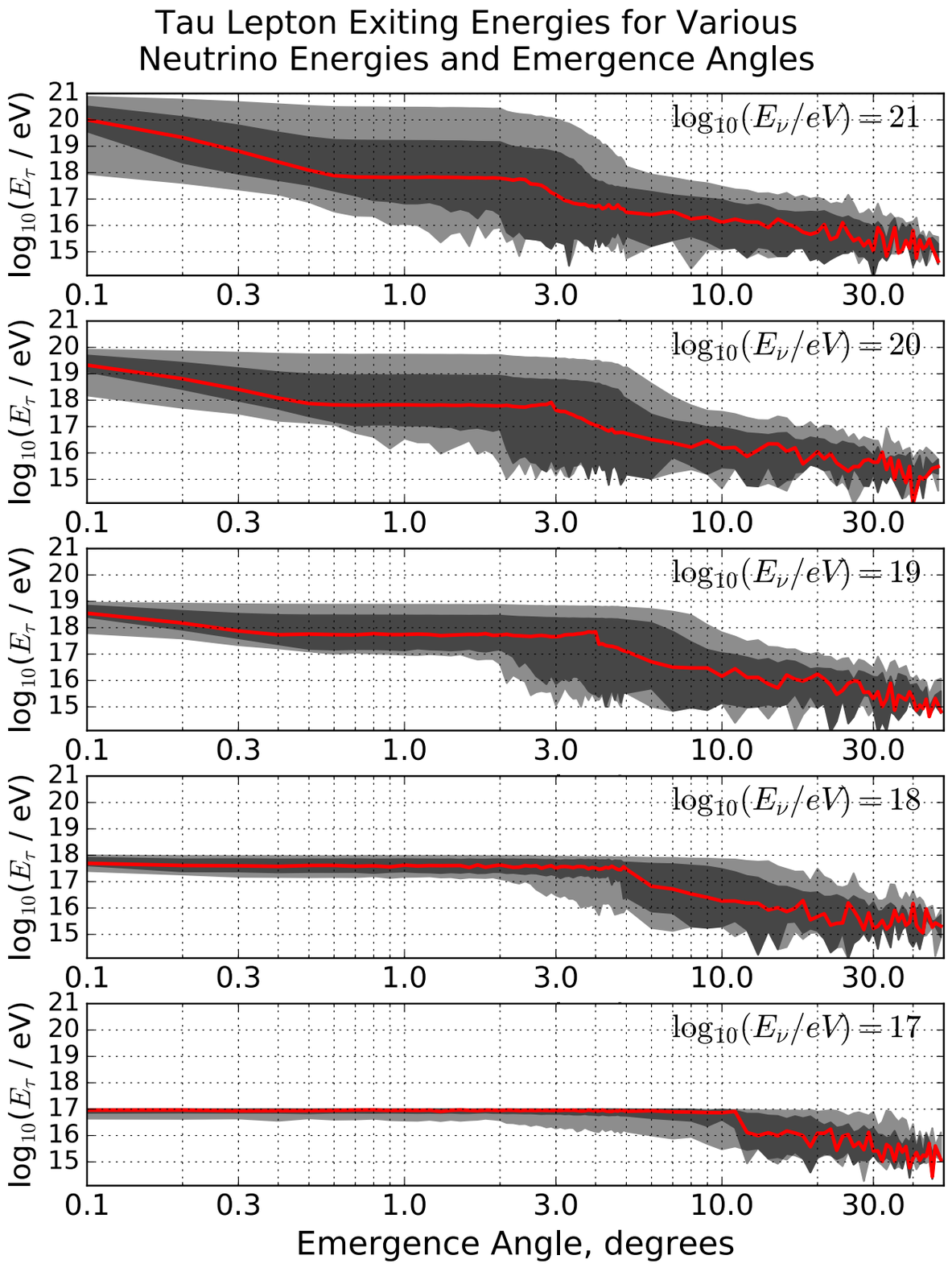
pionic: 64%

1. Ionization
2. Bremsstrahlung
3. Pair Production
4. Photon-Nuclear interactions

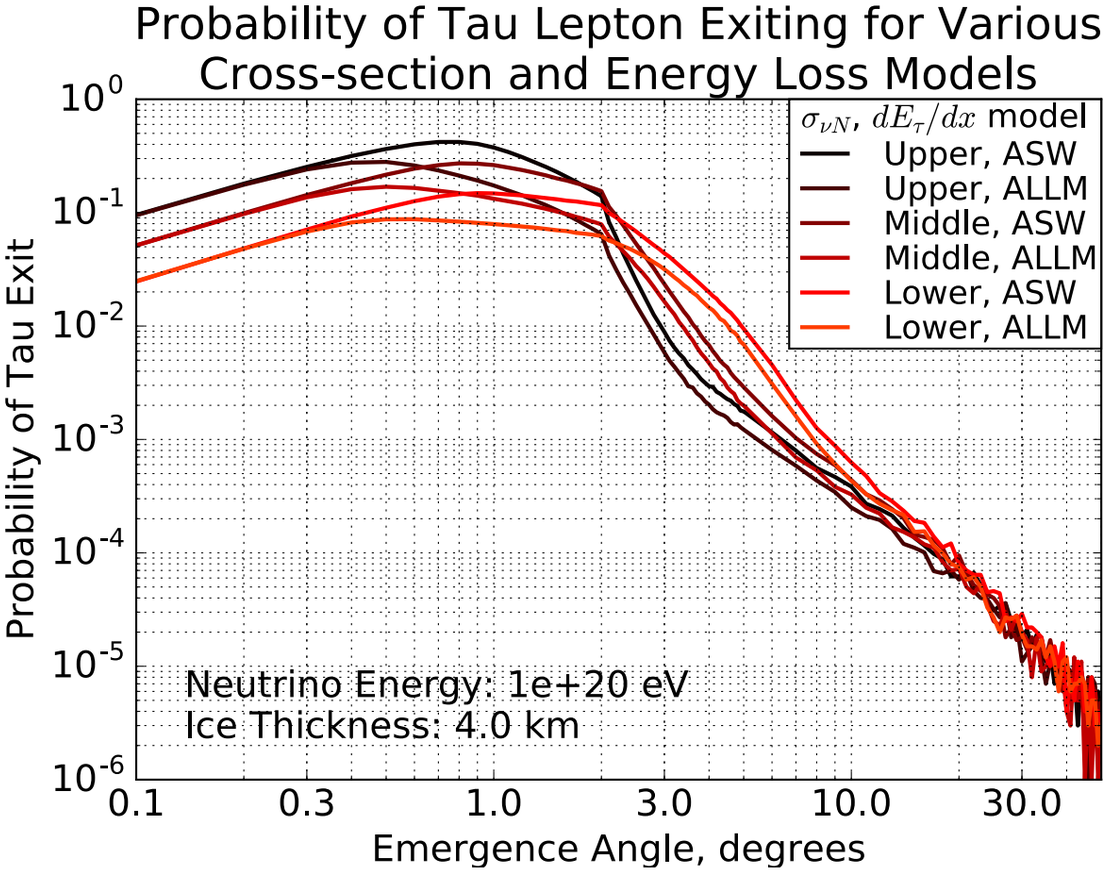
Exit Probability



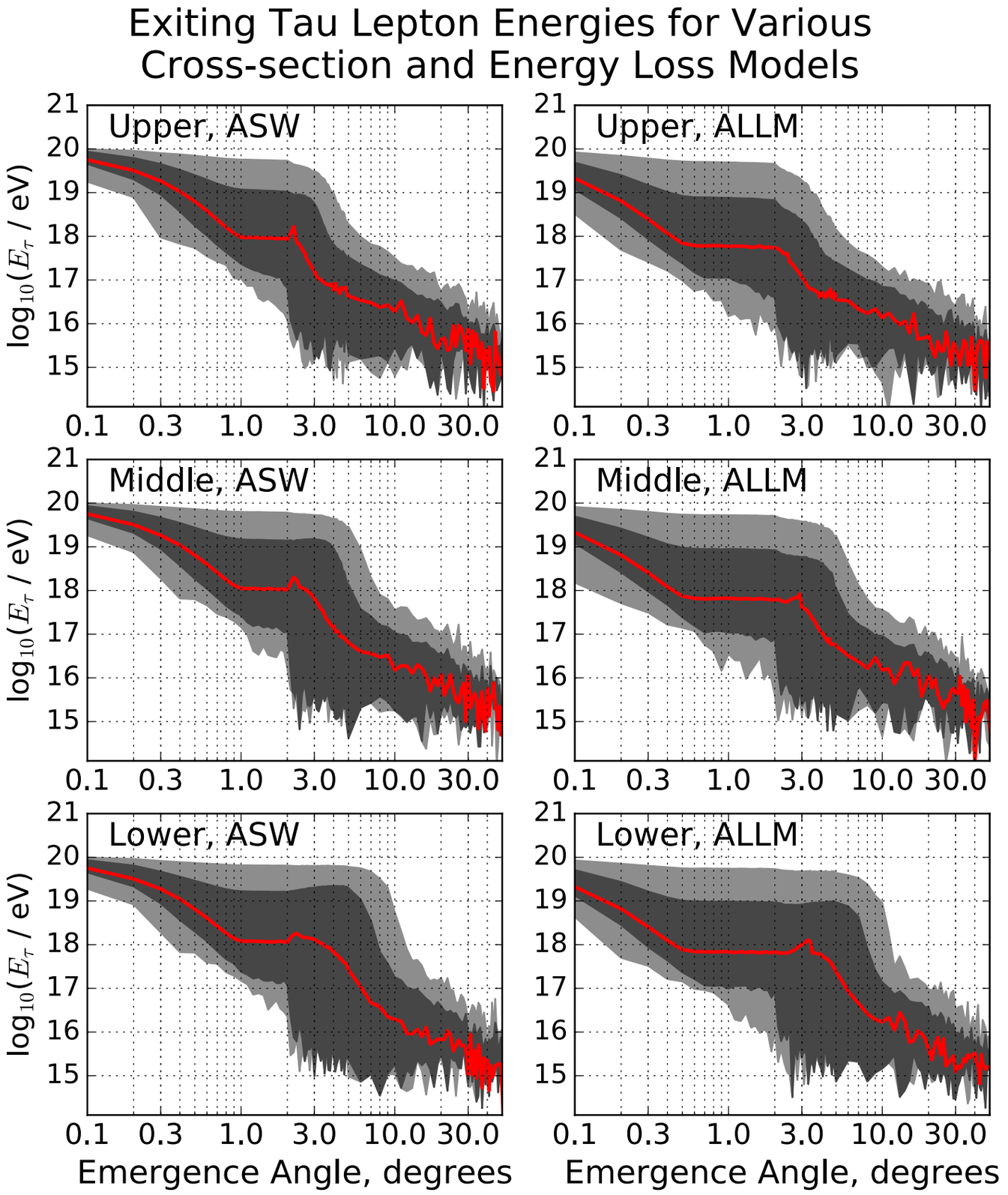
Exit Energy



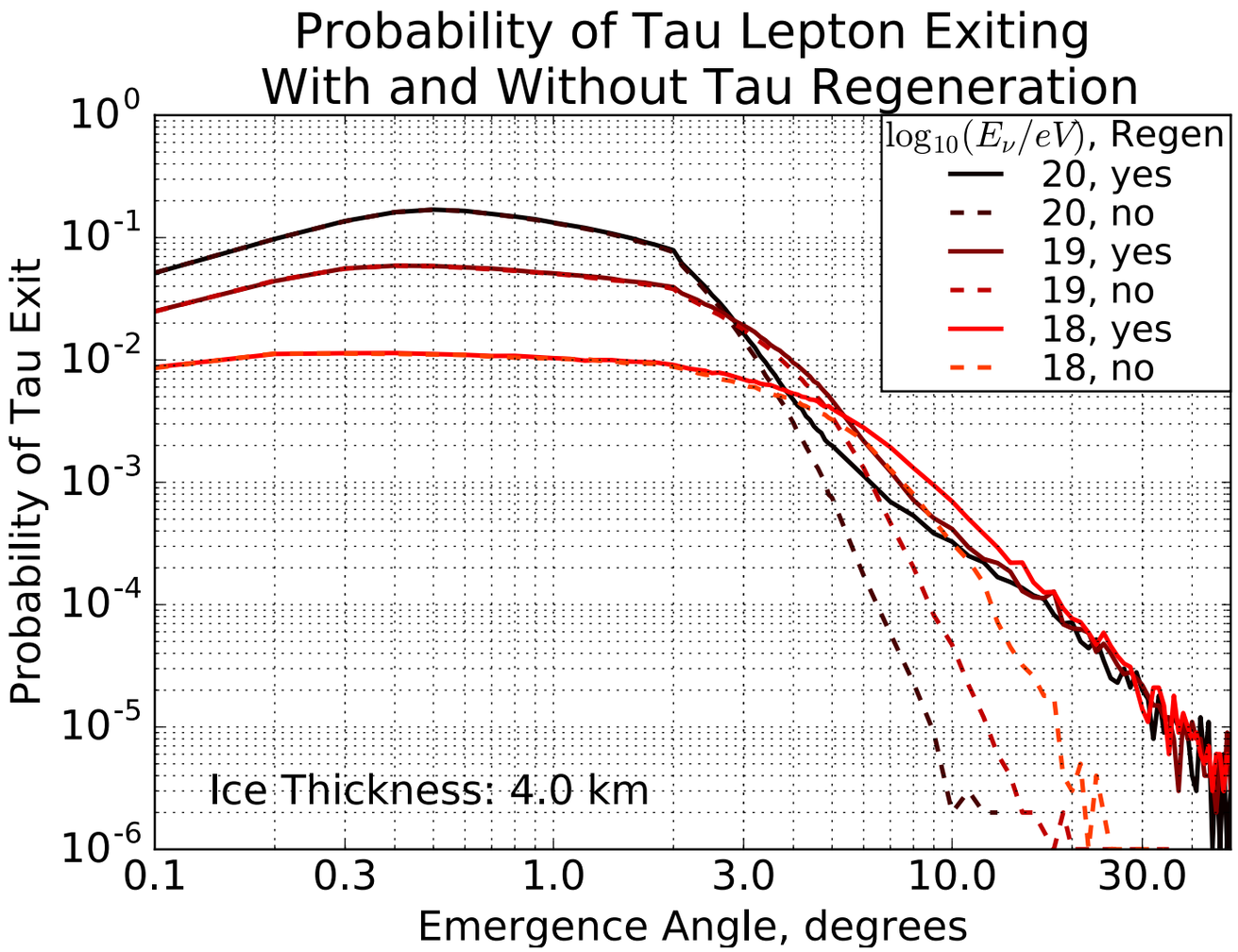
Exit Probability



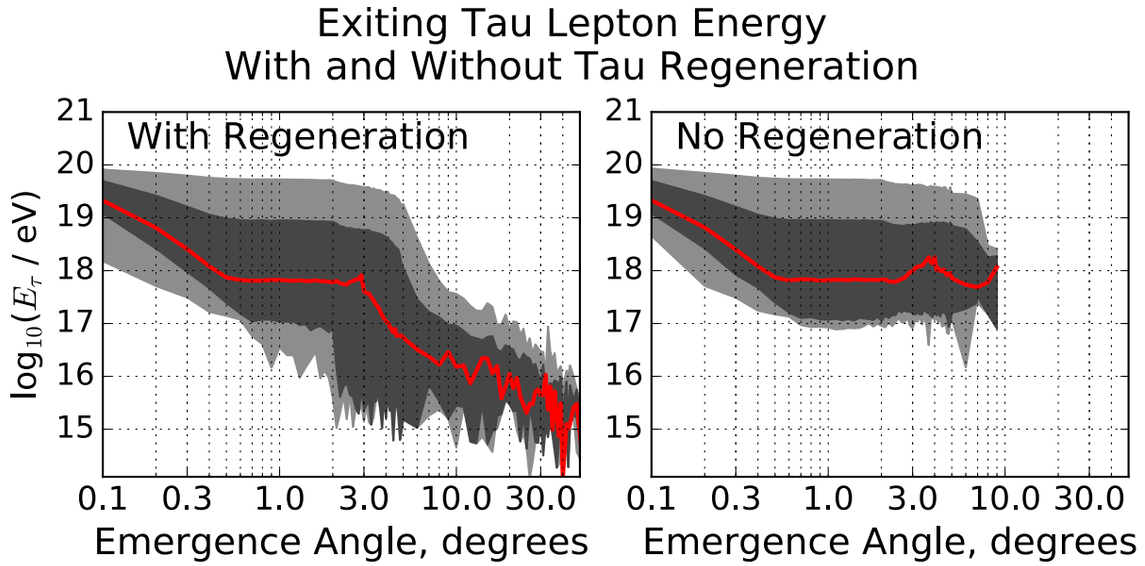
Exit Energy

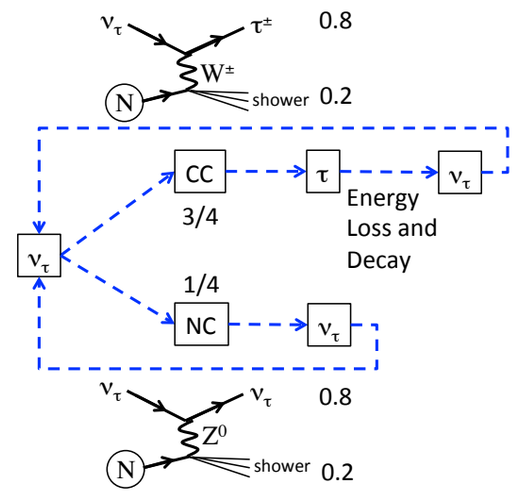


Exit Probability

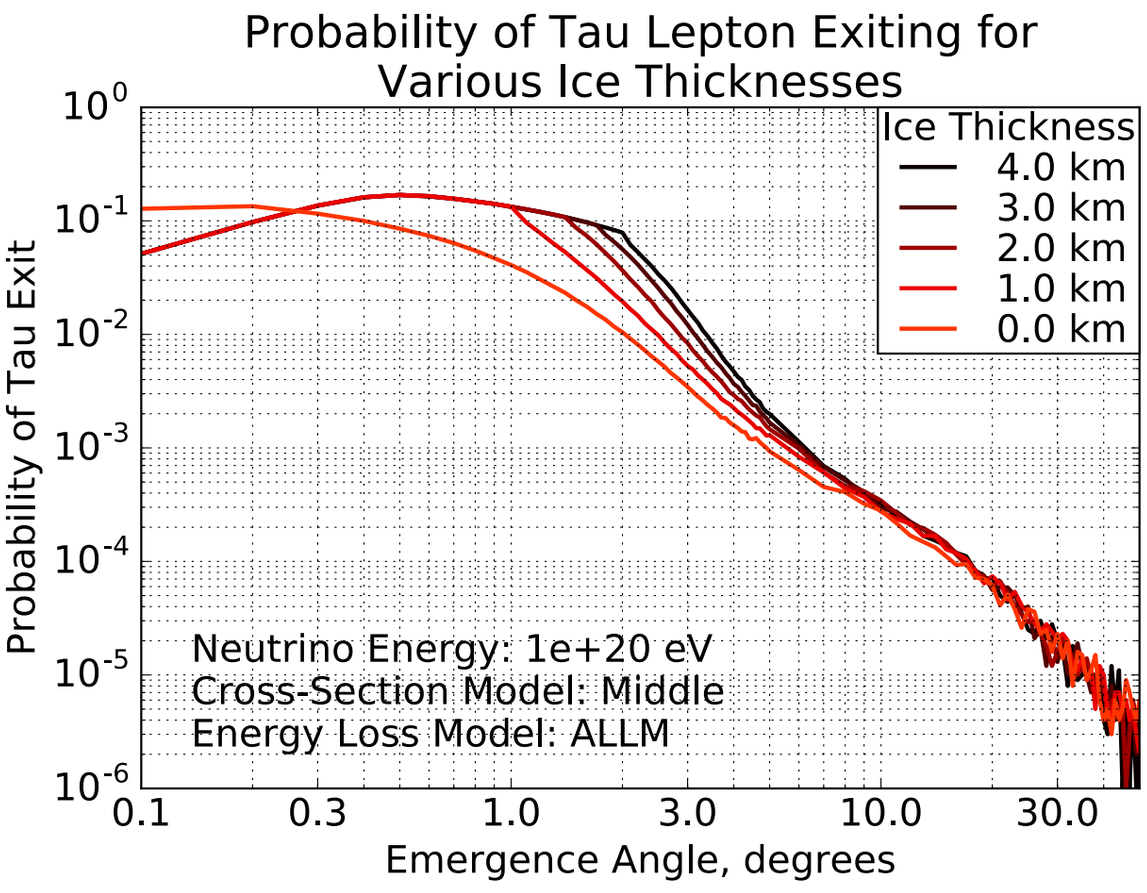


Exit Energy

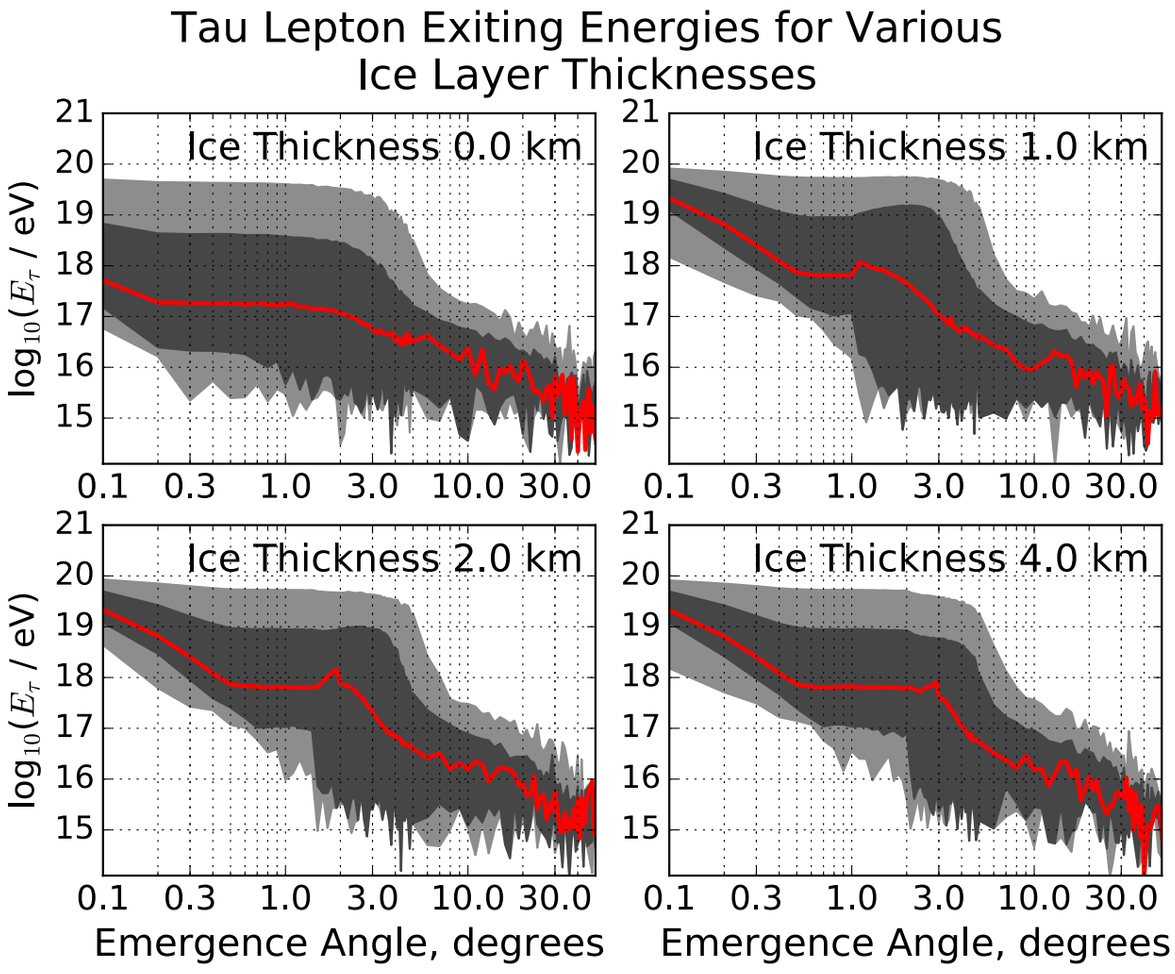




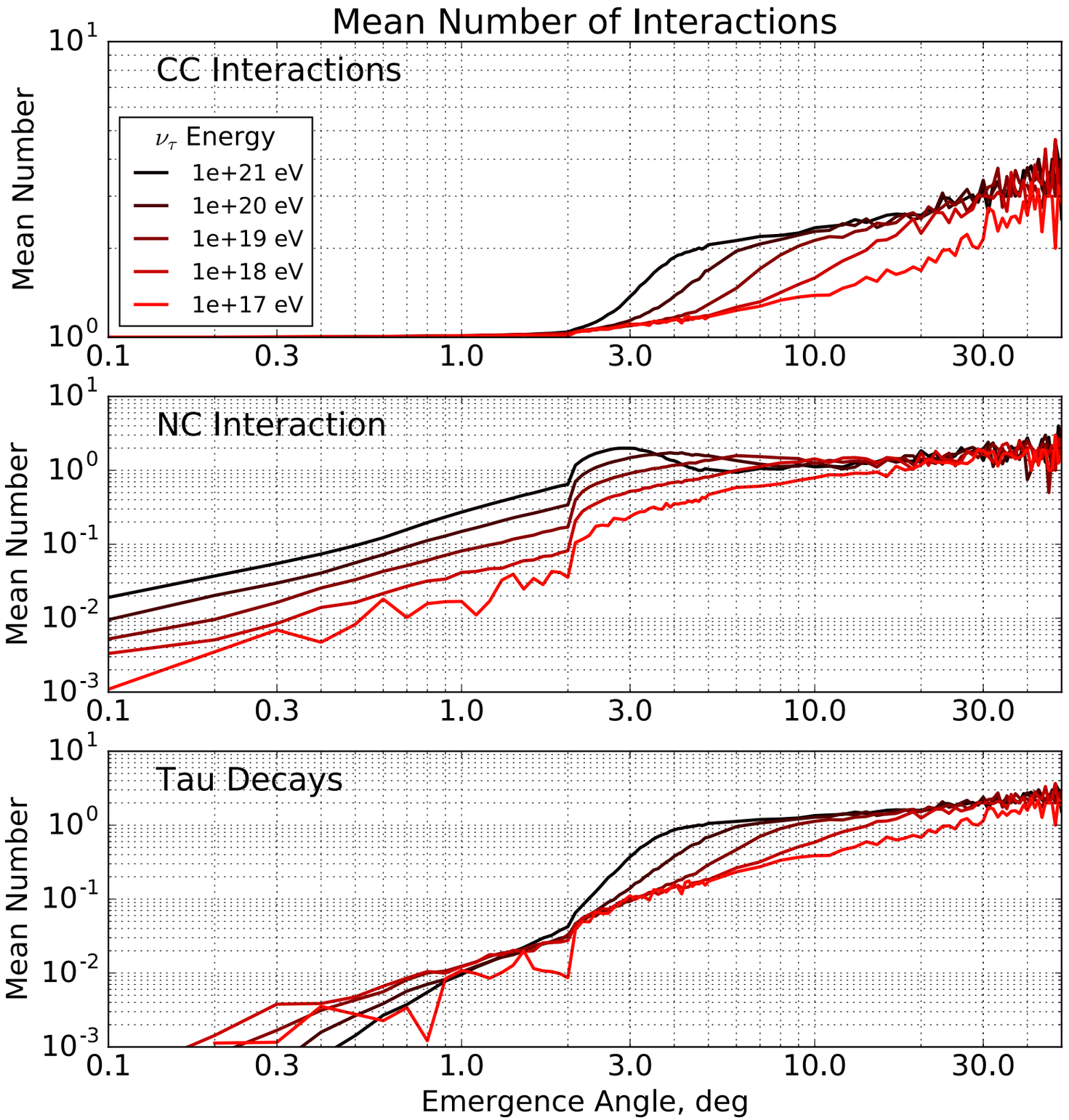
Exit Probability



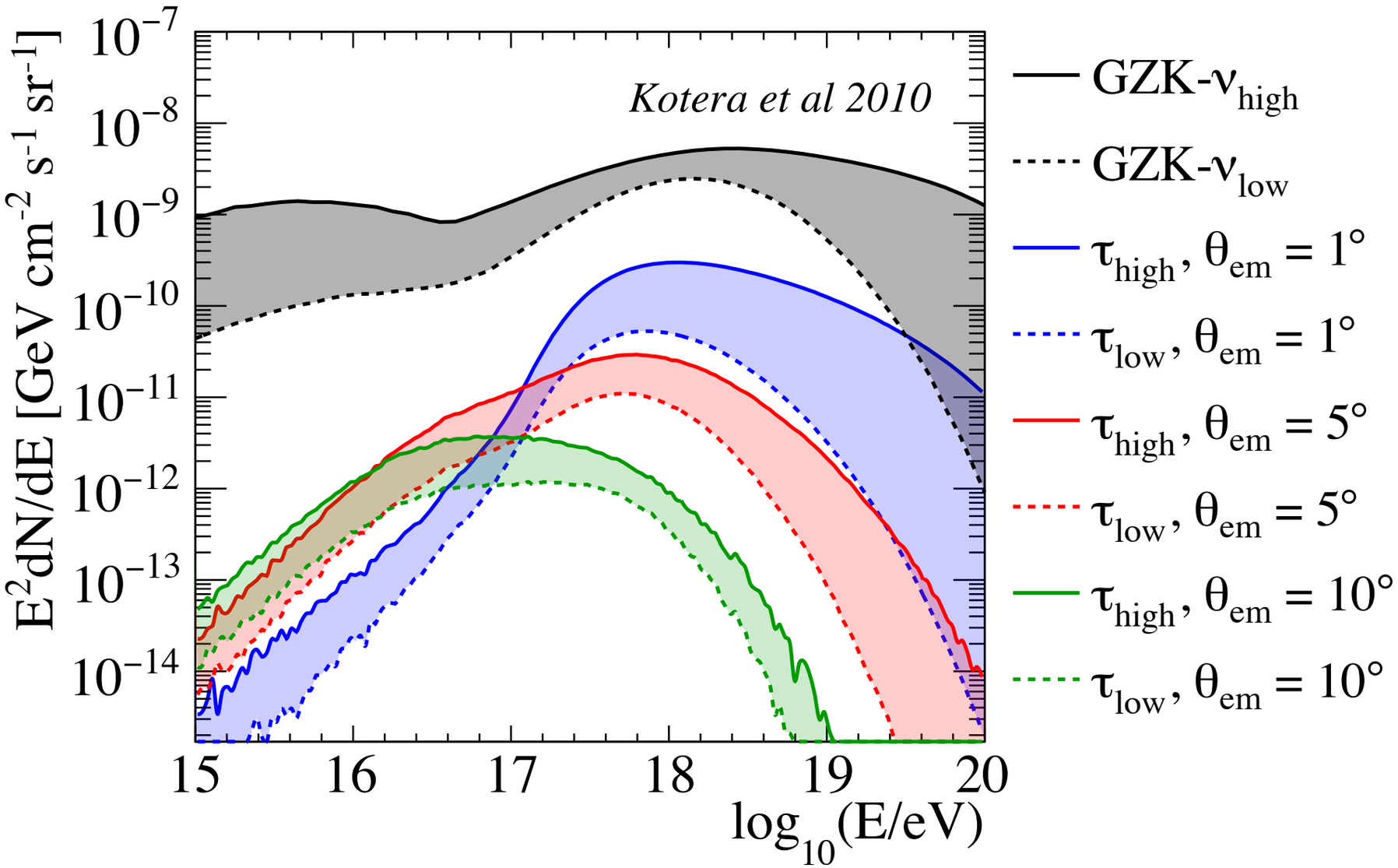
Exit Energy



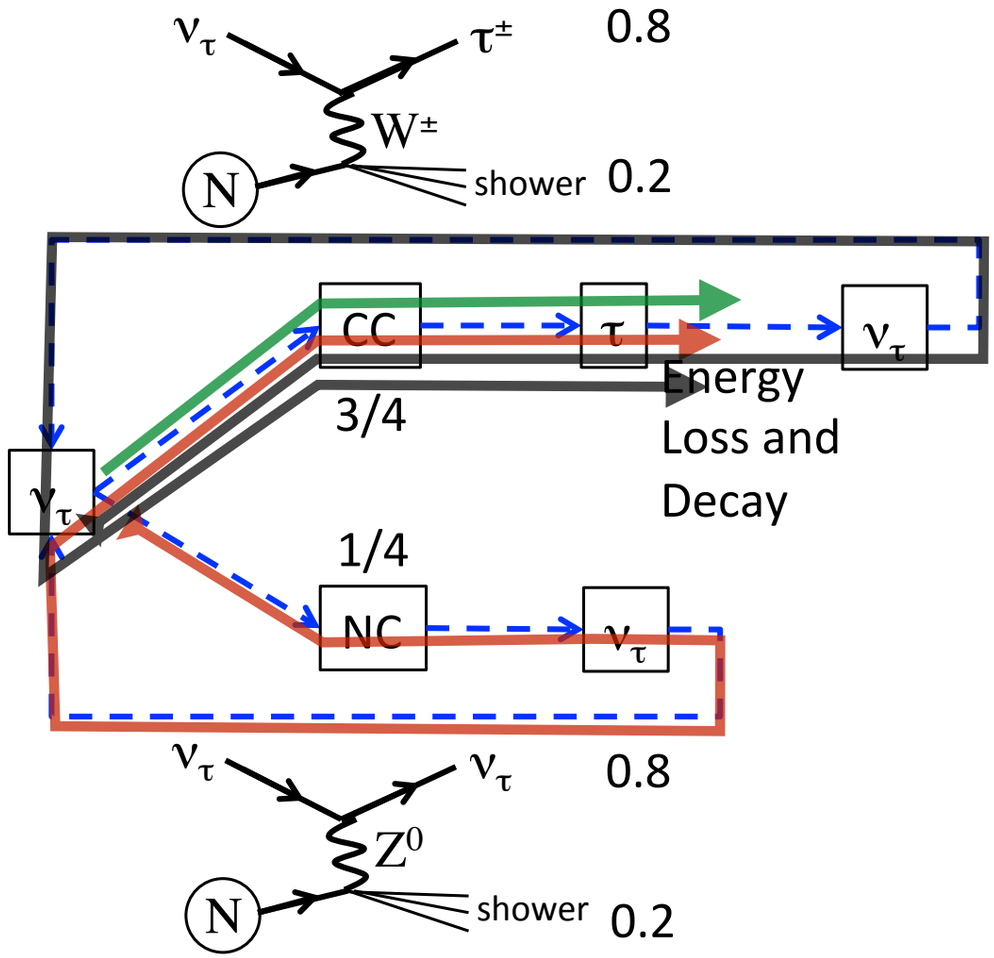
Interactions



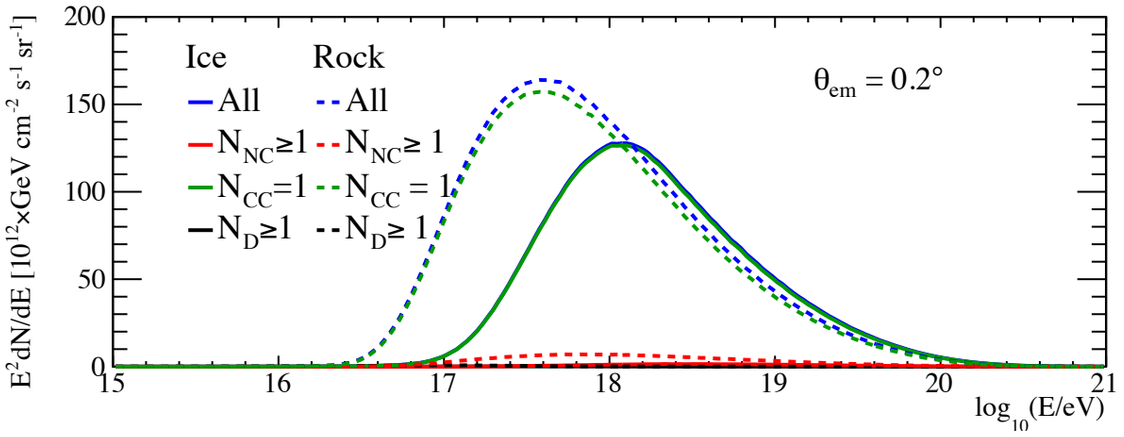
Response to a cosmogenic input neutrino flux

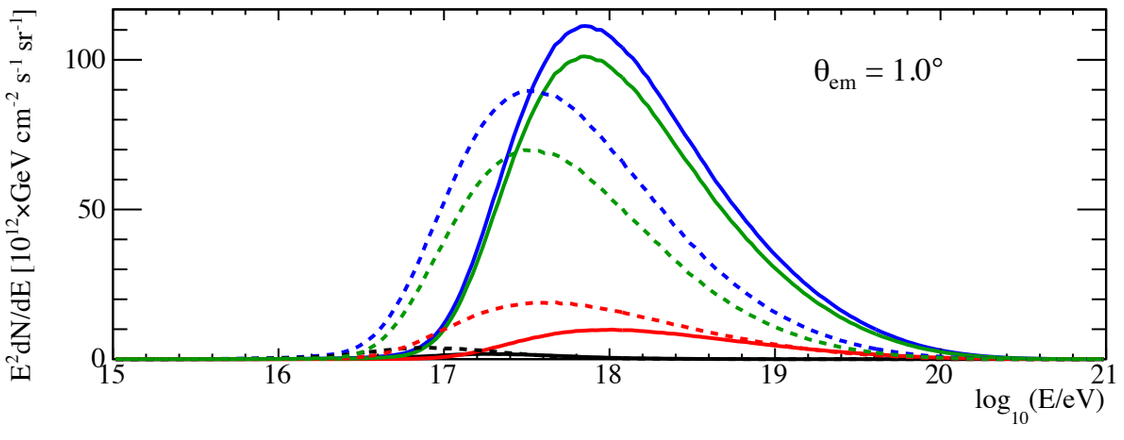


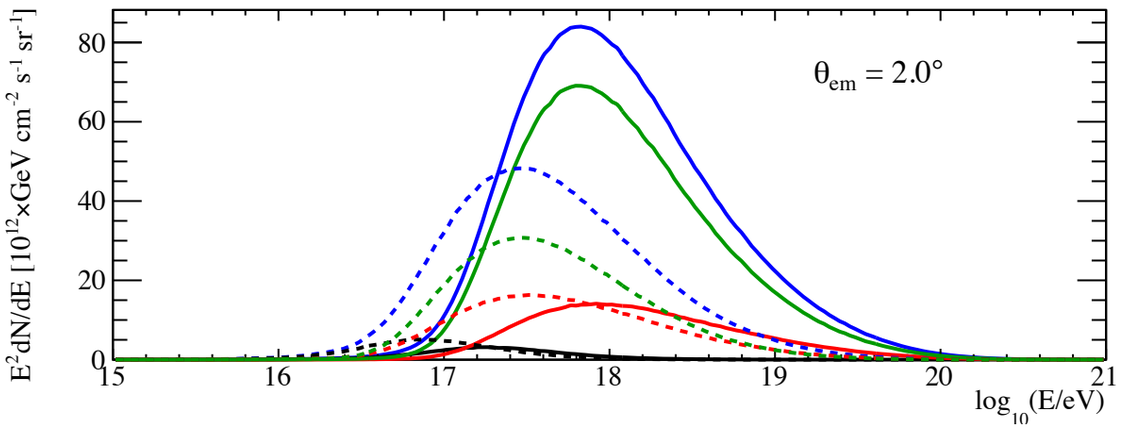
Flux in different tau production channels

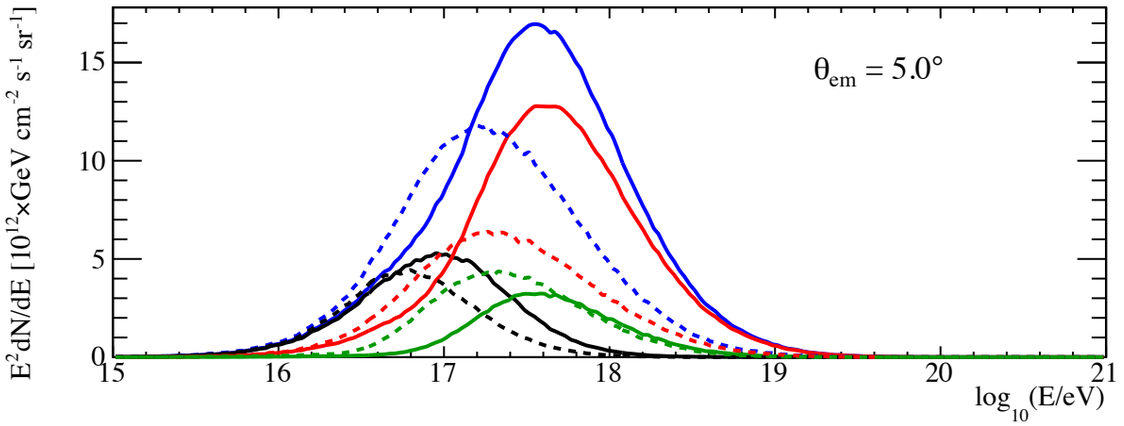


Flux model: Kotera -mean



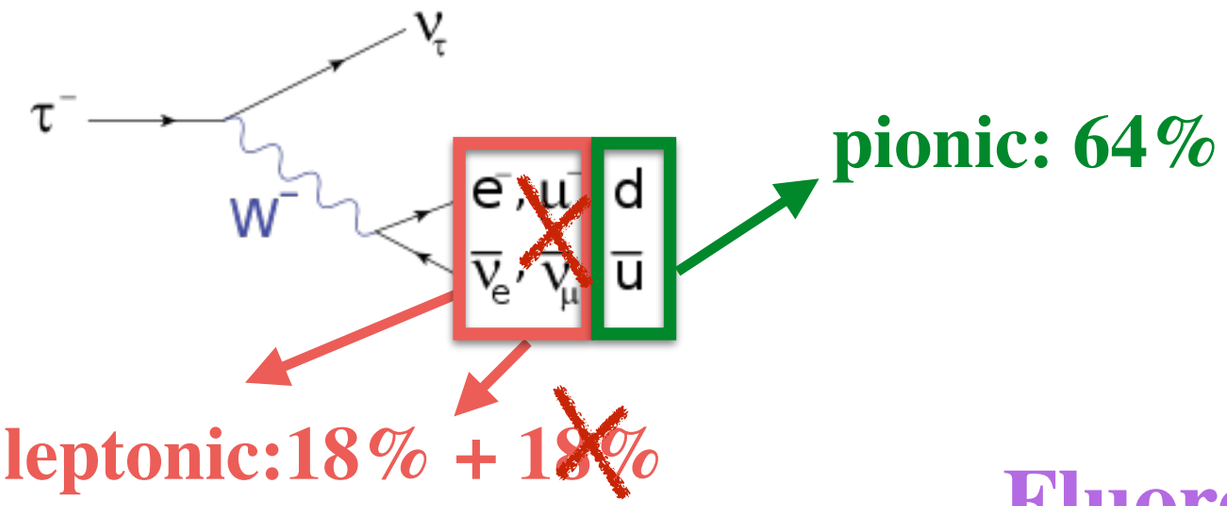






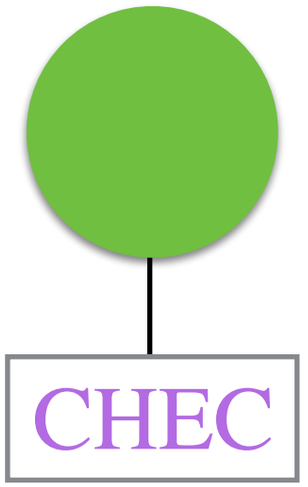
Detection possibilities …

Atmospheric decay:
Air shower



pionic: 64%

leptonic:18% + 18%



Fluorescence

Radio &

Cherenkov

CTA or
Radio antenna