ν_e Analyses

D Adey

NuStorm Phone Conference 18th January 2013

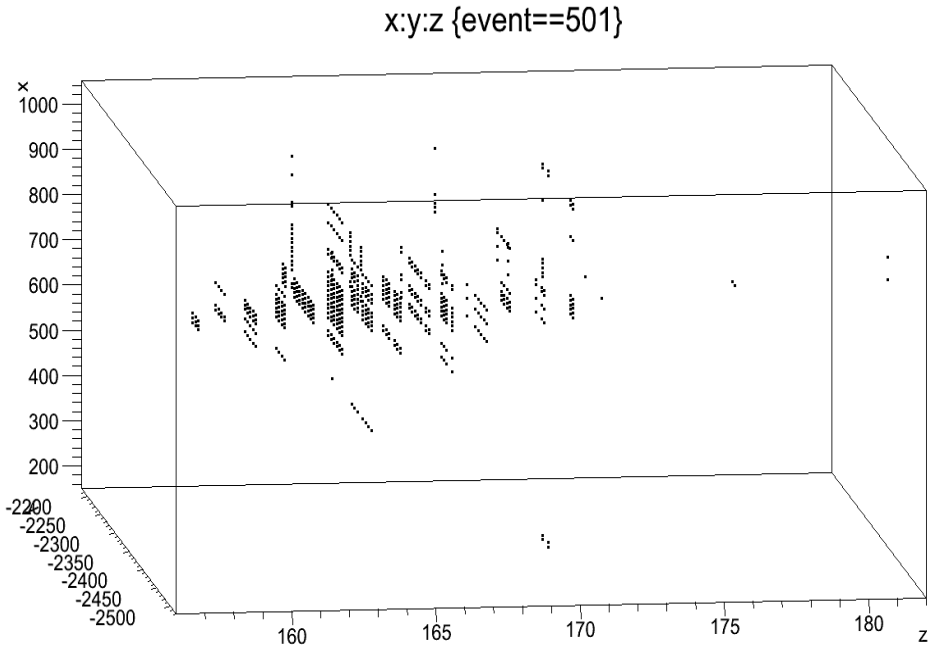
Goals and outline

- Aim to look into ν_e disappearance channel for sterile neutrino search
- Begin by characterising ν_e events in the steel-scintillator far/near detectors
- Investigate possibility of ν_e tagging through CC and NC event discrimination
- Simulate detector ν_e detection efficiency for use in GLOBES studies

Simulation Setup

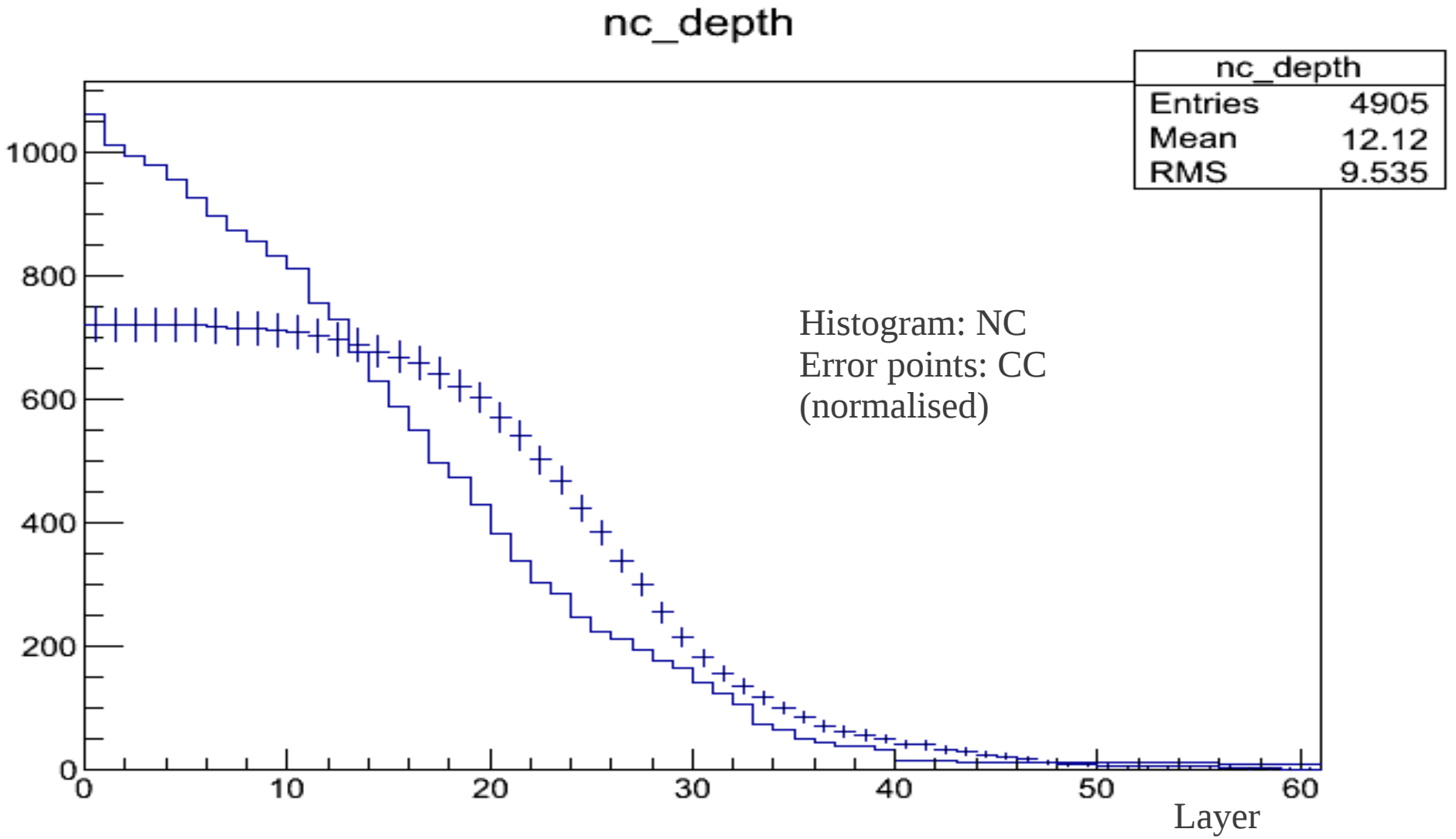
- Using C Tunnel's existing model of the far detector (Genie + Geant4) with some added detector simulation and shower reconstruction
- Detector 400 layers with each later 2cm steel with 2x1cm scintillator in x-y views (near detector ¼ length)
- Modified scintillation model for Birk's law saturation
- Electronics assumptions – 10bit available ADC range and SPIROC (or equivalent) gives timing ~ 2x better than TriP-t (250ps)
- Simulated 1000 ν_e events

Shower reconstruction – Space points



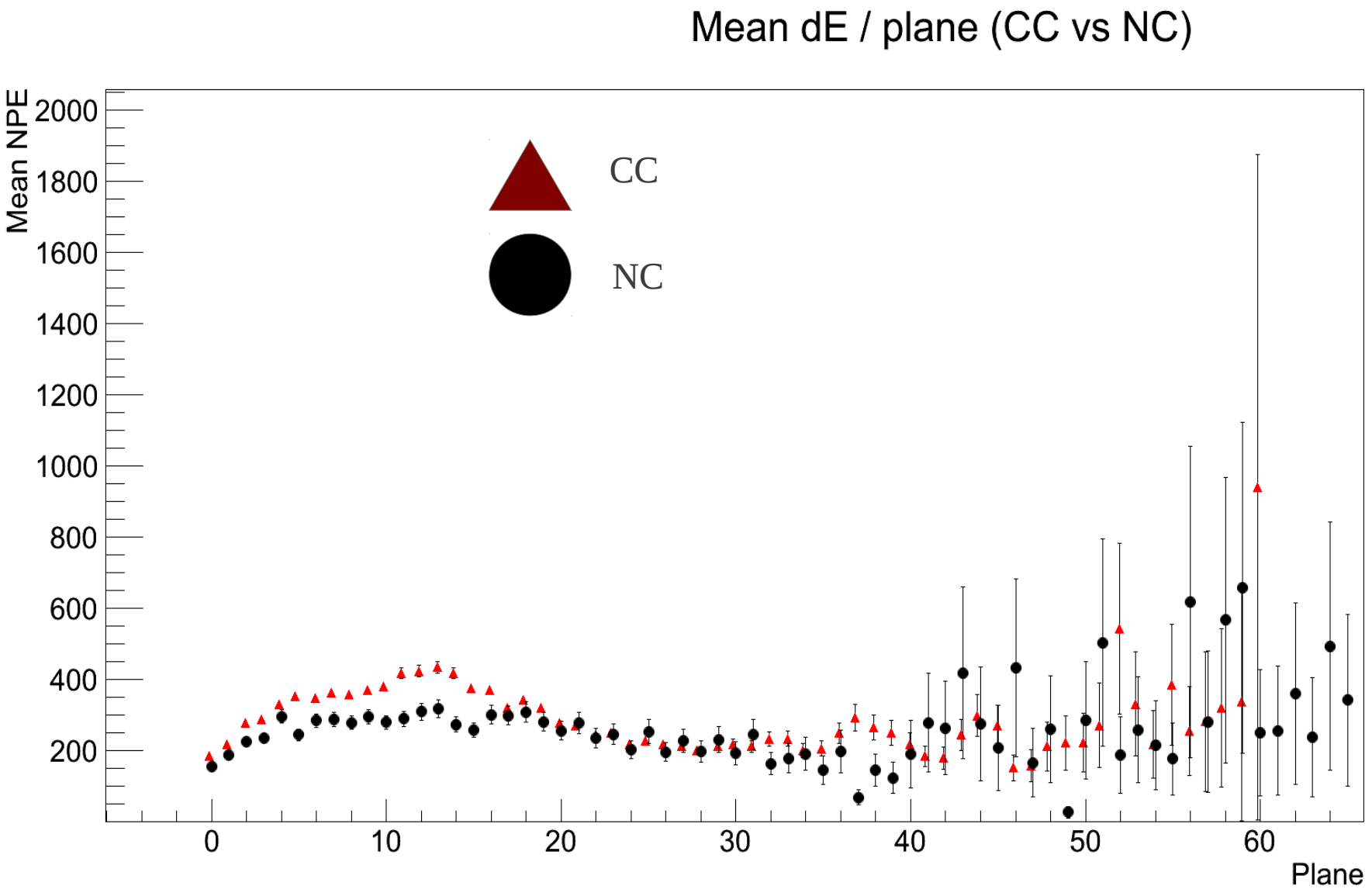
- “Brute force” combination of space points (all possible x-y bar combination in a plane) leads to many degeneracies
- Square/line blocks of points
- Timing assumptions do not help at this level

CC vs NC layer penetration

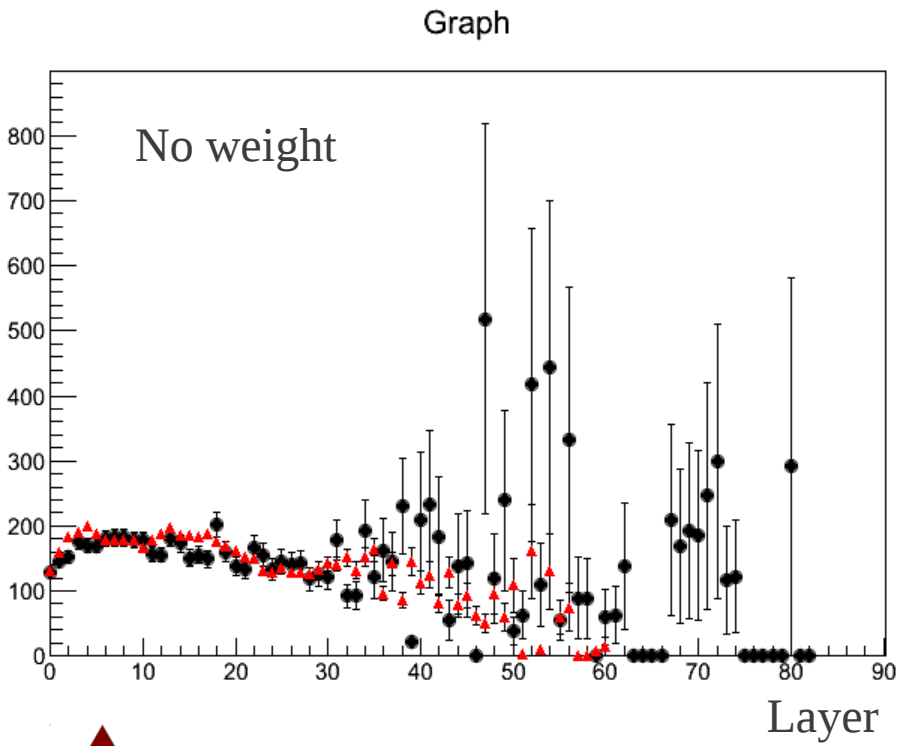


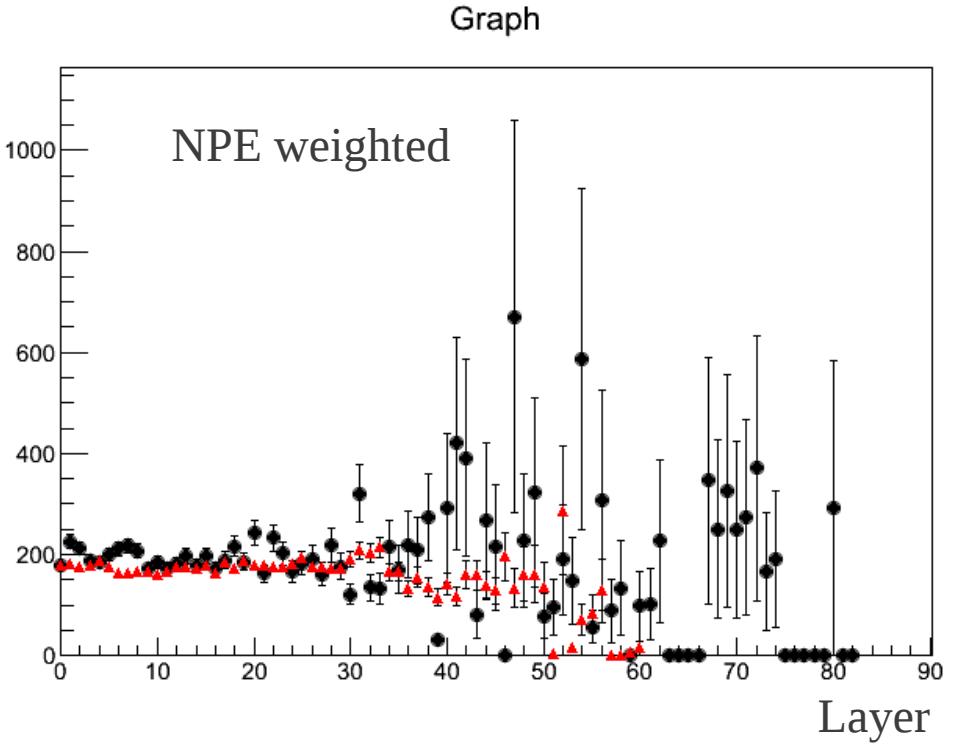
Mean NPE / layer

Note: Errors are the statistical error on the mean – spread of NPE within the bars is naturally large



Shower σ_x^2 (NPE weighted/un-weighted)





CC

NC

Summary

- Space point reconstruction proving difficult without intelligent pattern recognition
- No obvious candidate for a figure of merit for CC/NC distinction
- Next step – continue characterisation of events; look into methods for /combining parameters for tagging (Neural Network, Library comparison etc).
- Statistical approach based on large ensemble of events (mean values become useful) – cross sections would help