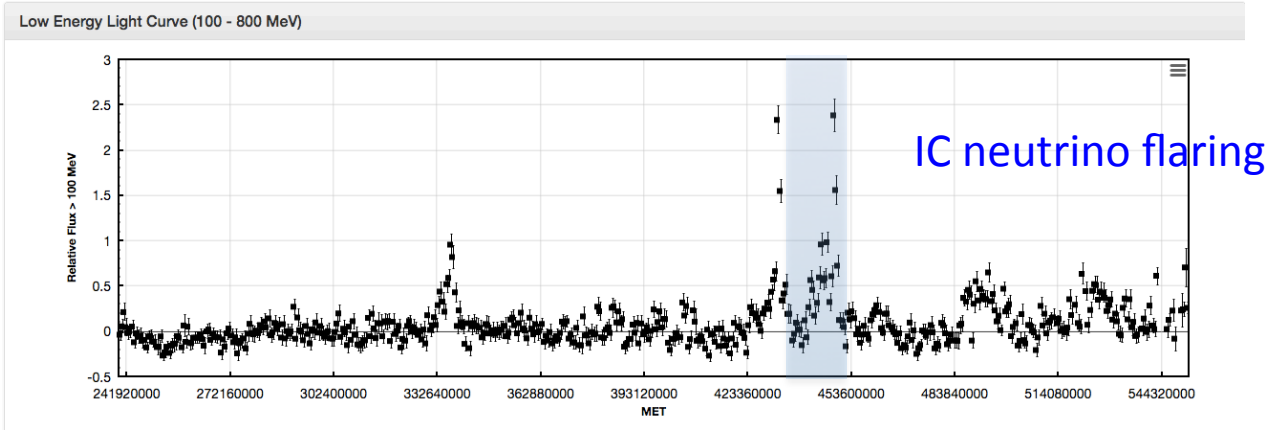
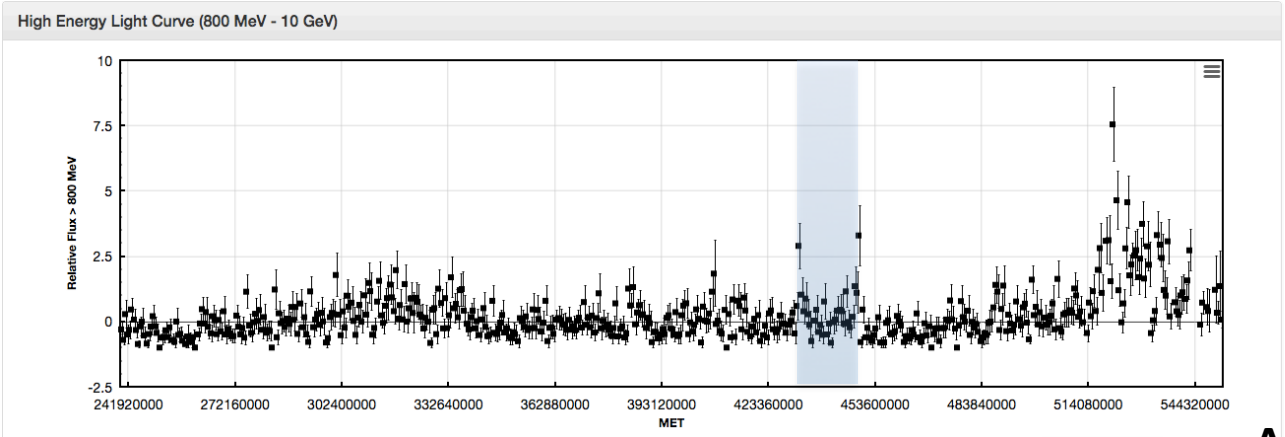
- ANTARES TXS result
- KM3NeT ARCA/ORCA data
- ORCA energy resolution

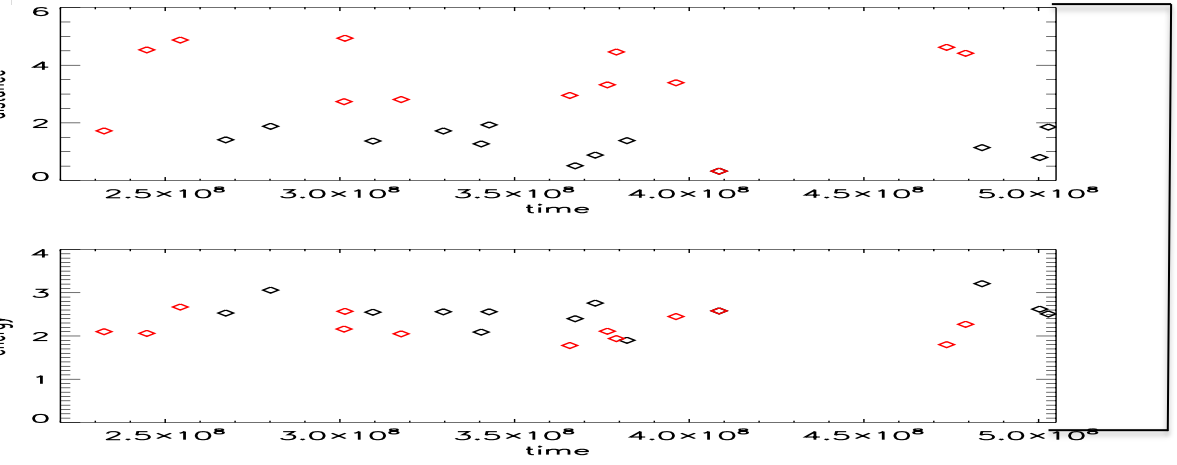
Dorothea Samtleben
KM3NeT/ANTARES group meeting 11 July 2018



IC neutrino flaring

Gamma-ray flux (FERMI)
at TXS0506 position





ANTARES events:

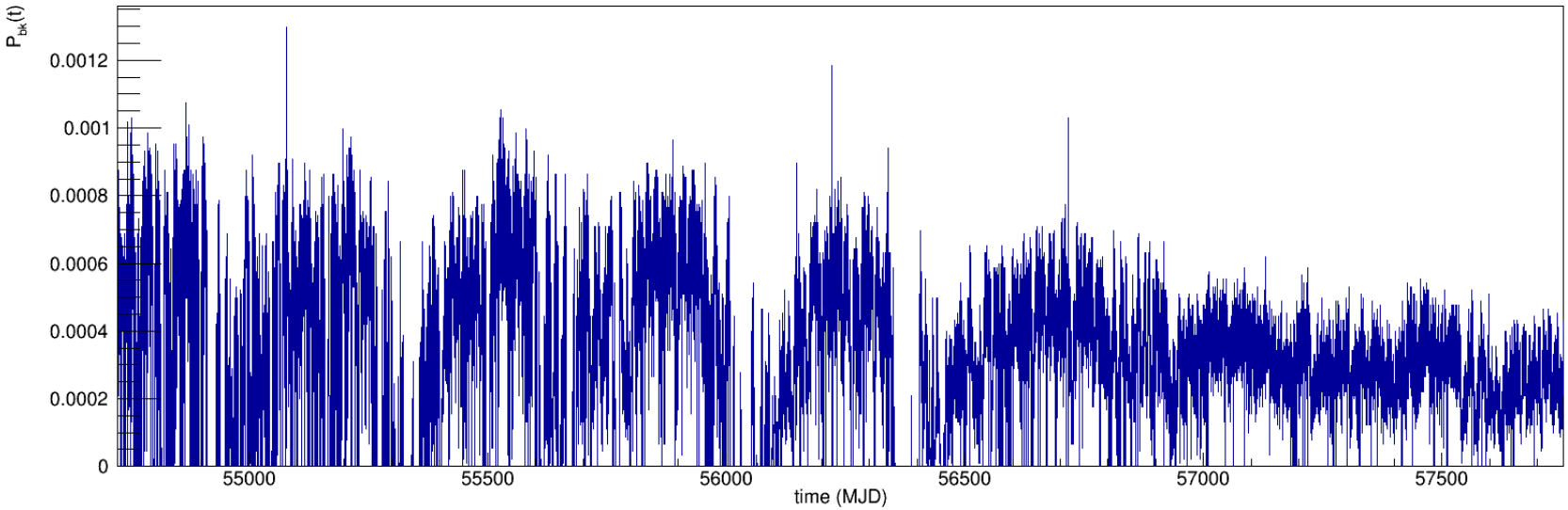
Distance to TXS vs time

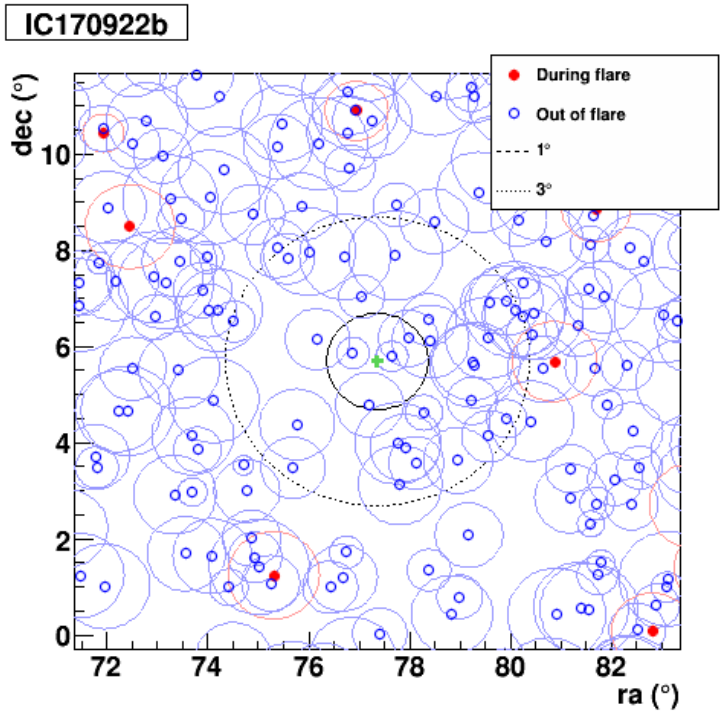
Energy estimate vs time

Black: Flare cuts (loose)

Red: PS cuts (strict, events public)

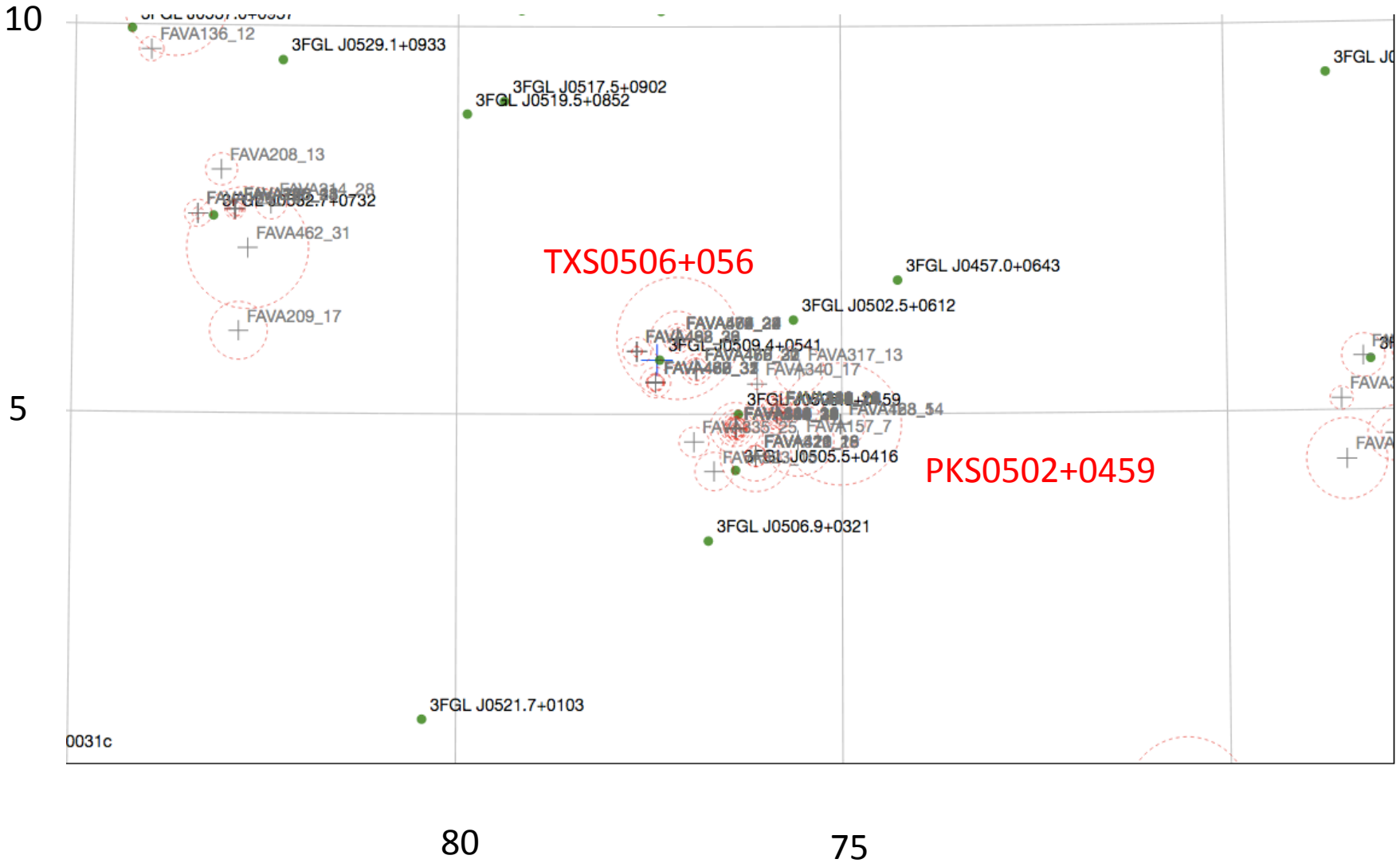
ANTARES time PDF 2008-2016, time-dependent analysis by Agustin Sanchez (only tracks)

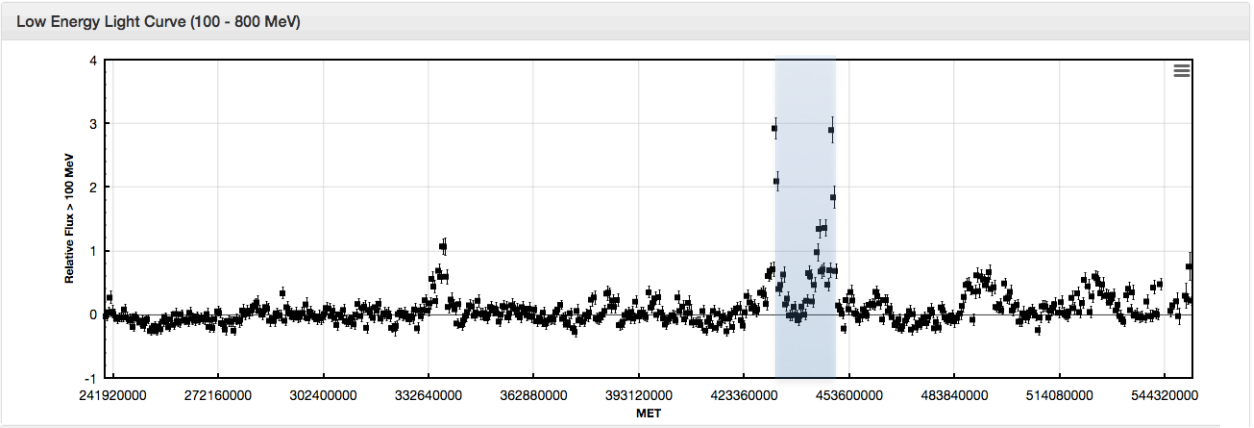


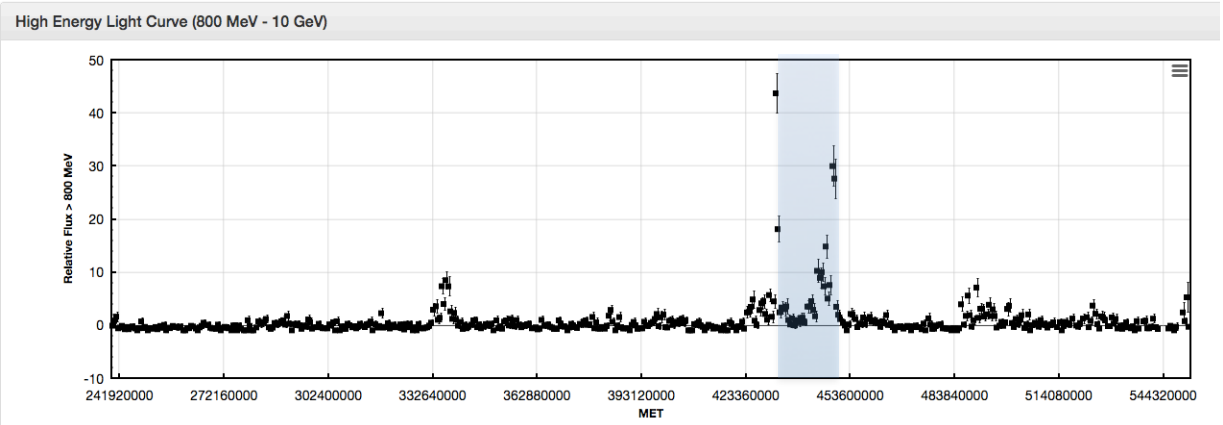


IC flaring

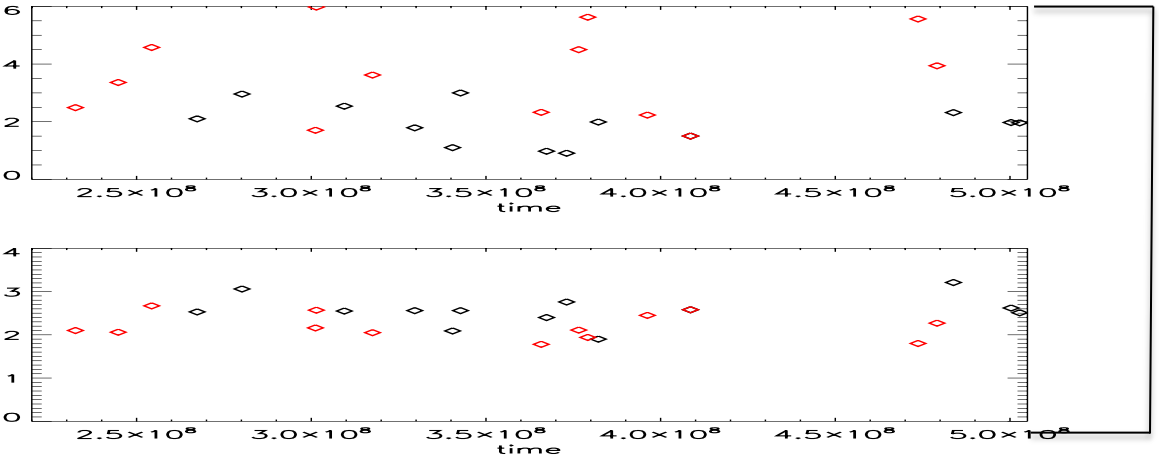
https://fermi.gsfc.nasa.gov/ssc/data/access/lat/FAVA/







Gamma-ray flux (FERMI) at position of source flaring during period that IC has identified as flaring (~1 degree away from TXS0506)



ANTARES events:

Distance to source vs time

Energy estimate vs time

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Red: PS cuts (strict, events public)

KM3NeT ARCA/ORCA data

- Efficiency and Single Rate difference ORCA/ARCA
- Data/MC difference ORCA/ARCA
- Mismatch vertex positions data/MC (ARCA)

Efficiency and Single Rate difference ORCA/ARCA

Pieter Braat Bachelor project:
Determination and comparison of Single Rate and K40 efficiencies

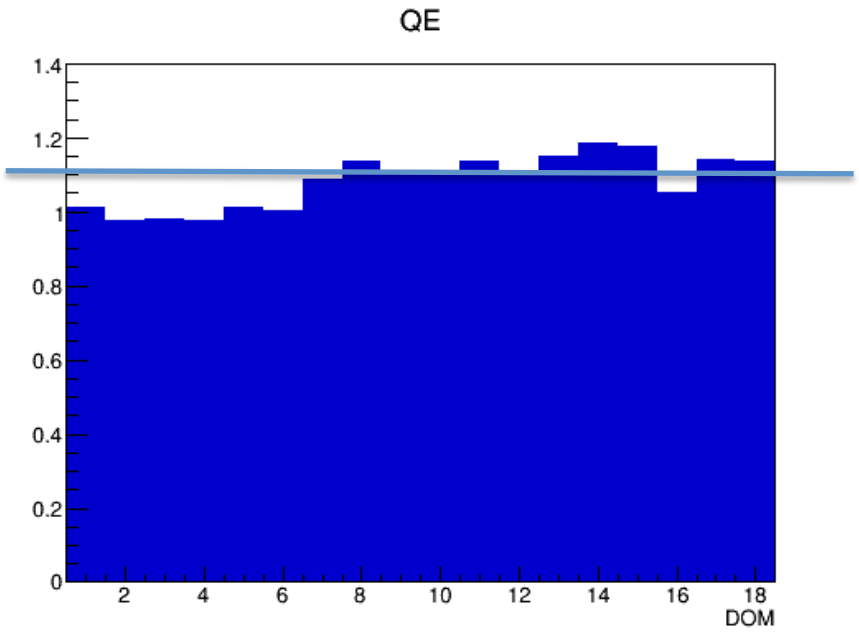
Comparing ARCA/ORCA

- K40 (salinity) should be identical at the sites
- PMTs should be 'identical' (same batches etc)
- DOMs should be 'identical' (similar structures/reflector rings etc)
- HV tuning similar

} K40 efficiency, Single Rates should be the same

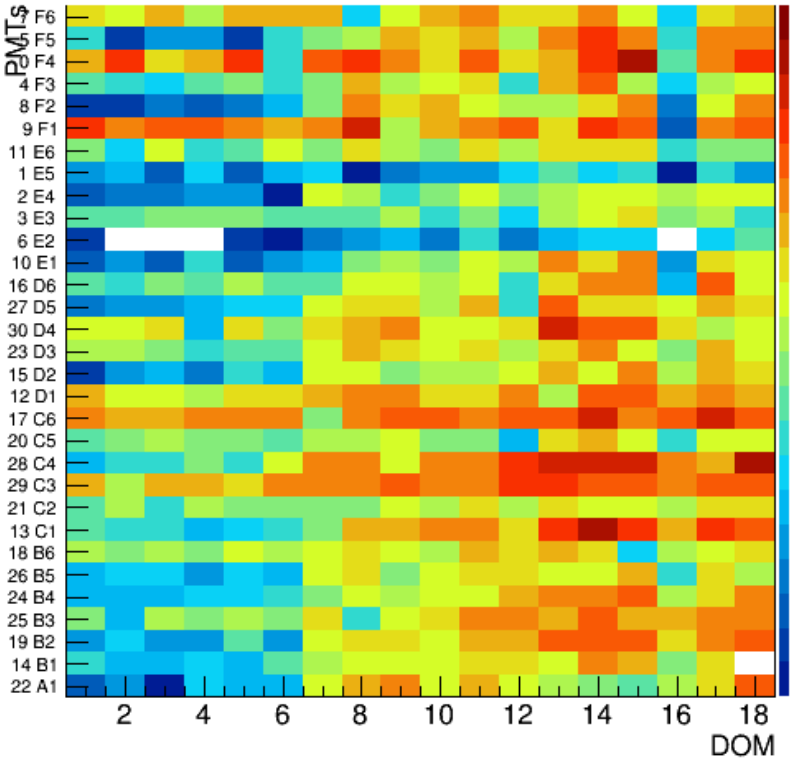
- Bioluminiscence higher at ORCA site
- Seafloor close to lowest DOM

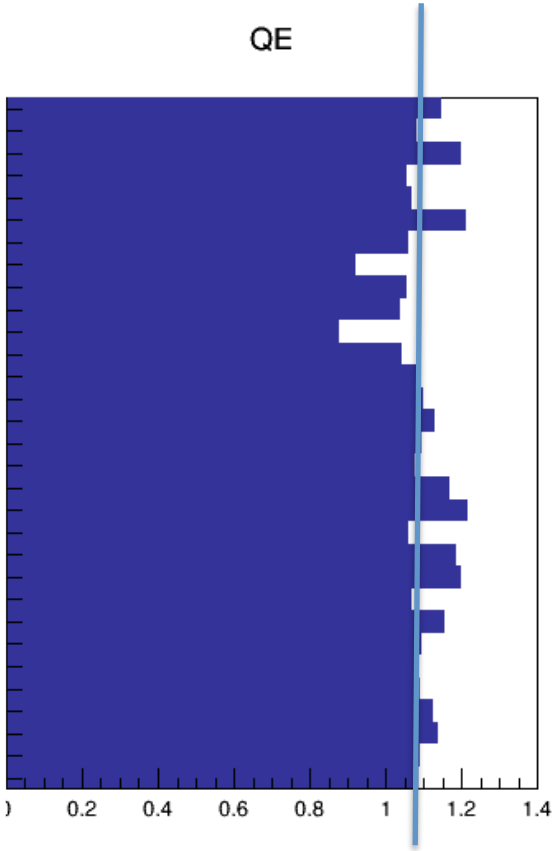
} Possible impact on Single Rates

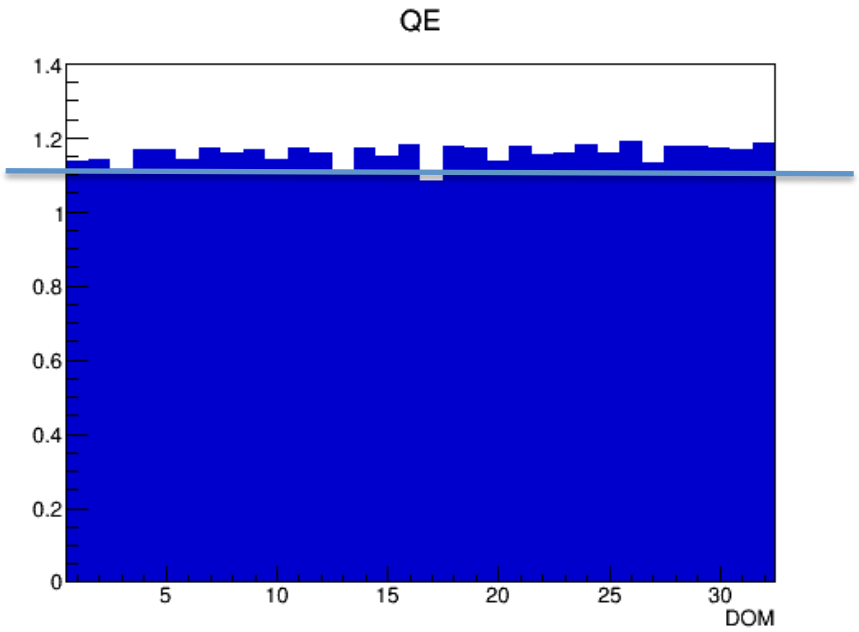


K40 efficiency
Projections show median

ORCA run 3104
Color scale 0.8-1.4

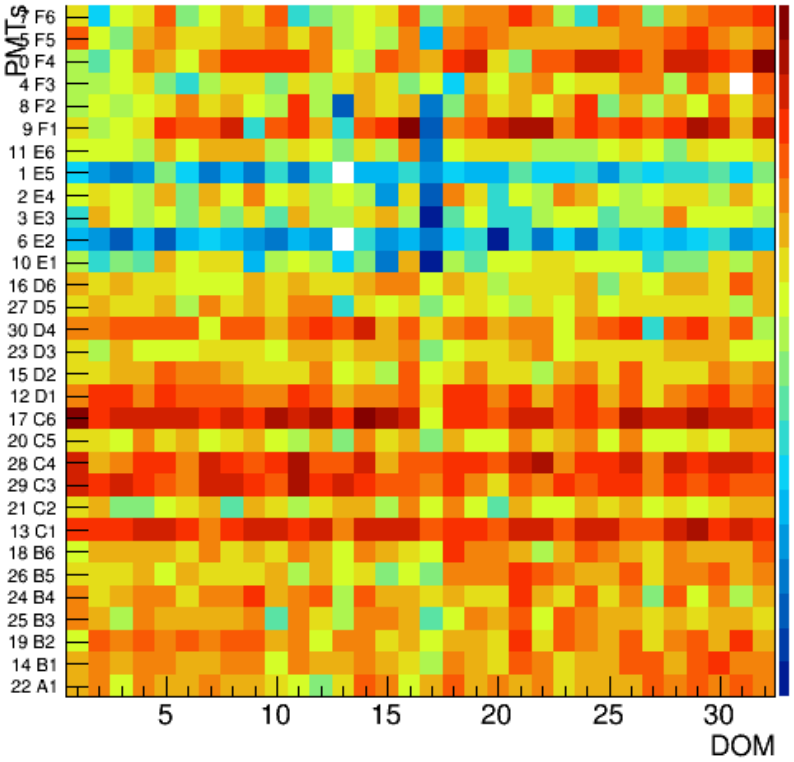


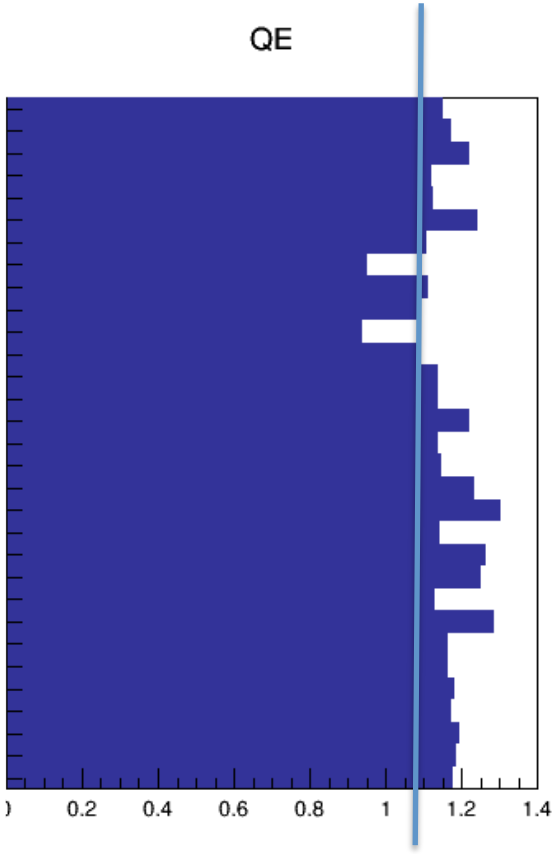


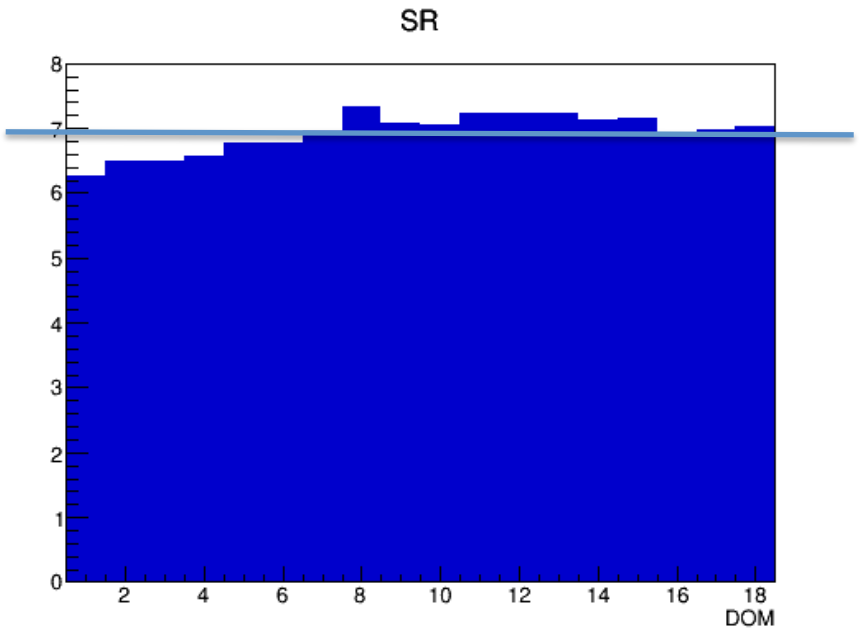


K40 efficiency
Projections show median

ARCA run 5045
Color scale 0.8-1.4

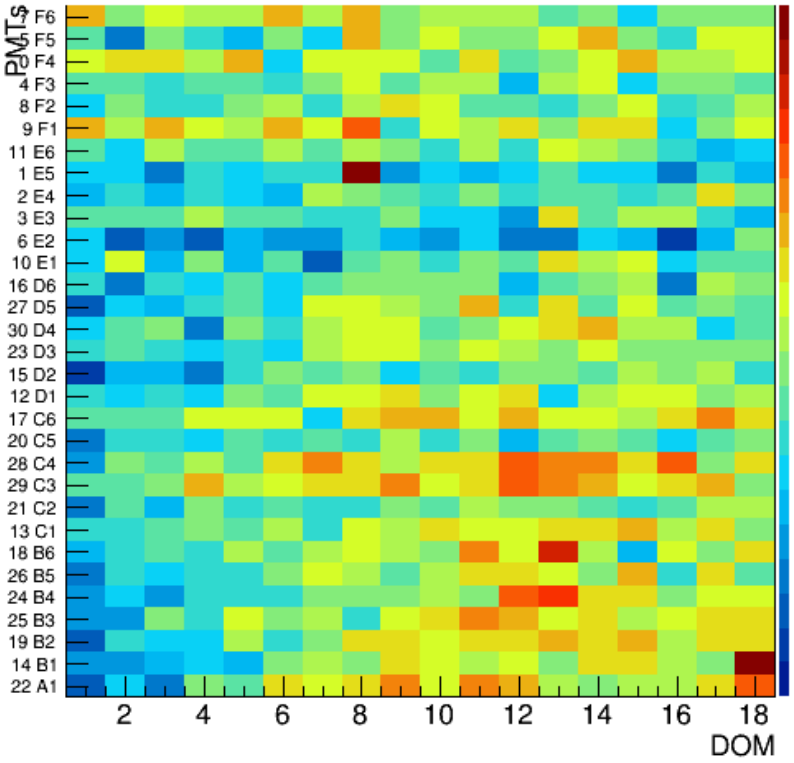


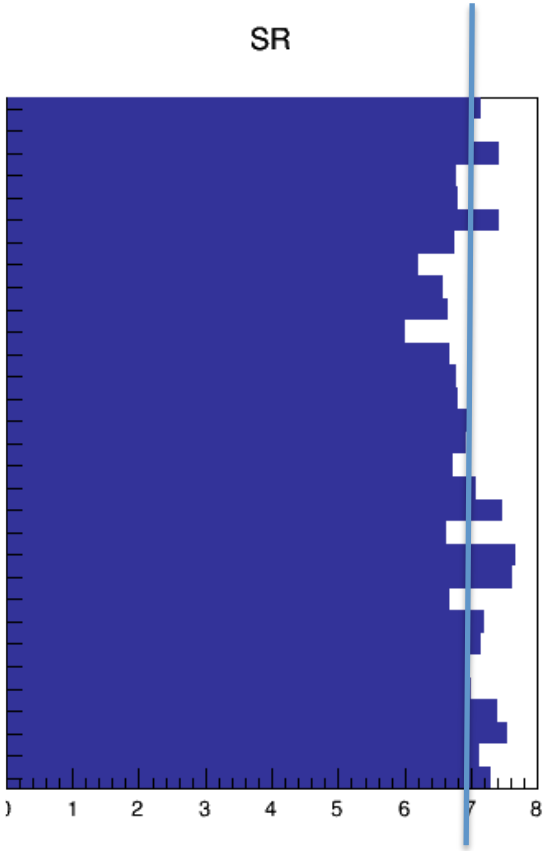


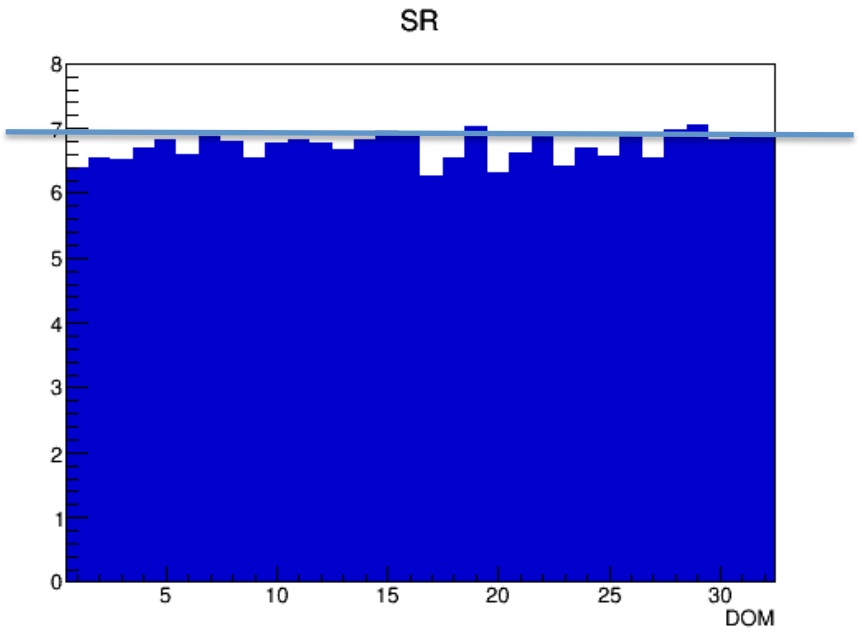


Single Rate (Baseline fit)
Projections show median

ORCA run 3104
Color scale 5kHz-10kHz

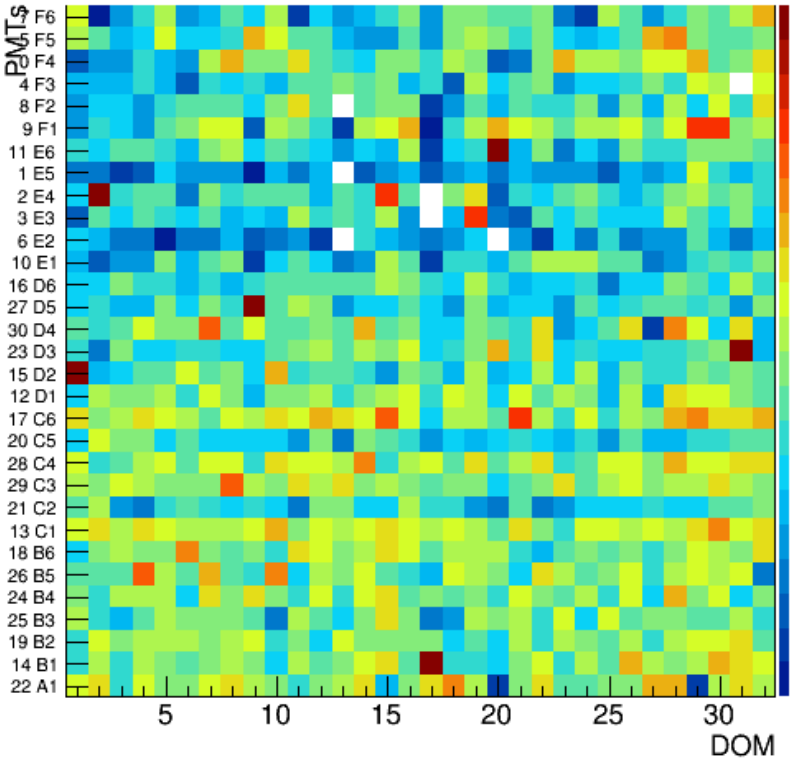


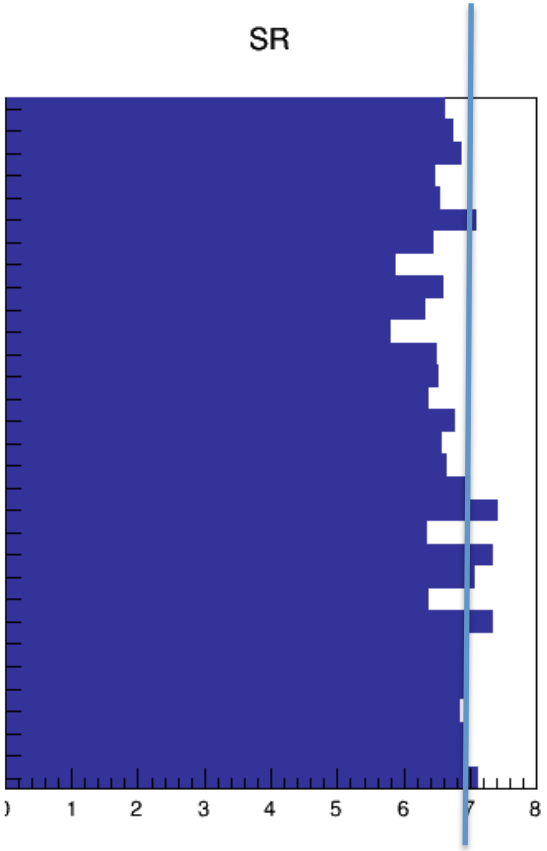




Single Rate (Baseline fit)
Projections show median

ARCA run 5045
Color scale 5kHz-10kHz





Efficiency and Single Rate difference ORCA/ARCA

Pieter Braat Bachelor project:
Determination and comparison of Single Rate and K40 efficiencies

Comparing ARCA/ORCA
- K40 (salinity) should be identical at the sites
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- HV tuning similar

} K40 efficiency, Single Rates should be the same

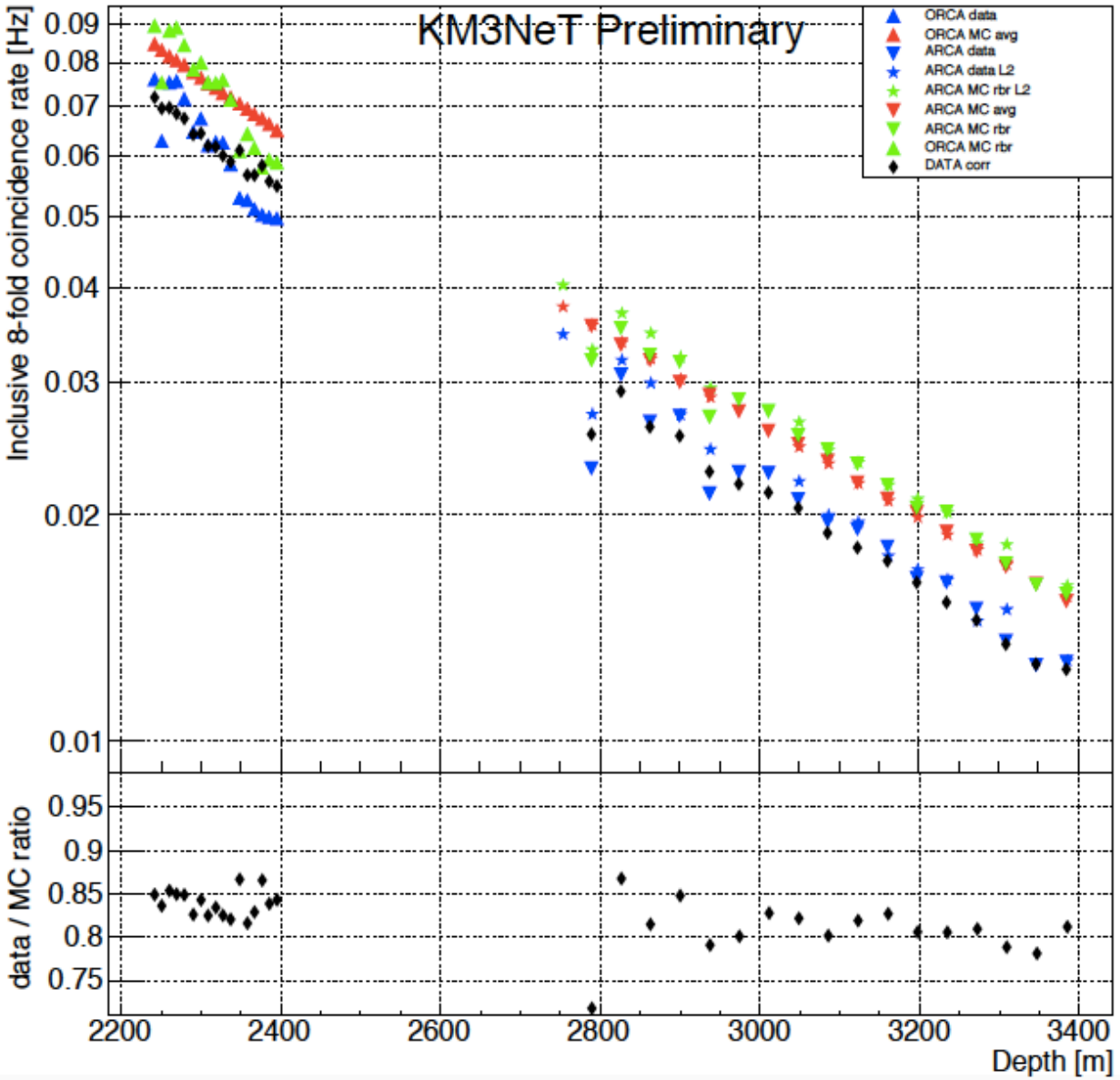
- Bioluminiscence higher at ORCA site
- Seafloor close to lowest DOM

} Possible impact on Single Rates

Findings:
K40 efficiencies on average higher for ARCA
Single rates on average higher for ORCA

Data/MC difference ORCA/ARCA

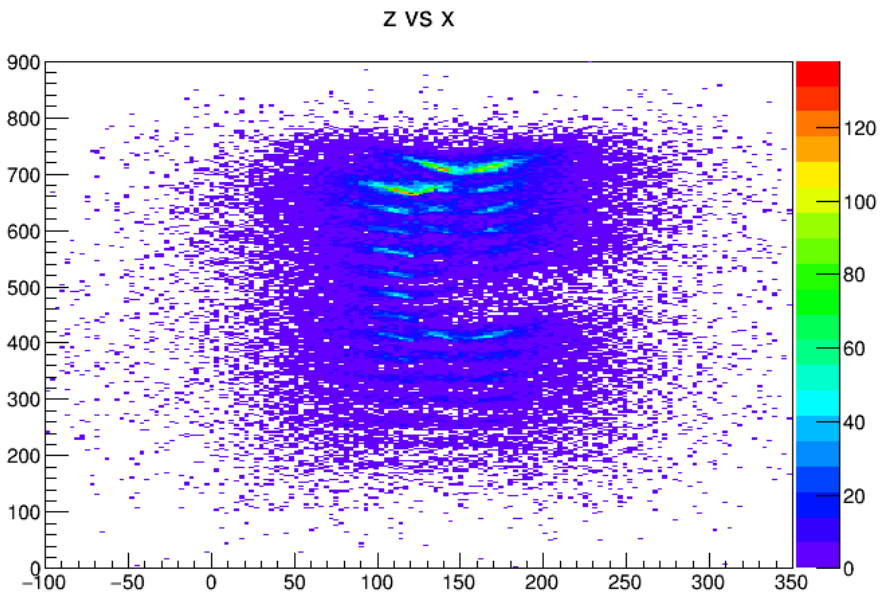
Plot by Massimiliano Lincetto

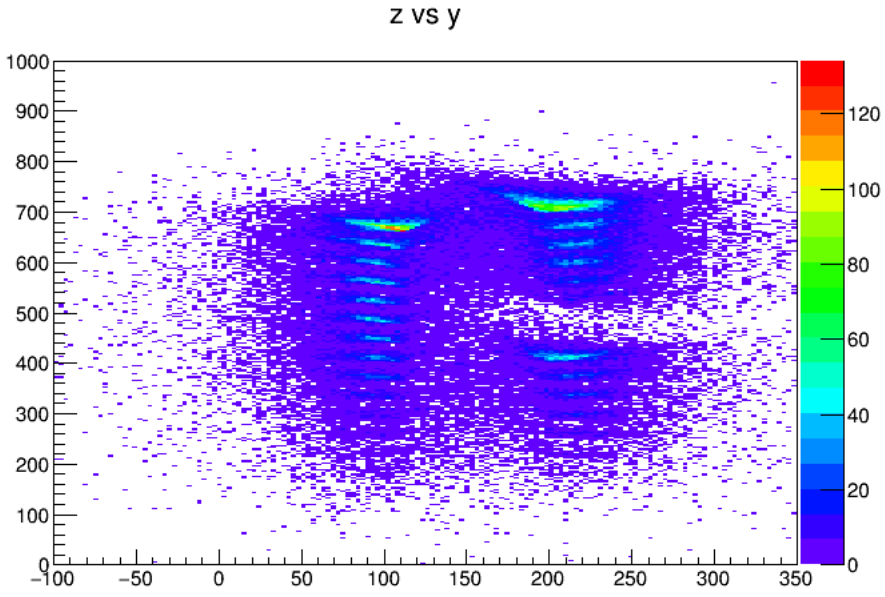


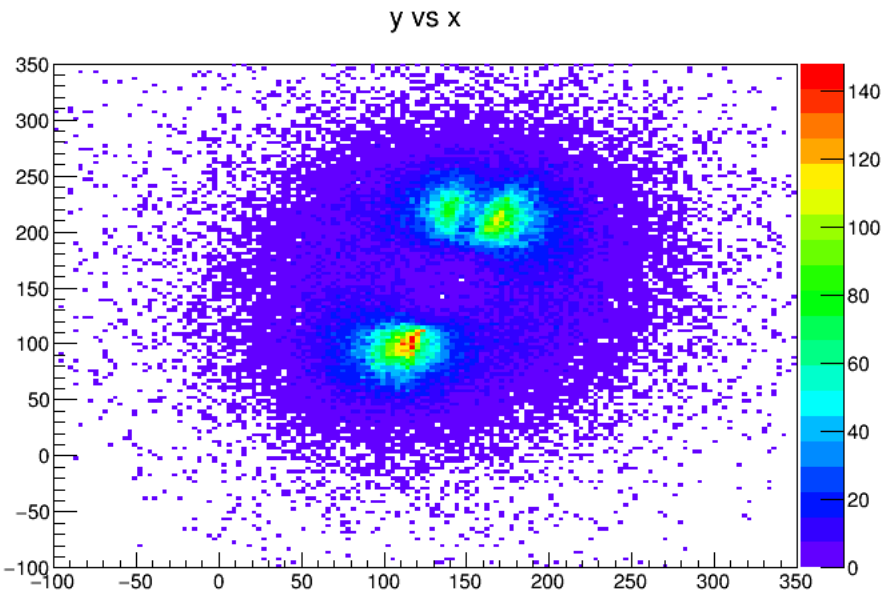
Mismatch vertex positions data/MC

- JPrefit-JSimplex-JGandalf reconstruction on ARCA 2-line data
- JStart reconstructing start position (at given time)

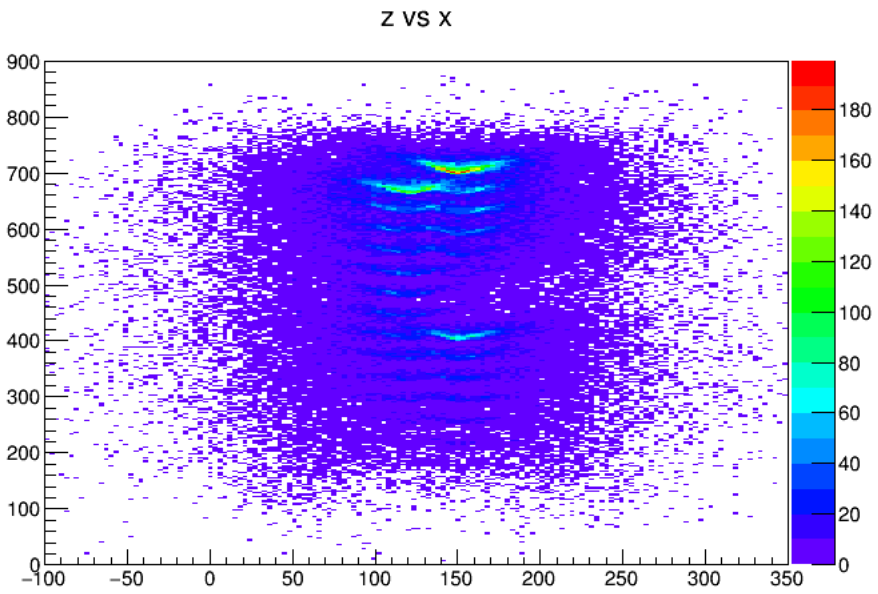
ARCA Runs 5010-5049, 2 lines, data
v5.0/reco/datav5.0.jchain.aashower.00000014_000050*root

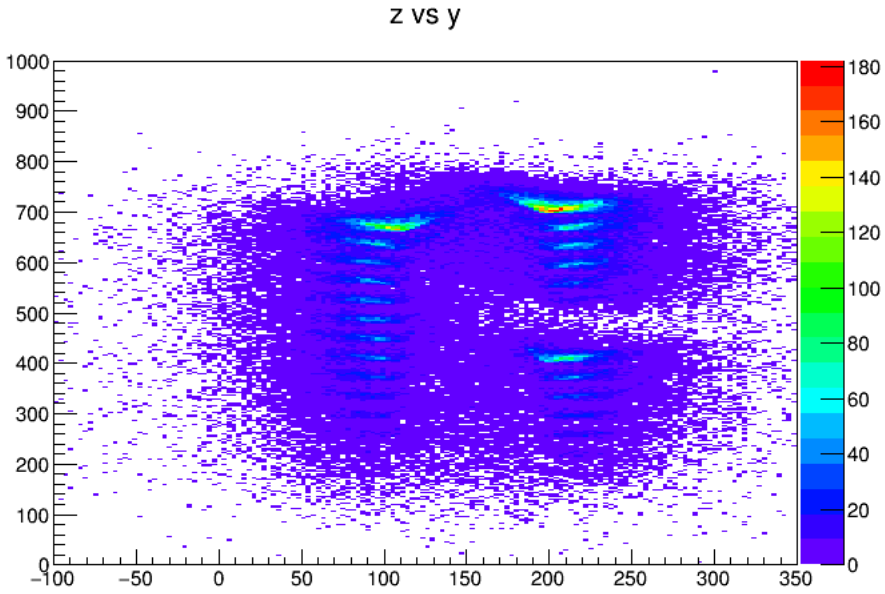


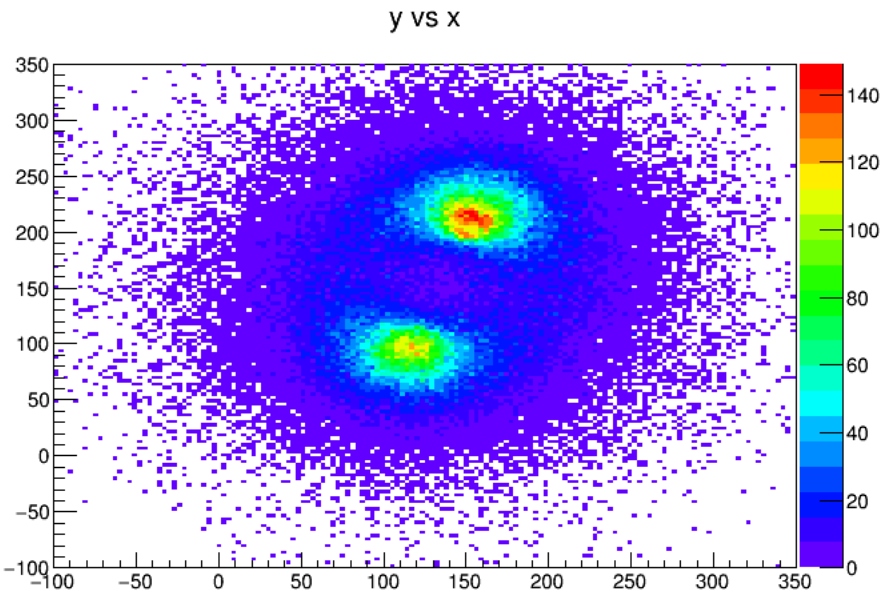




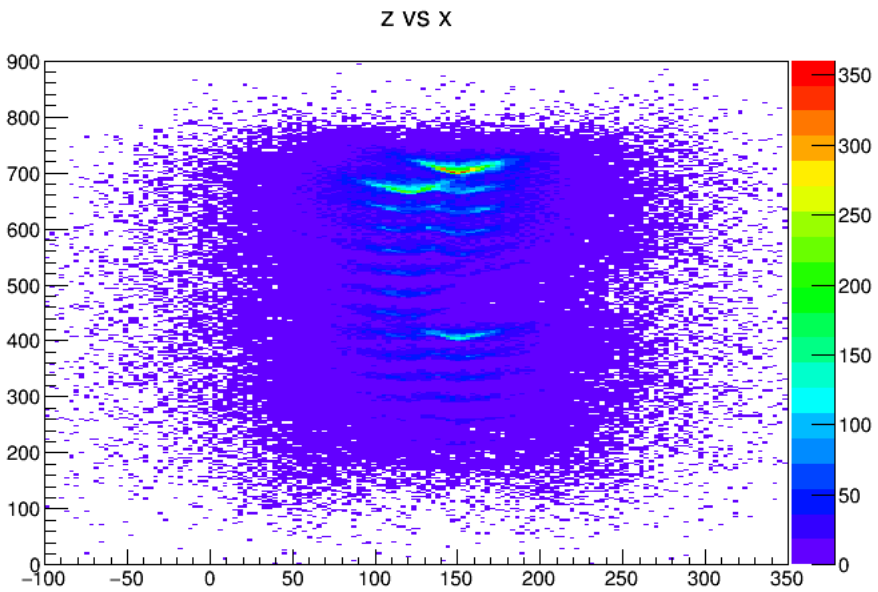
ARCA Runs 5010-5049, 2 lines, MC
v5.3/reco/mcv5.3.mupage_10G.km3_AAv1.jterbr000050*jchain*aashower*.root

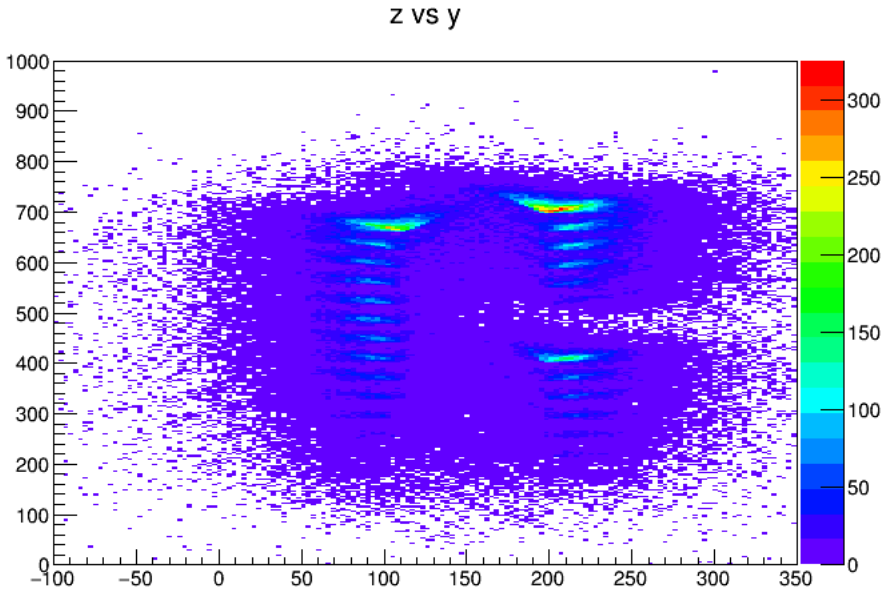


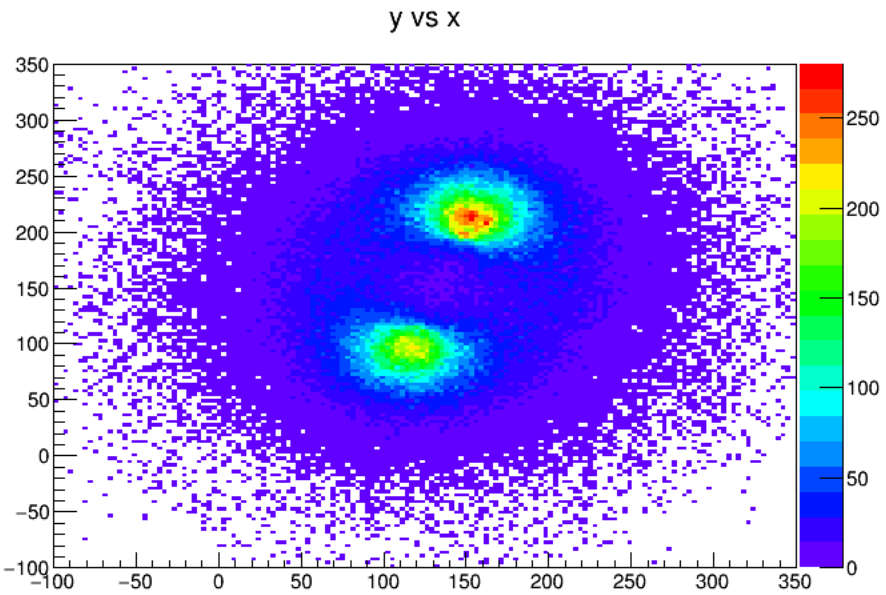




ARCA Runs 5010-5049, 2 lines, MC
v5.1/reco/mcv5.1.mupage_10G.km3_AAv1.jterbr000050*jchain*aanet.root







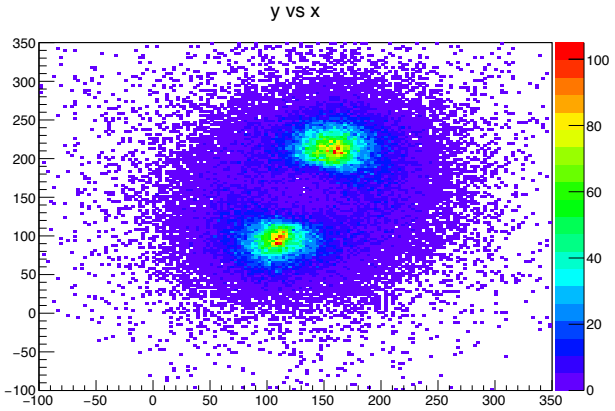
Mismatch vertex positions data/MC

- JPrefit-JSimplex-JGandalf reconstruction on ARCA 2-line data
- Jstart reconstructing start position (at given time)

=> start positions close to 'first' DOM with signal

Possible Cause?

- Rotation of String 1 (but this is not the one with the 'feature')
- Shift between strings in x/y/z (but then why not symmetric feature?)
- **Known time offset of 20ns**
- Length uncertainty (seems too small to impact such visibly)
- ???



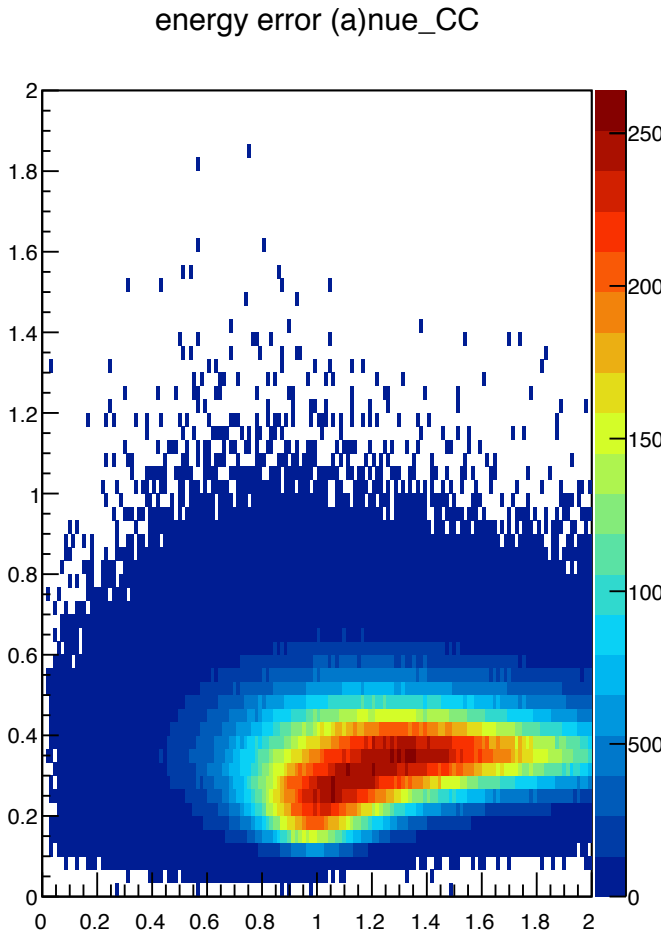
After application of time shift

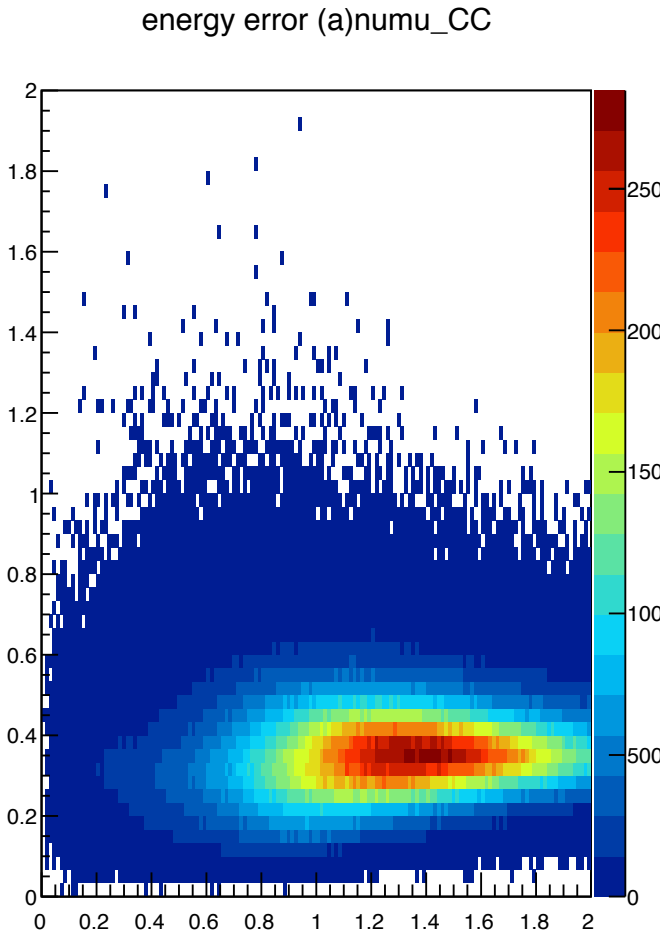
ORCA energy resolution

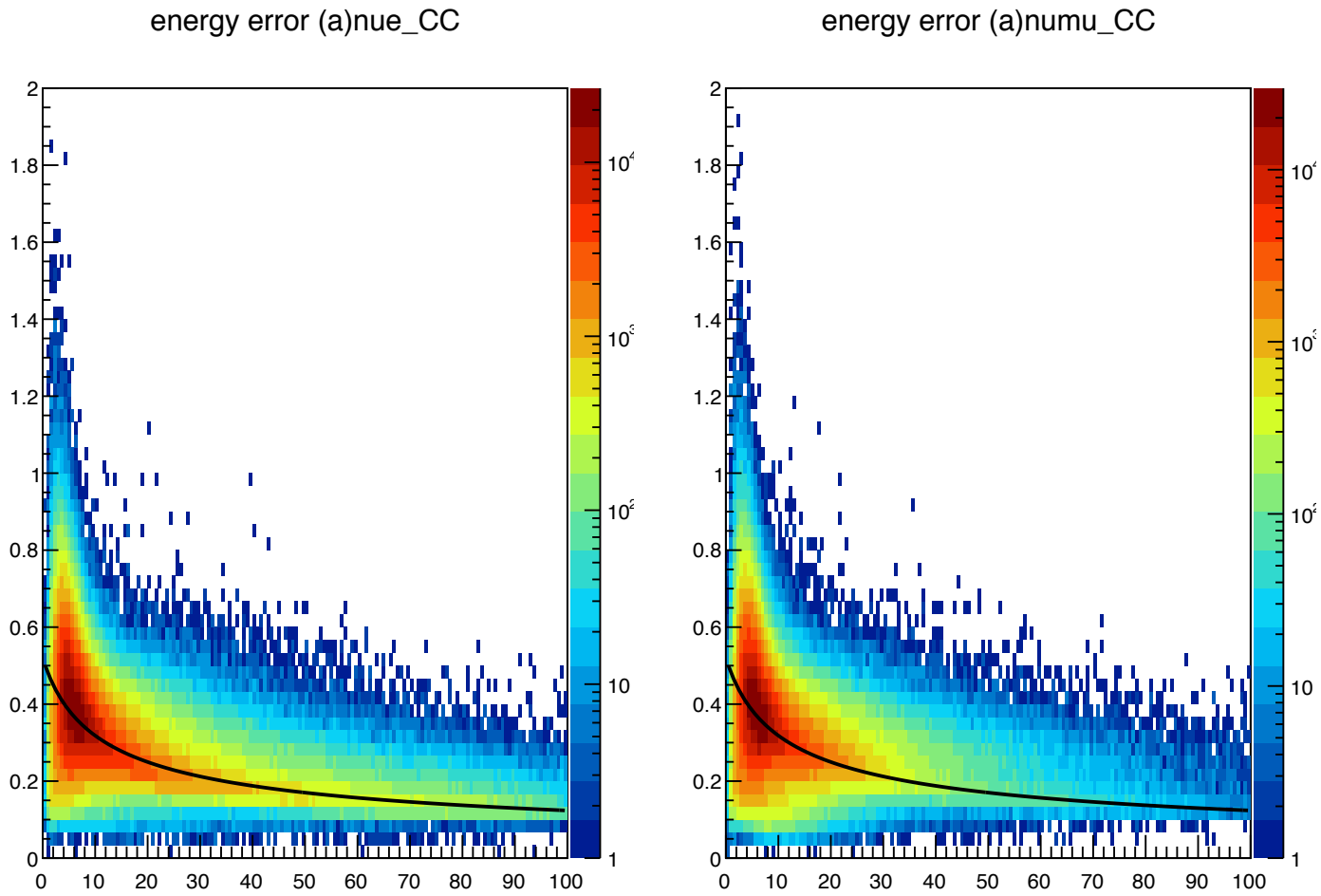
Identify events with good energy estimate -> improve sensitivity
Possibly event-wise fit taking event-wise energy/angular uncertainties into account?

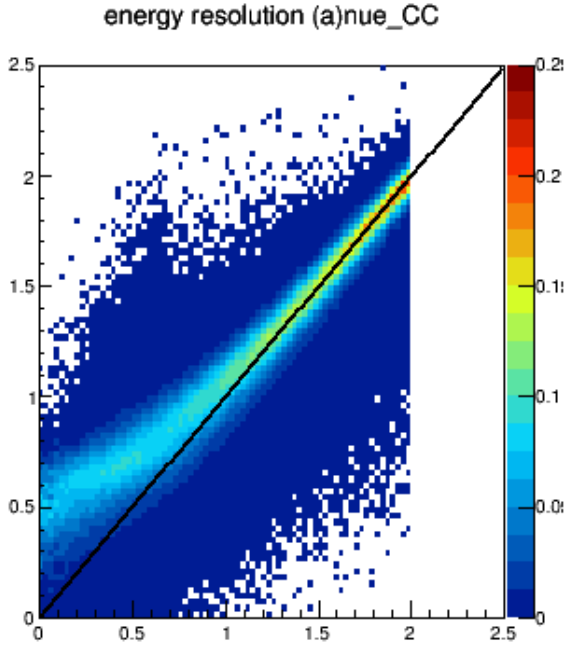
Shower energy estimate from LLH scan => determination of 1sigma boundaries (Jannik's reco)

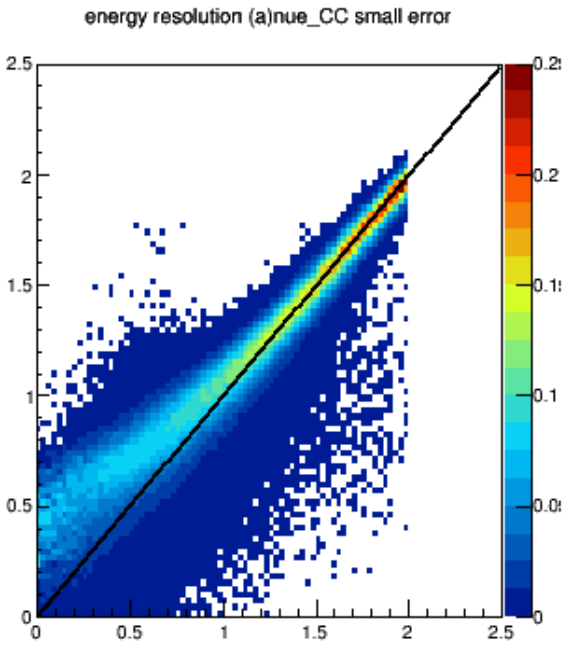
(sigma_up + sigma_down)/energy_reco versus energy_reco

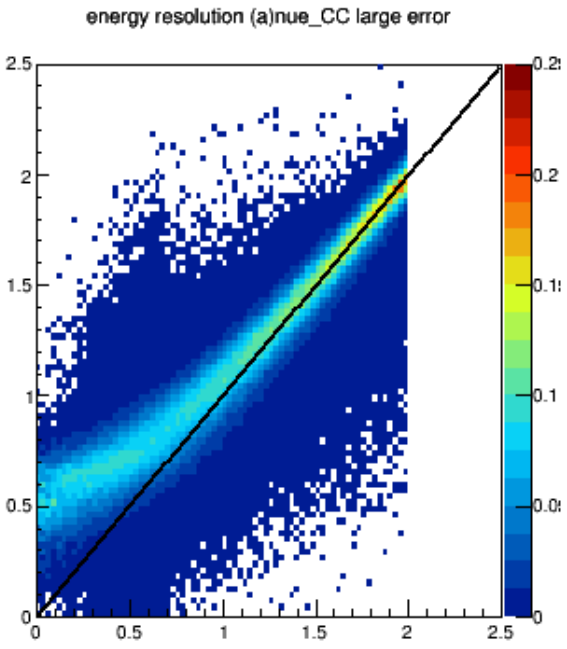


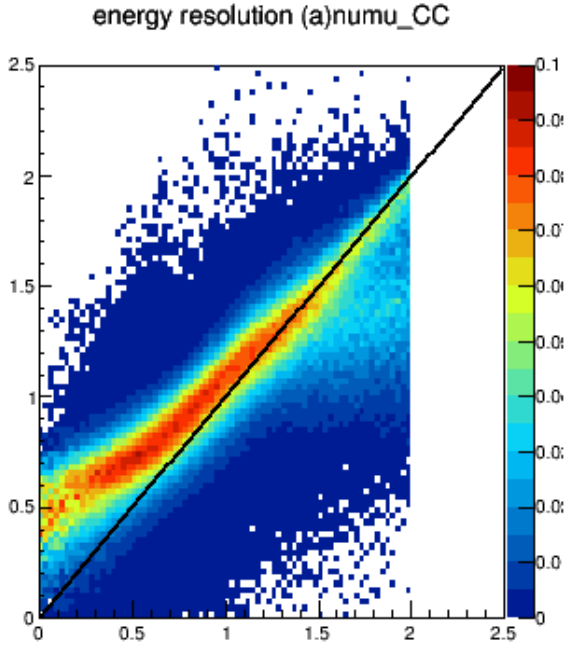



energy error (a)nue_CC
energy error (a)numu_CC
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
10
20
30
40
50
60
70
80
90
100
1
10


energy resolution (a)nue_CC


energy resolution (a)nue_CC small error


energy resolution (a)nue_CC large error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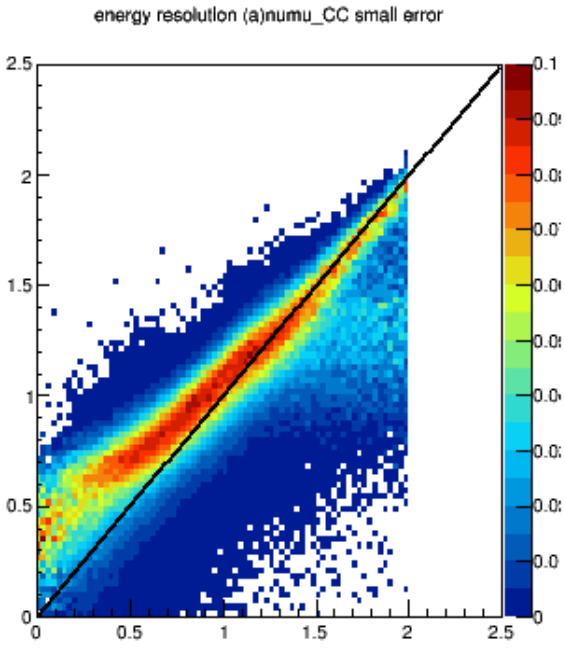
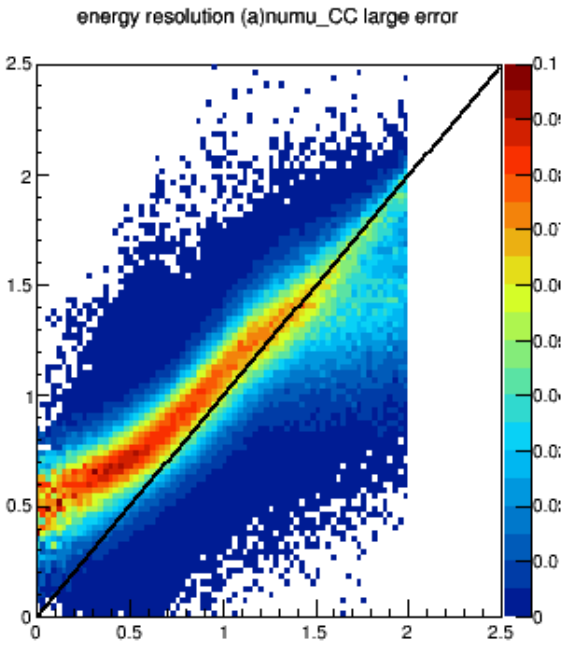

energy resolution (a)numu_CC small error


energy resolution (a)numu_CC large error