NMH sensitivity

Bruno Strandberg
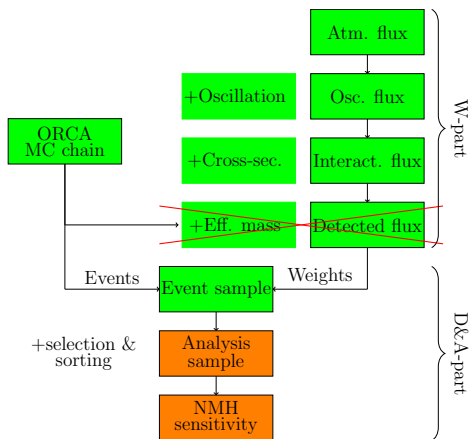
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Outline

1. NMH chain

2. Event sampling

3. vs Swim

4. Asymmetry

5. Outlook

NMH chain
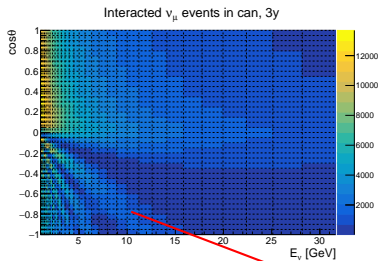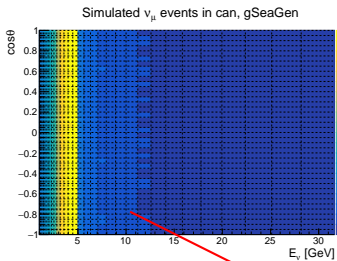

$$gSeaGen \rightarrow KM3Sim \rightarrow JTE \rightarrow Reco \rightarrow selection + PID \rightarrow Summary\ file$$

interacted $\underbrace{}_{\text{"effective mass"}}$ detected

Event sampling, ν_μ example

Simulated ν_μ events in can, gSeaGen   Interacted ν_μ events in can, 3y
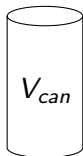
Available events in bin i: N_{GSG}^i Required events in bin i: N_{INT}^i
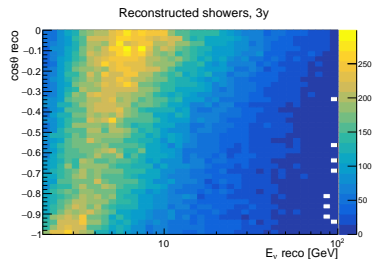
- For each bin of GSG events there is a vector
  `vector<evtid>`($evtid_1$, ..., $evtid_{N_{GSG}^i}$)

- Sample `Poisson`(N_{INT}^i) events from the vector.

- Lookup which of the sampled gSeaGen events made it to the end of the MC chain.

gSeaGen → KM3Sim → JTE → Reco → selection + PID → Summary file

sampling   loss of events

vs Swim
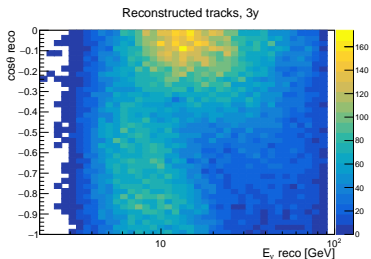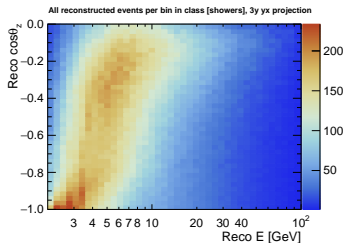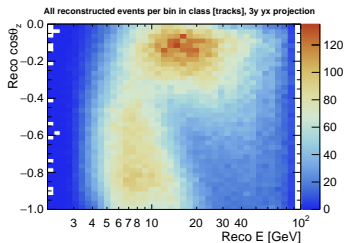
- Swim plots from https://elog.km3net.de/Analysis/255.
- As expected, similar event patterns.

vs Swim

Evt type	Int. [/y/MTon]	Rec. [3y]
Tracks	8106.9	68495.6
ν_μ	5727.9	
$\bar{\nu}_\mu$	2379.0	
Showers	15696.5	125222.7
ν_e cc	4785.3	
$\bar{\nu}_e$ cc	1684.7	
ν_τ cc	617.6	
$\bar{\nu}_\tau$ cc	287.0	
ν nc	5739.2	
$\bar{\nu}$ nc	2582.7	

Table: Swim

Evt type	Int. [/y/MTon]	Rec. [3y]
Tracks	8394.5	64674.0
ν_μ	5904.8	
$\bar{\nu}_\mu$	2489.7	
Showers	15648.6	147507.0
ν_e cc	4836.4	
$\bar{\nu}_e$ cc	1676.7	
ν_τ cc	613.1	
$\bar{\nu}_\tau$ cc	284.8	
ν nc	5697.3	
$\bar{\nu}$ nc	2540.3	

Table: Me

Swim has $\sim 3.4\%$ less tracks at interaction level, but $\sim 5.6\%$ more events after reco. Swim has $\sim 15\%$ less showers. This could be:

- Bug (Liam reports ~ 120k showers, but 57k tracks).
- Different event selection.

Asymmetry

- Fill E vs $\cos\theta$ hists for tracks and showers for NH/IH.
- Calculate $A_i = |NH_i - IH_i|(NH_i - IH_i)/NH_i$ for each bin i.
- Calculate $A_{\sum} = \sqrt{\sum_i A_i^2}$ for tracks and showers.

Asymmetry

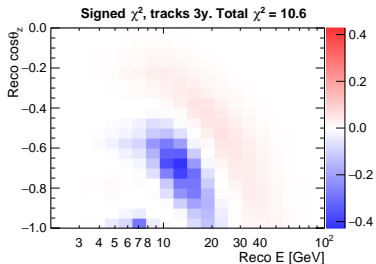The problem: I get nothing like has been shown before.

Figure: Track asymmetry in Swim.

Figure: Track asymmetry in my samples.

Possible causes:

- This Swim plot is based on expectation values (No Poisson smearing)?
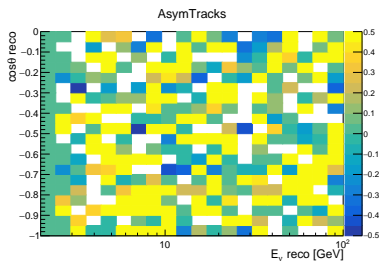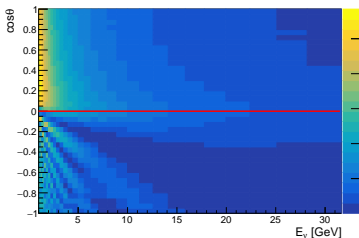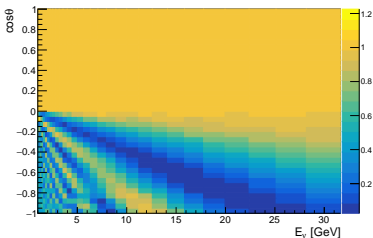- I am doing something wrong...

Outlook

- Understand the difference in asymmetry.

- Optimize event selection.

- Options to fit oscillation parameters.

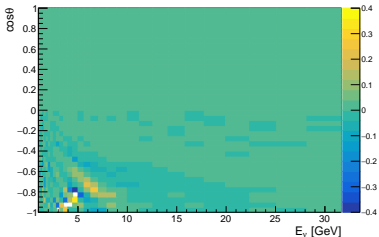- And something about systematics...

Outlook

Interacted flux in can in 3y, per MTon

Upgoing E, ct divided by downgoing E, -ct

Asymmetry wrt IH

Why?

1. Divide out flux scale.
2. Divide out σ.