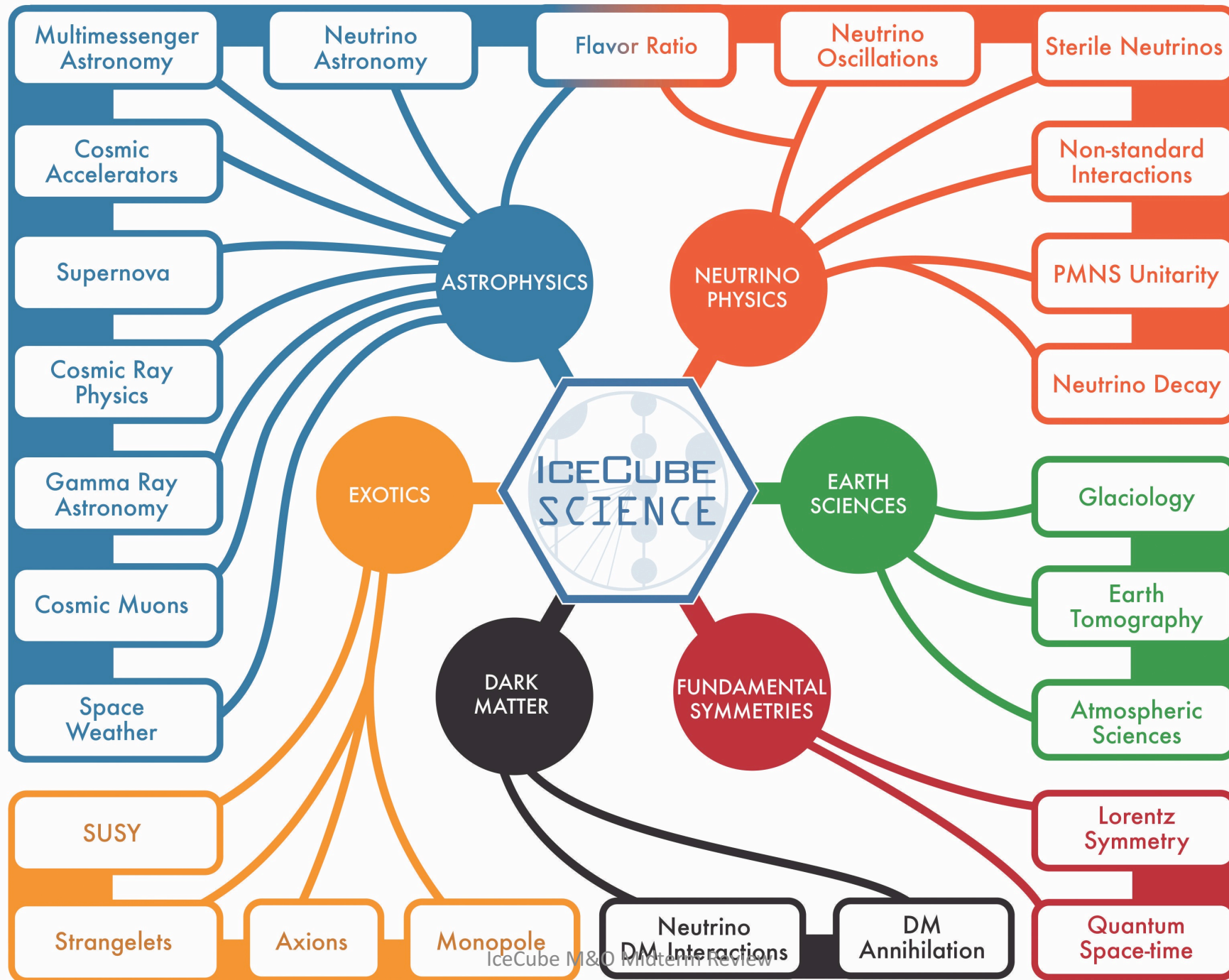# Analysis Coordination and Publications

Dawn Williams

Maintenance and Operations Mid-term Panel Review

IceCube M&O Midterm Review

IceCube Analysis

- IceCube analysis continues to evolve

- Many analysis use common data sets

- Some analysis use common software

- New analysis methods continue to be proposed

- New data sets are in various stages of development

- High statistics analyses like oscillation are systematics limited, systematics becoming important for astrophysical neutrinos

Analysis review cycle

New WG structure in 2018

Main motivations:

1. Consolidating topics
2. Improving communication between working groups on systematics
3. Moving some technical tasks out of overburdened working groups

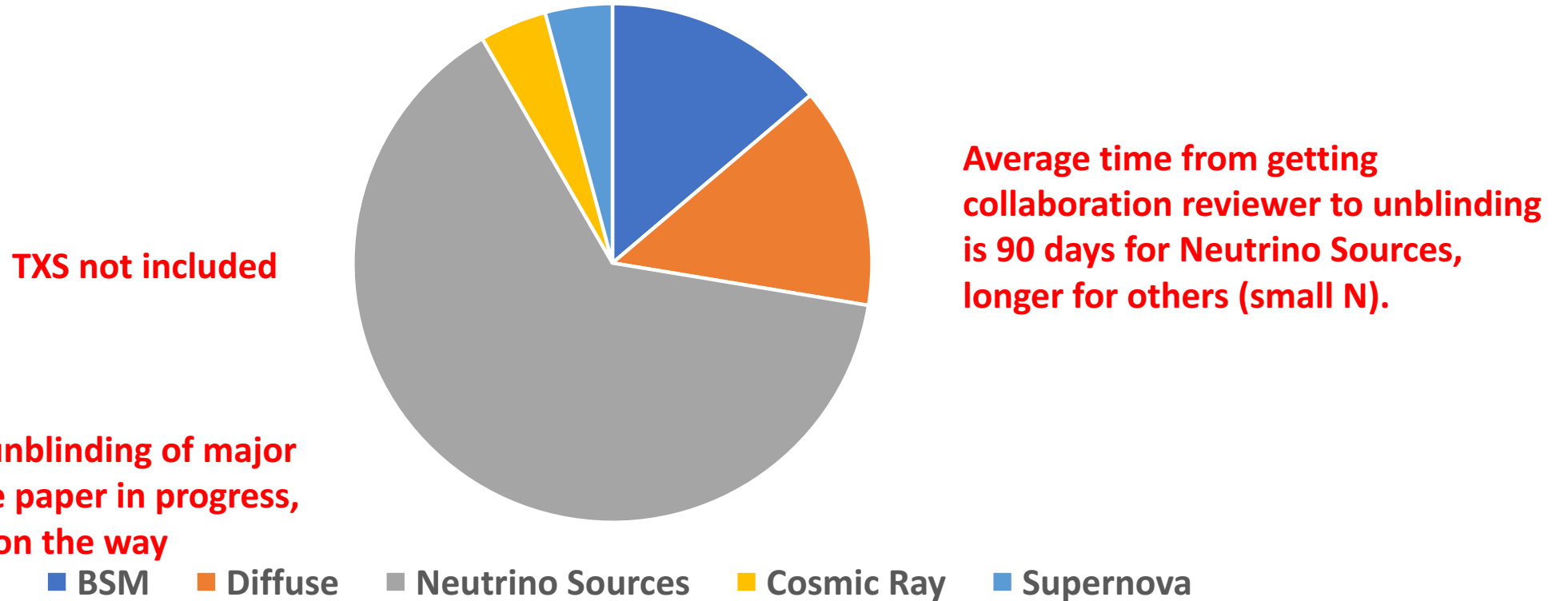| Analysis WG	Convenor(s)
Diffuse	Claudio Kopper, Klas Hultqvist
Neutrino Sources	Naoko Kurahashi Neilson, Ignacio Taboada
Beyond Standard Model	Carsten Rott, Anna Pollman
Cosmic Rays	Kath Rawlins, Dennis Soldin
Oscillation	Juan Pablo Yanez, Tom Stuttard
Supernova	Lutz Koepke, Segev BenZvi

Technical WG	Convenor(s)
Realtime	Erik Blaufuss
Calibration	Summer Blot, Keiichi Mase
Systematics and Reconstruction	Joshua Hignight, Jakob Van Santen, Juanan Aguilar
Systematics Coordinator	Nathan Whitehorn

Working group technical personnel

Role/Area	Tech Lead	Affiliation	Data Curator	Affiliation	Current Datasets
Neutrino Sources WG	Joshua Wood	UW-Madison	Liz Friedman ✉	UMD	Nu Sources Datasets
Oscillations WG	Philipp Eller	PSU			
Diffuse WG	Lu Lu	Chiba U.			
Cosmic Rays WG	Katherine Rawlins	U. Alaska			
Beyond Standard Model WG	Carlos Argüelles	MIT			

Analyses over the past year

Analyses That Entered Review and Were Unblinded September 2017-2018

Average time from getting collaboration reviewer to unblinding is 90 days for Neutrino Sources, longer for others (small N).

TXS not included

Oscillations in between unblinding of major analyses: tau appearance paper in progress, sterile neutrino analysis on the way

■ BSM   ■ Diffuse   ■ Neutrino Sources   ■ Cosmic Ray   ■ Supernova

New samples in progress

Downgoing uncontained muons

ν_μ

μ

Lower energy contained muons

Partially contained cascades

Time [microseconds]
0.0 0.8 1.6 2.4 3.2 4.0 4.8 5.6

1400 m

2400 m

ν

μ
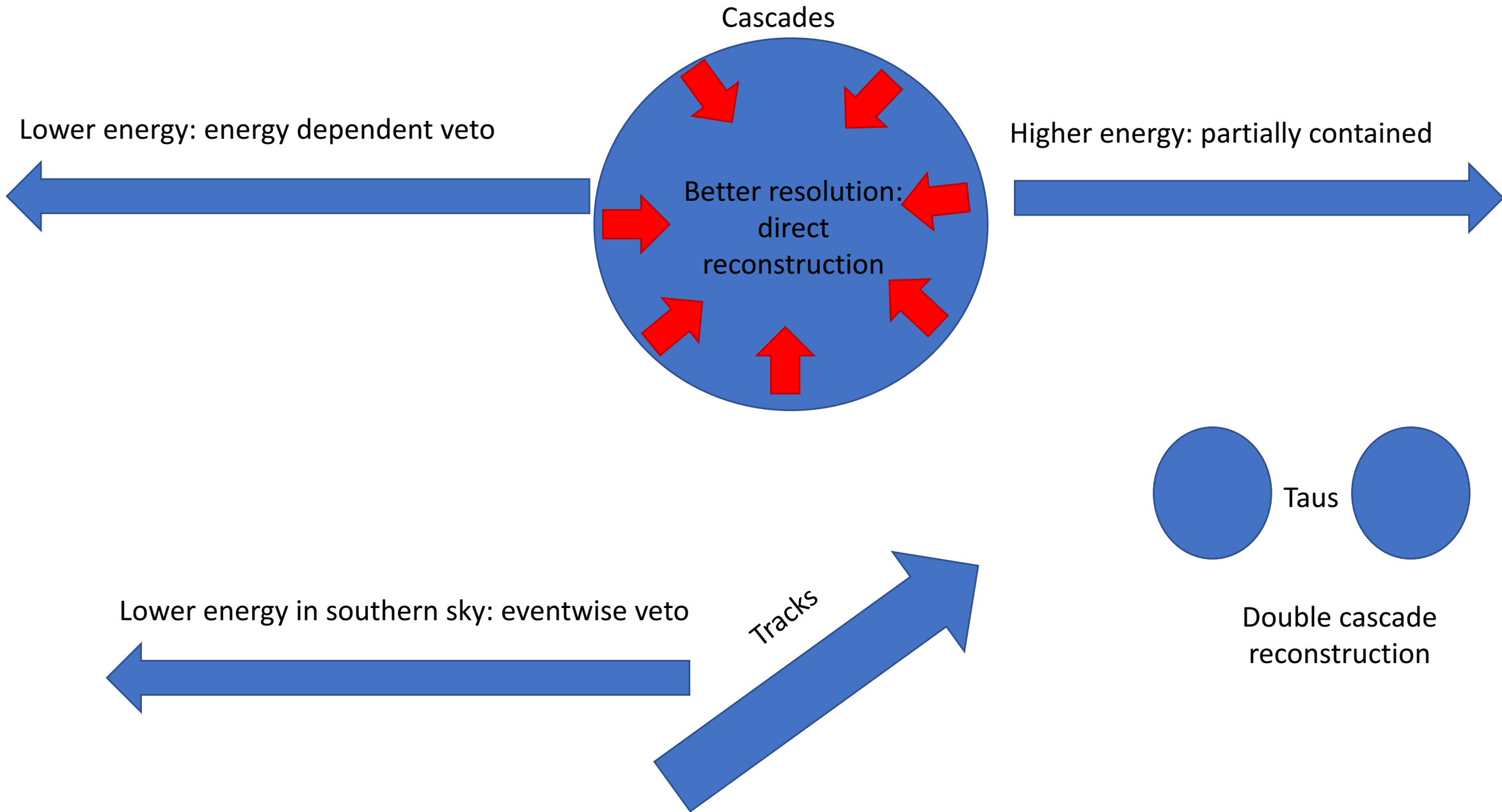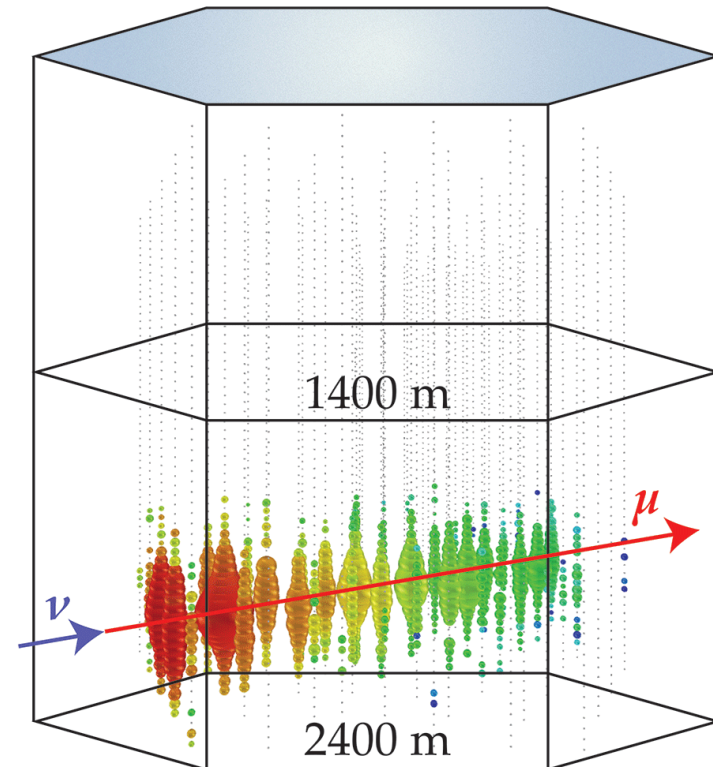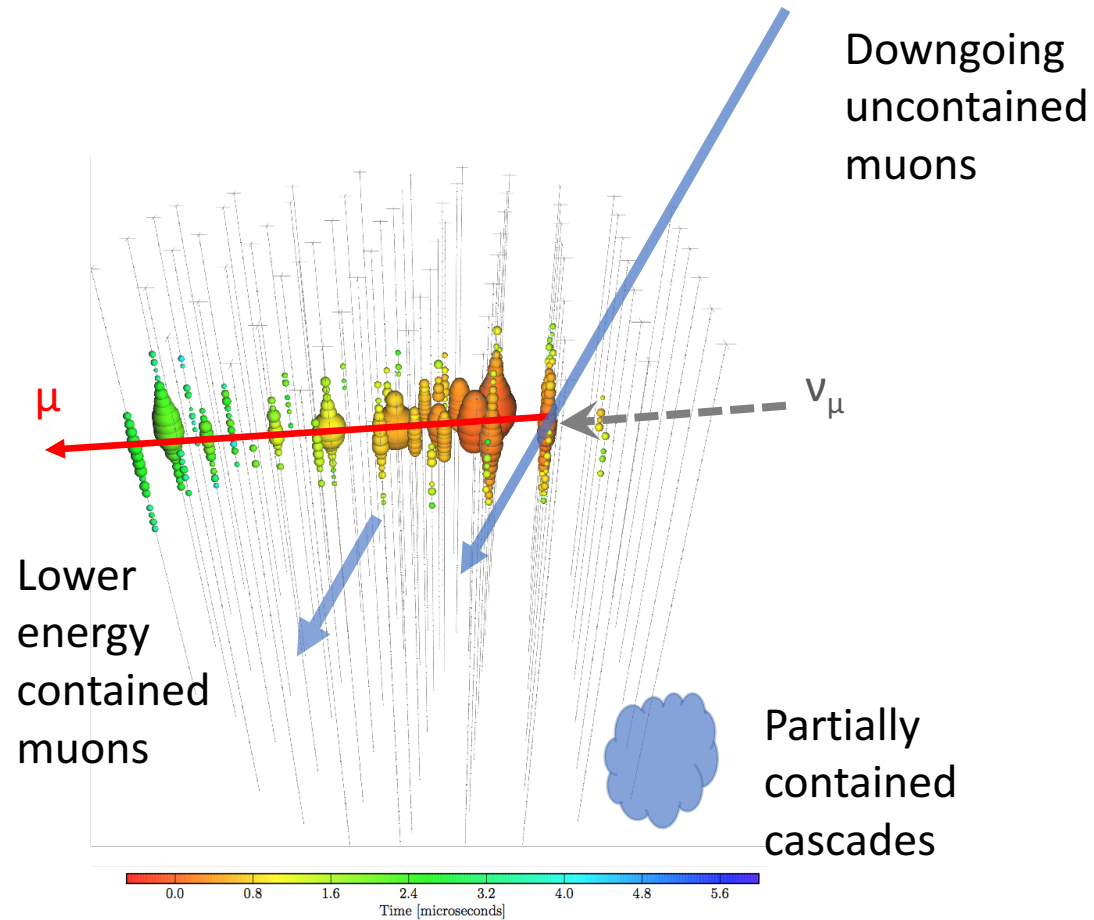
Selected Analyses on the horizon

- Multi-flare blazar search and many more multimessenger and realtime campaigns
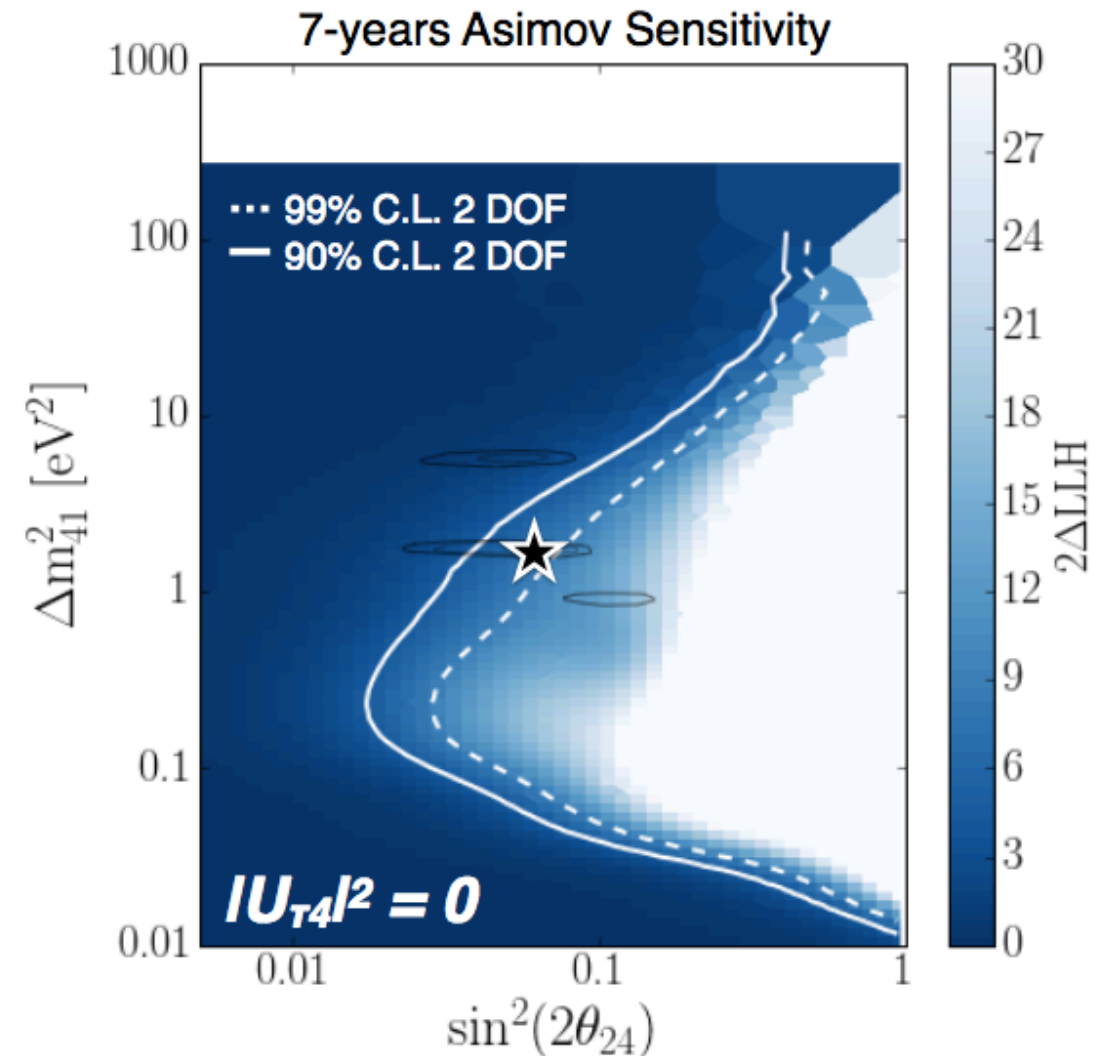
- Updated sterile neutrino analysis

- OscNext oscillation analysis

- Global fit of multiple diffuse neutrino data samples

7-years Asimov Sensitivity

M77 (figure to be added)

- Recent result: combined muon sample with updated catalog, showed a warm spot near M77, result communicated as preliminary to MOU partners (private comm based on time integrated result), not public release/realtime)

Internal data release protocol

- For unblinding, data sample must be in the data warehouse and software (analysis scripts beyond core software) must be in SVN or GitHub, documentation must be complete

- Technical coordinator/data curator of analysis WG must sign off on this

- For publication, higher threshold: analysis must be able to be reproduced. This is only reproduction of high level results, not reproduction of all data processing

Internal data release protocol

STEP 1

presentation of analysis to working group

data sample
/data/ana/analyses/<analysis>

software
SVN:/IceCube/analyses/<analysis>
GitHub:IceCubeOpenSource

documentation
maintained wiki pages
internal report

STEP 2

analysis review by working group

location of data files?

how were files generated?

where is the software used?

has the code recently changes?

can it reproduce this results?

can it reproduce previous results?

list of results to reproduce?

STEP 3

unblinding proposal at analysis call

reviewers & data curator give OK?

first complete version of repository

final level data files

analysis scripts to get data files

analysis tools used to analyze data

documentation: wiki, draft of internal report

STEP 4

paper outline proposal at analysis call

final version of repository

final level data files

analysis scripts to get data files

analysis tools used to analyze data

documentation: wiki, draft of internal report

can the analysis results be reproduced?

STEP 5

paper submission to journal

publish internal repository as complete

make sure all components are final and well documented

External data releases

- Text format data release of 3 years of tracks in October

- Looking into next generation of data releases: supporting versions, different types of data sets, database functionality

- A data release task force has been convened to look into this

- Possible solutions being investigated include High Energy Astrophysics Archive for NASA (HEASARC) and Italian Space Energy Space Science Data Center

Papers in Progress

Papers in Progress [edit]

- FRB search with Level2 tracks and SNDAQ Added 2018-12-05
- Pan-STARRS IceCube Paper Added 2018-11-13
- Cascade Type Distinction Added 2018-10-30
- Non-Poissonian Template Fitting Added 2018-10-11
- SPE Templates Paper Added 2018-09-22
- Density of GeV muons in air showers measured with IceTop Added 2018-09-22
- Search for PeV Gamma Rays with 5 Years of Data from the IceCube Observatory Added 2018-09-22
- 3 Year Energy Spectrum and Composition Added 2018-09-22
- Search for Large Scale Northern Sky Cosmic Ray Anisotropy with 6 Years of IceCube Atmospheric Neutrinos Added 2018-09-22
- Gamma-ray counterparts to high-energy neutrinos detected by IceCube Added 2018-08-22
- Neutrino Mass Ordering Paper with 3 Years of DeepCore (DRAGON and GRECO analyses) Added 2018-08-03
- Measurement of Atmospheric Tau Neutrino Appearance with IceCube DeepCore added 2017-11-10
- Upper Limits on High Energetic Neutrinos from Core Collapse Supernovae using the IceCube Neutrino Telescope added 2017-11-01
- Veto techniques for selecting neutrinos below 100 TeV from the southern sky with the IceCube detector (LESE/STeVE) Added 2017-08-21

Technical and new methods papers

- New SPE Templates

- Application of Non-poissonian template fitting to point source searches

- Cascade type distinction

- Forthcoming: deep neural network reconstruction of IceCube cascades
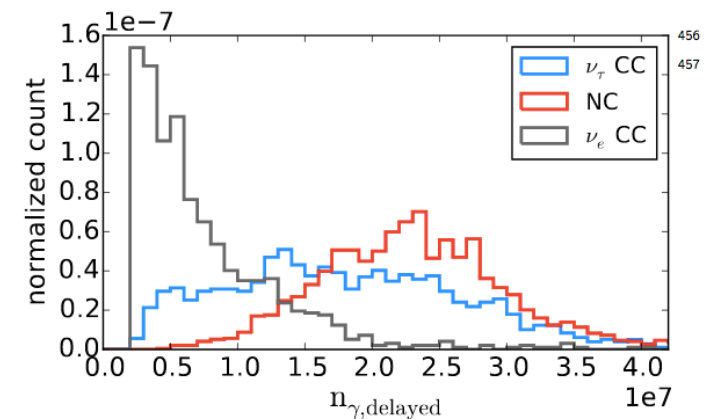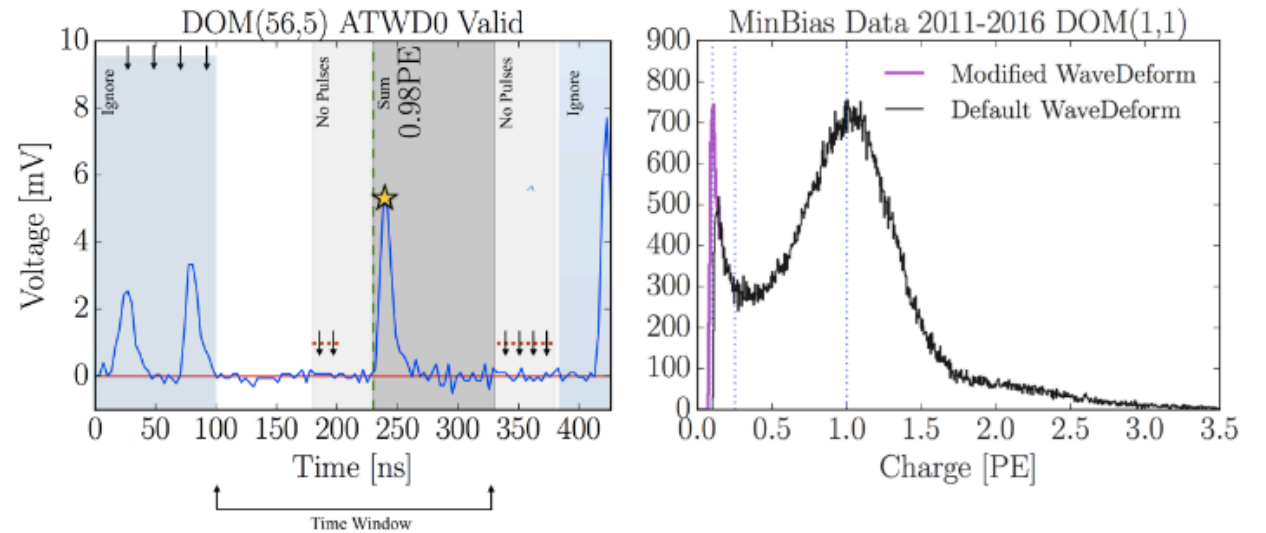
Recently approved paper outlines

- Neutrino sources
  - 7 year medium energy cascade analysis with DNN reconstruction
  - 2MRS correlation paper
- Future technologies
  - IceACT demonstrator paper
  - JUNO/PINGU combined NMO sensitivity

Selected Paper outlines expected soon

- HESE 7 year analyses, including first glimpse of high energy tau neutrino

- Neutrino cross section with cascades

- First hint of the Glashow resonance in IceCube data, including technical details of the reconstruction in a supporting paper

Backup

IceCube M&O Midterm Review