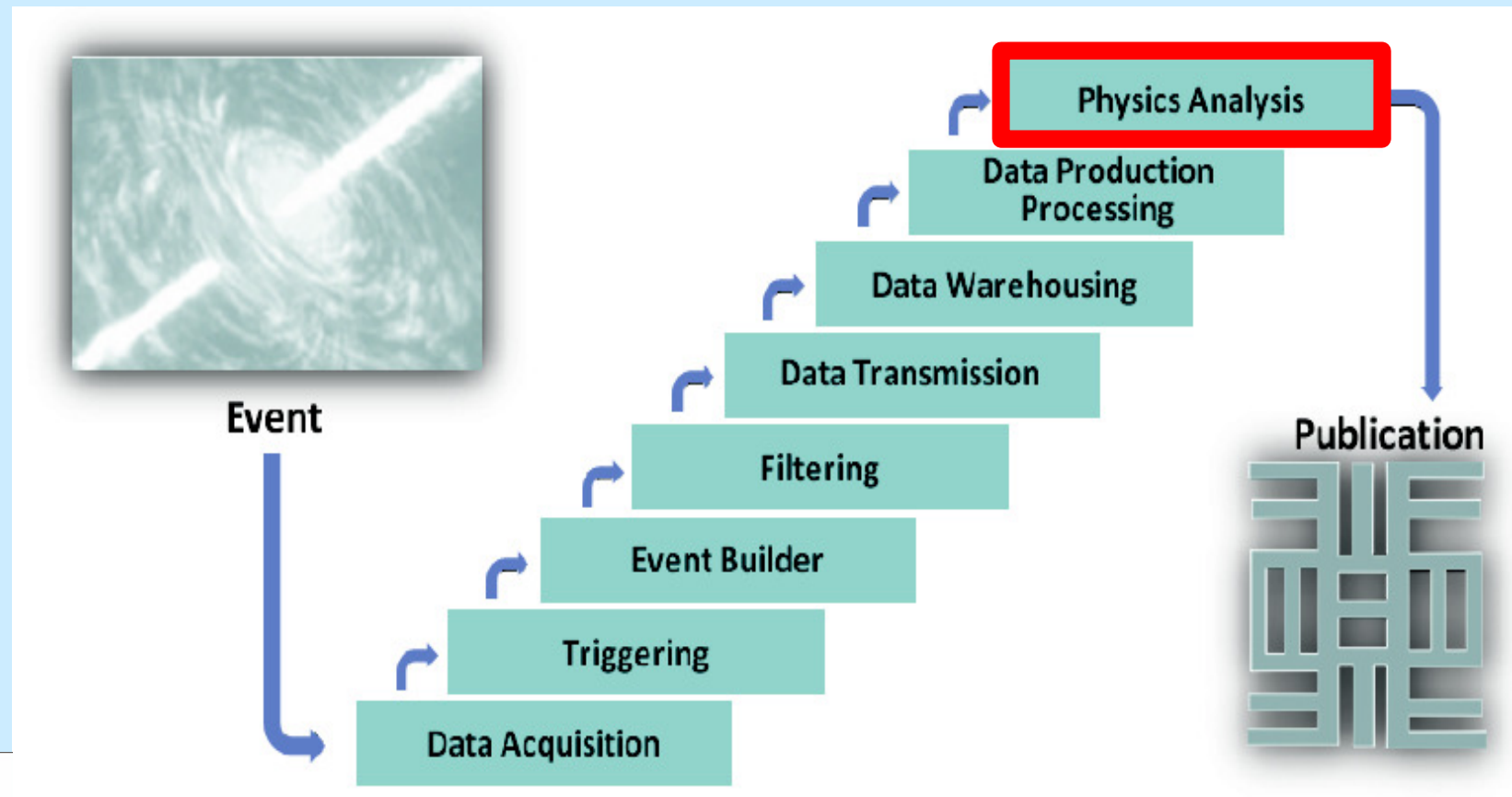


From science event to publication: the last step



Physics Run

From April-May to April-May year later

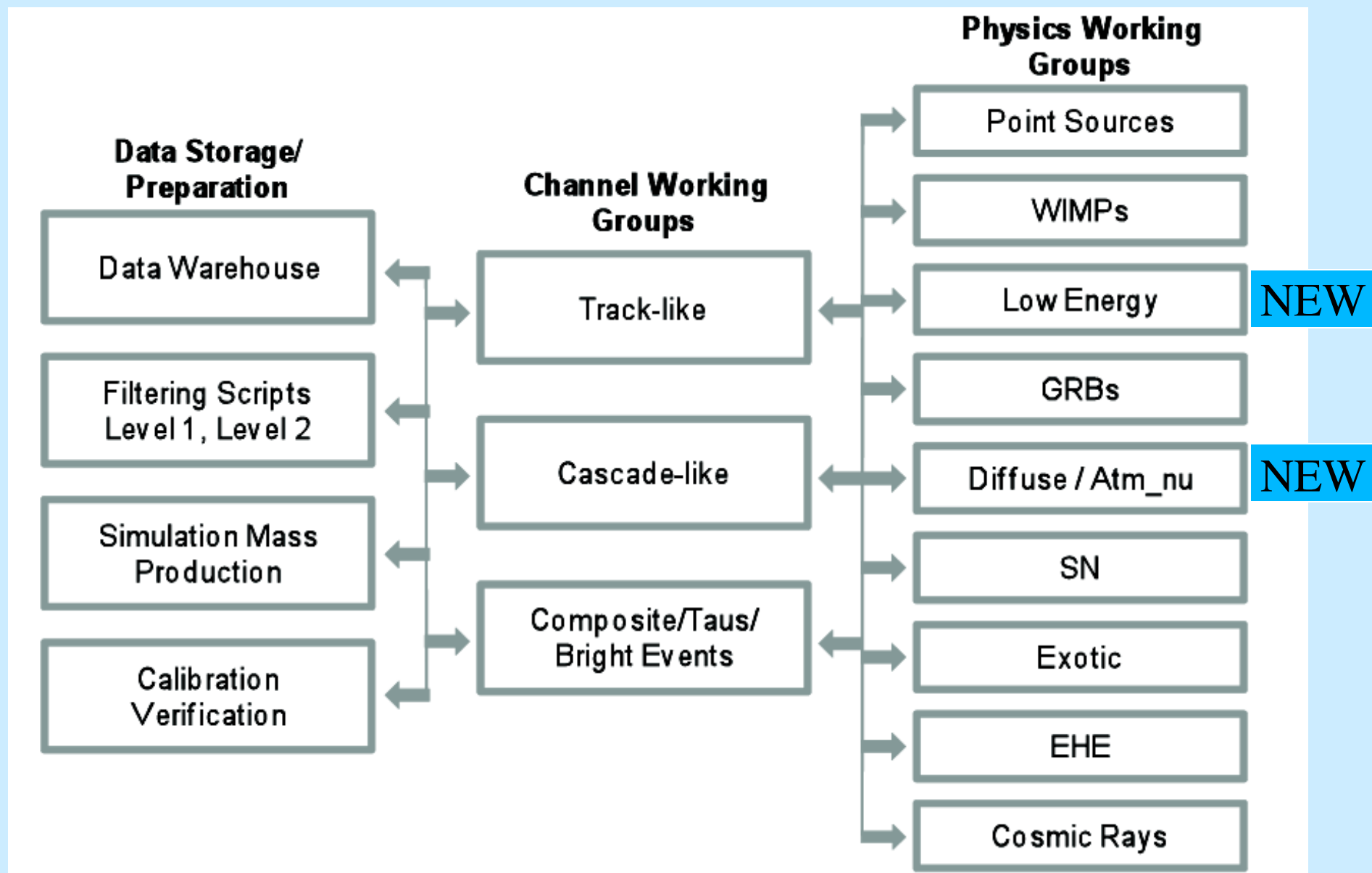
IceCube-9 strings (2006-2007): completed

IceCube-22 strings + AMANDA (2007-2008): completed

IceCube-40 strings + AMANDA (2008-2009): completed

IceCube-59 strings (2009-2010): just started

Distributed Model



Elisa Resconi

Distributed Model

Physics Working Groups

Point Sources

WIMPs

Low Energy

GRBs

Diffuse / Atm_nu

SN

Exotic

EHE

Cosmic Rays

IC22, 3 steady searches,
soft spectra sources optimization
UHE, southern hemisphere optimization
flaring/periodic sources optimization
first paper submitted to ApJL

IC40, unblinding proposals under preparation
IC59, on-line filters submitted, under
verification

Elisa Resconi

Distributed Model

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Cosmic Rays

IC22, results published PRL

IC40, under preparation

IC59, on-line filters submitted, under verification

Distributed Model

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GRBs

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EHE

Cosmic Rays

IC22, GRB080319B search, published PRL
Northern GRBs, unblinded
Southern GRBs, unblinded
IC40, GCNs sent by IceCube to ROTSE
unblinding proposals under preparation
IC59, GCNs sent by IceCube to ROTSE
(updated)
On-line filters submitted, under
verification

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Exotic

EHE

Cosmic Rays

IC22, 2 analysis unblinded,
excess of events at high nch, in the
bottom part of the detector;
Hidden systematic effects under study.
Cascades analysis under discussion.
IC40, unbinned analysis under preparation
IC59, on-line filters submitted,
under verification

Elisa Resconi

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SNDAQ extended to IceCube in 2007

Elisa Resconi

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EHE

Cosmic Rays

Simulation of very high energetic events, done IC22, IC40, Tau signature analysis, on going

Elisa Resconi

Distributed Model

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Point Sources

WIMPs

Low Energy

GRBs

Diffuse / Atm_nu

SN

Exotic

EHE

Cosmic Rays

Independent simulation software
IC22, unblinding proposal approved
IC40, under preparation
IC59, on-line filter

Distributed Model

Physics Working Groups

Point Sources

WIMPs

Low Energy

GRBs

Diffuse / Atm_nu

SN

Exotic

EHE

Cosmic Rays

IC22, large scale anisotropy
IceTop26, CR energy spectrum
Coincident events for knee composition
... for systematic effects study?

Channel: Muons

Neutrino-induced muon: CC muon neutrino interaction

- Point Source
- Diffuse
- WIMPs
- GRBs

Time resolution: ~2-3 nsec

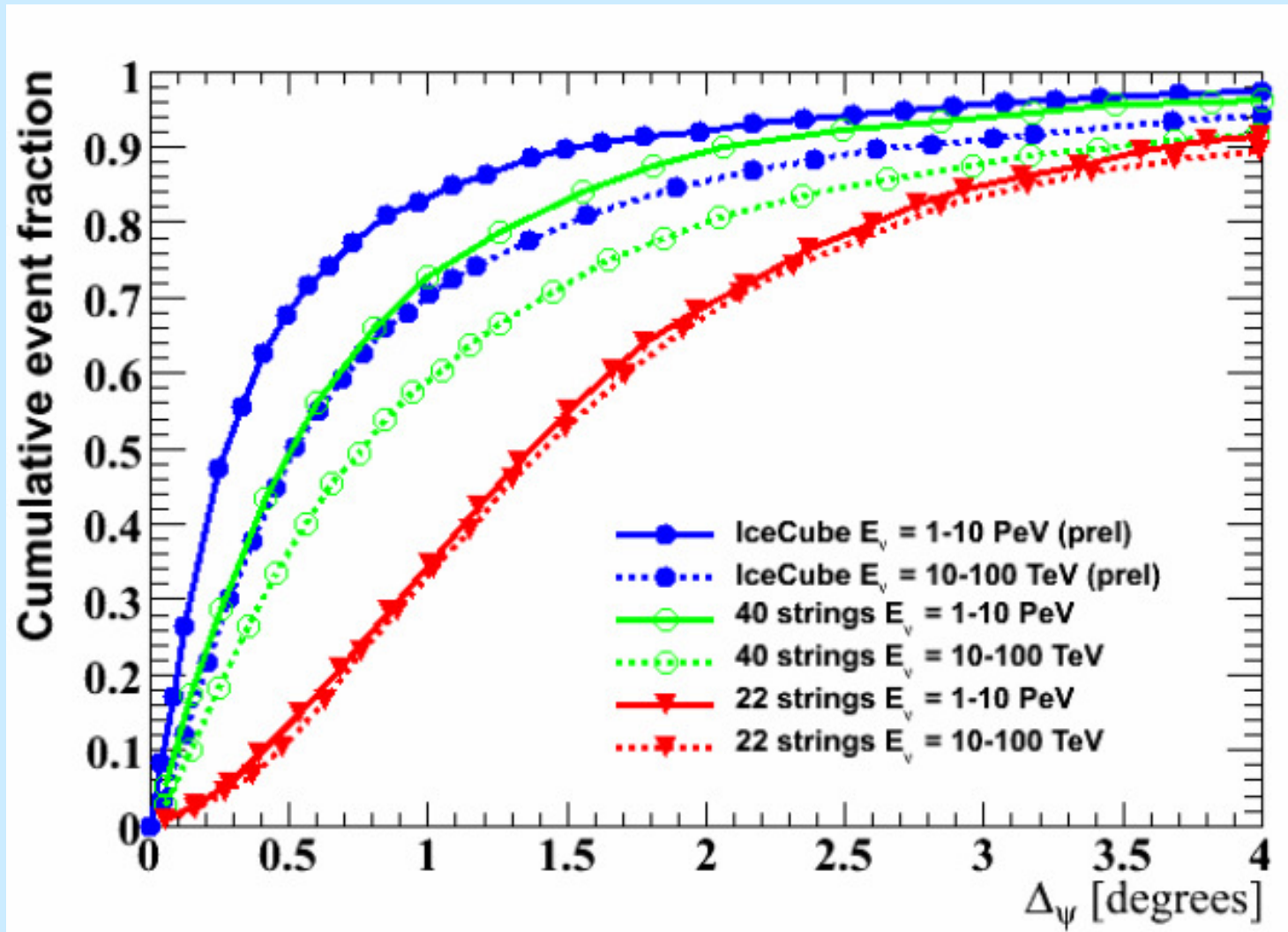
Incoming Direction: log-likelihood based reconstructions (with ice layers, analytic approximations)

Centralized Framework “Gulliver”:

- code reviewed
- set of standard projects
- constantly new implementations under test

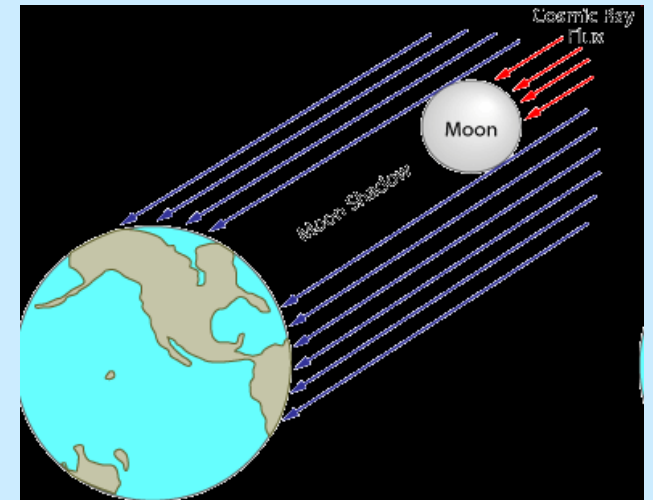
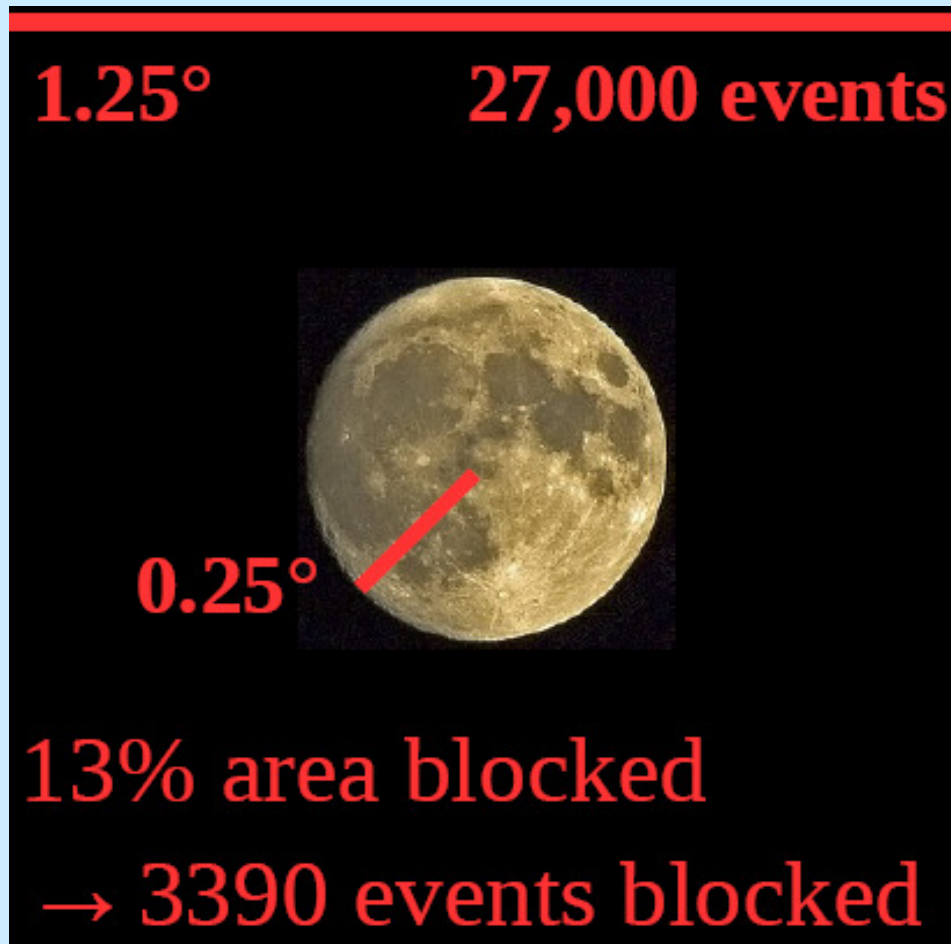
Channel: Muons

Incoming Direction point spread function of the 22-, 40-, and 80-string



Channel: Muons

Absolute Pointing: shadow of the moon

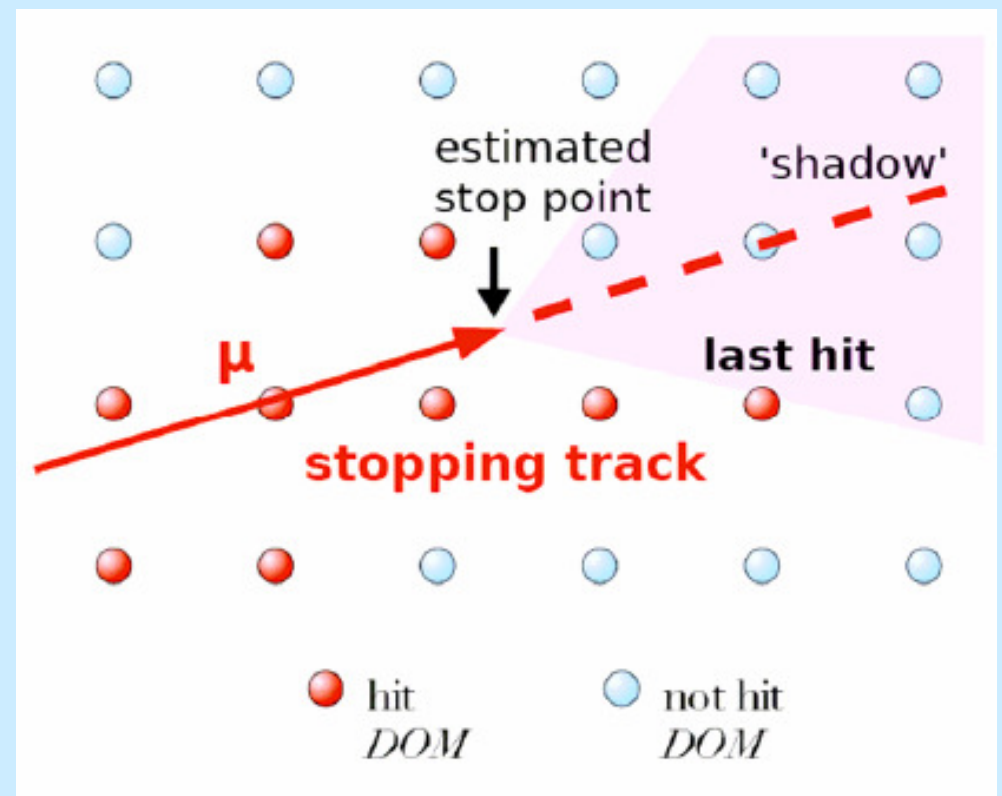
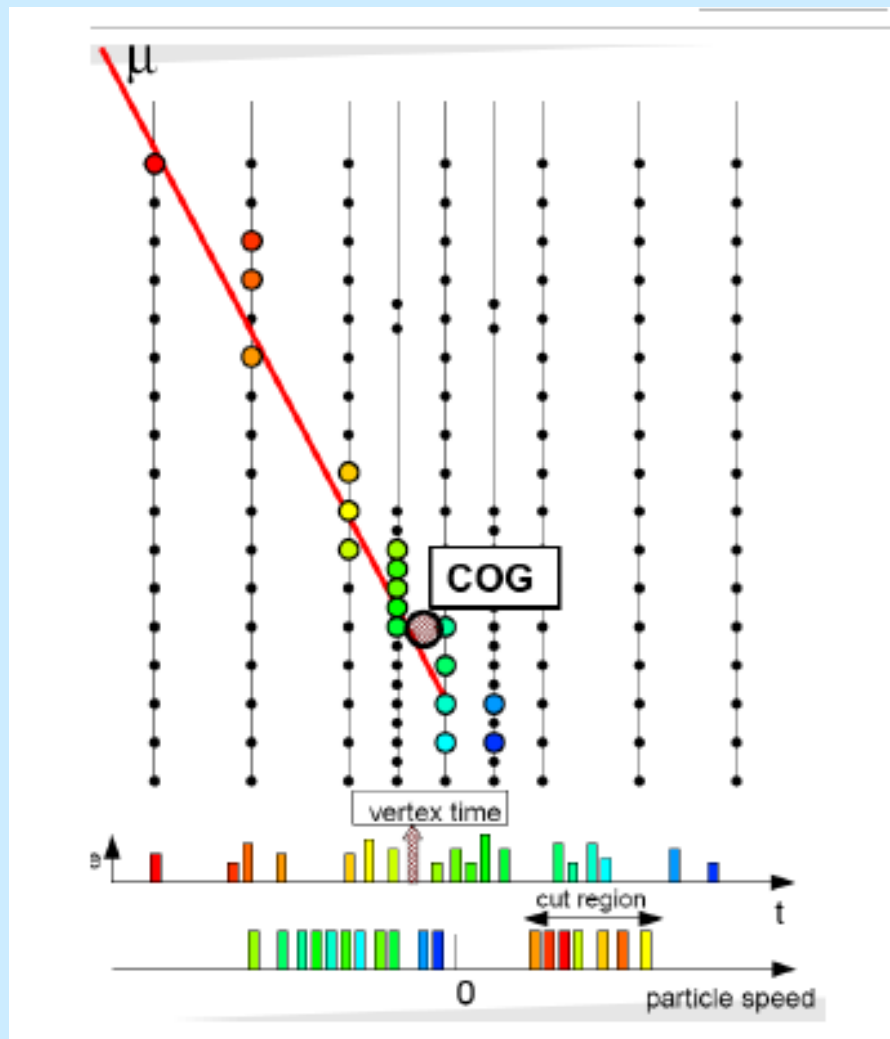


Moon bin shadow: 5.2σ less events

Channel: Muons

New signatures: starting, stopping, contained events

Veto technique: Deep Core



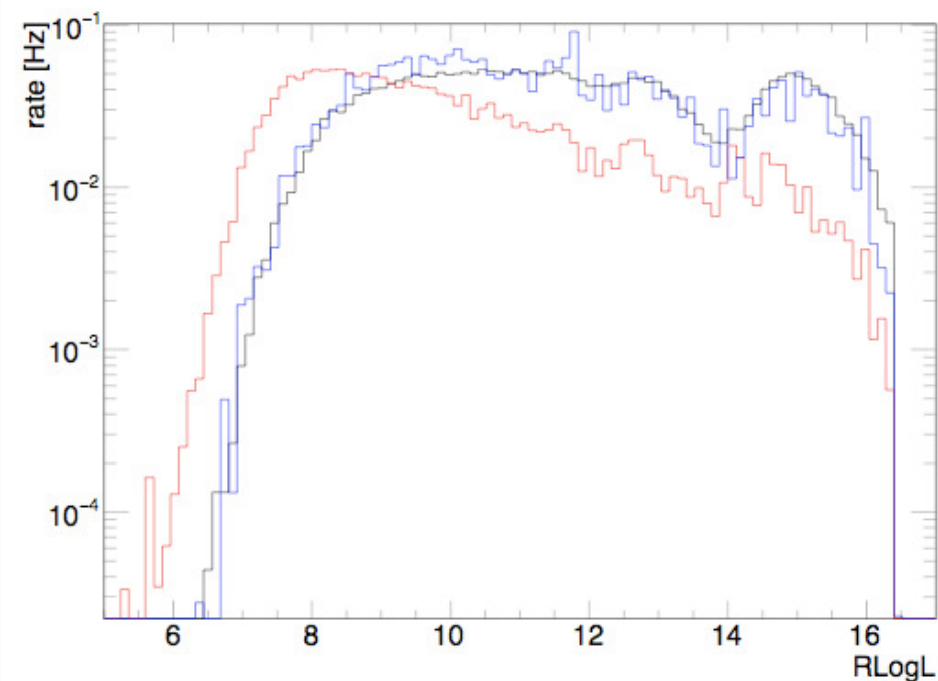
Channel: Muons

RLogL

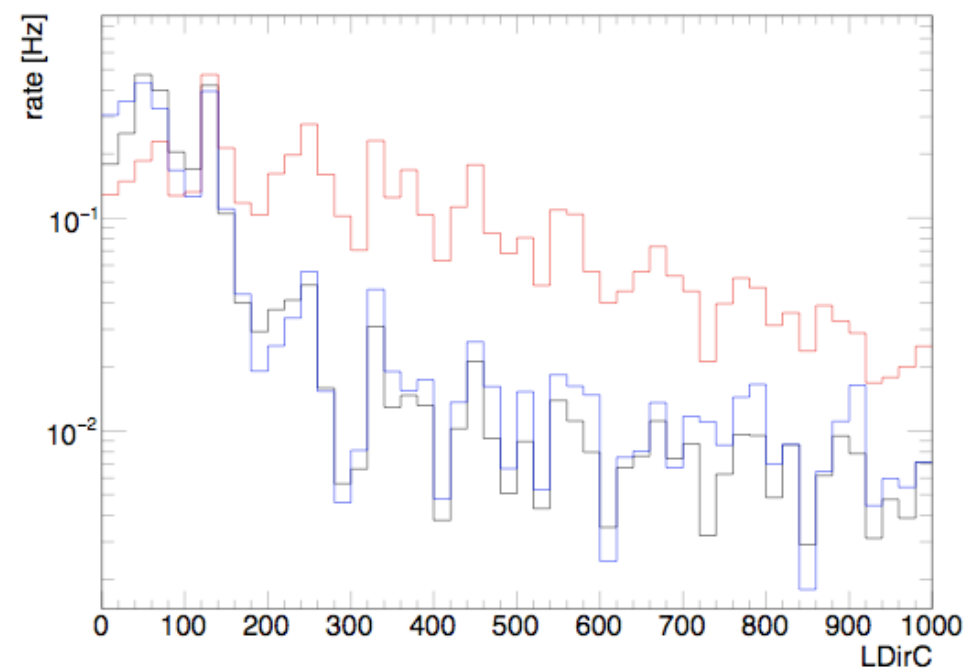
IceCube 59

LDirC

RLogL of 10it LLH at Level2



LDirC of 10it LLH at Level2



Data Quality: constantly monitored

Channel: Cascades

Neutrino-induced cascades:

**NC and CC electron neutrino events,
NC muon neutrino events, and starting events**

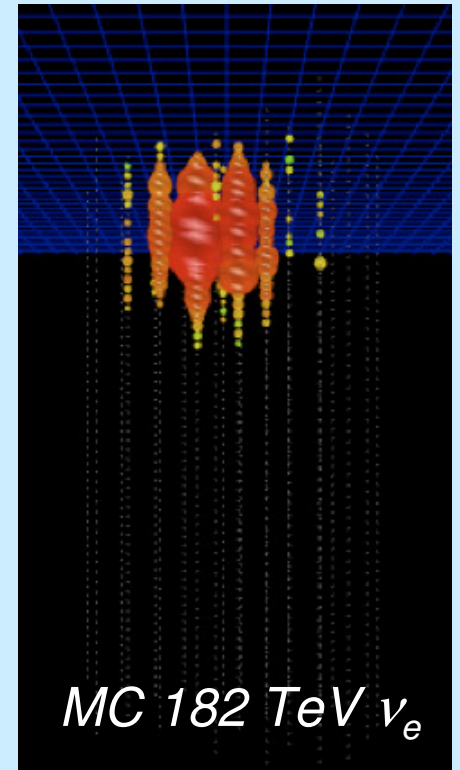
- Diffuse, atm nus
- Variable point sources
- GRB

Interaction vertex resolution: $\sigma_x = 7 \text{ m}$ $\sigma_y = 7 \text{ m}$ $\sigma_z = 4 \text{ m}$

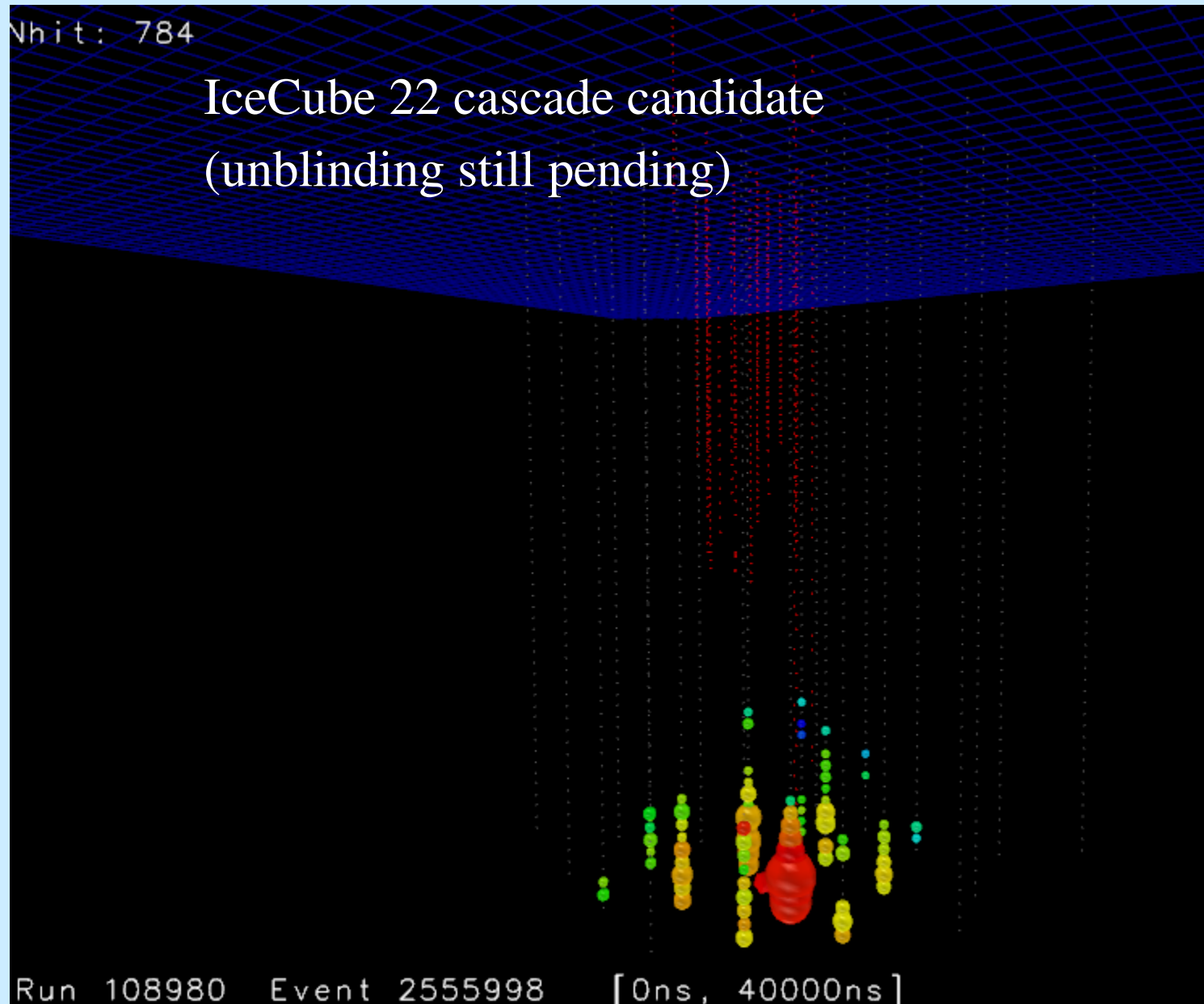
Energy reconstruction (using ice properties): $\sigma(\log_{10} E) = 0.2$ (up to $\sim 10 \text{ PeV}$)

Advances in methods for events identification

IceCube 22: $\text{Rate}(\nu_e) \sim 15 \text{ /day}$



Channel: Cascades



Channel: Composite/ Bright

Analysis Topics:

- Tau: Double Bang events
(Learned & Pakvasa 1995)
- EHE /GZK

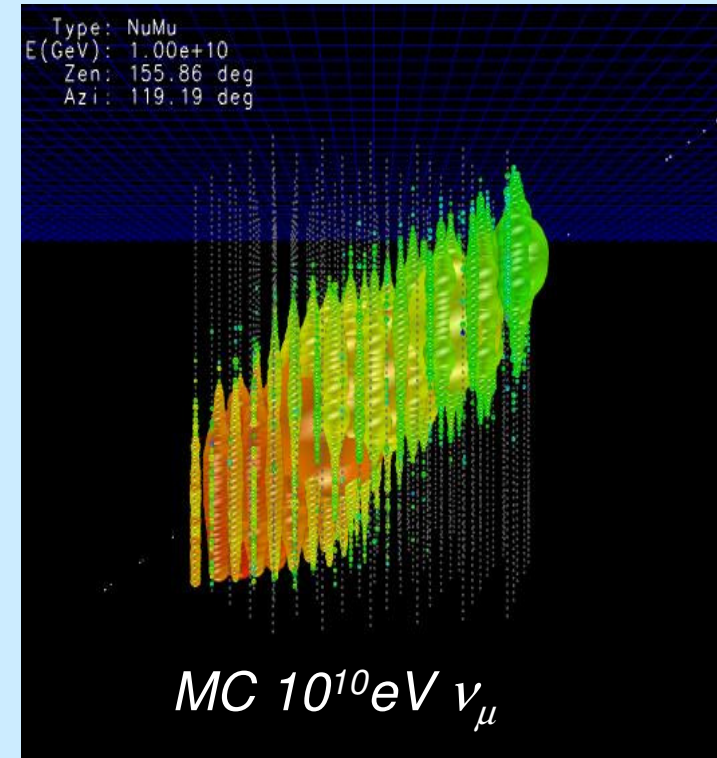
Reconstruction: double-bang, other signatures
under study on MC

Simulation: mass production started

Plans: 4 Tau analysis under going

EHE: IC22 analysis recently unblinded

GZK: new test recently performed (add info from the meeting)



Systematic Effects

- Study of systematic effects in IceCube: permanent activity
- Calibration and verification wg leading
- Problematic issues integrated and discussed at the analysis call

Systematic Effects

1- Natural Materials:

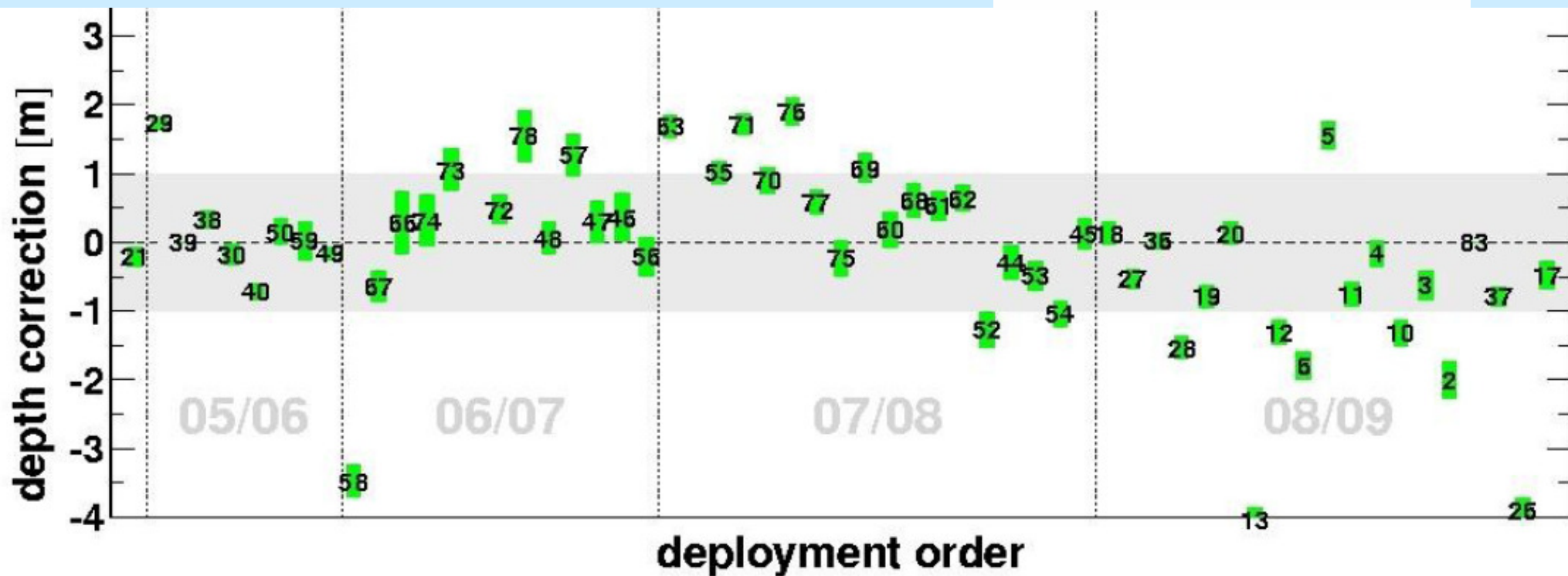
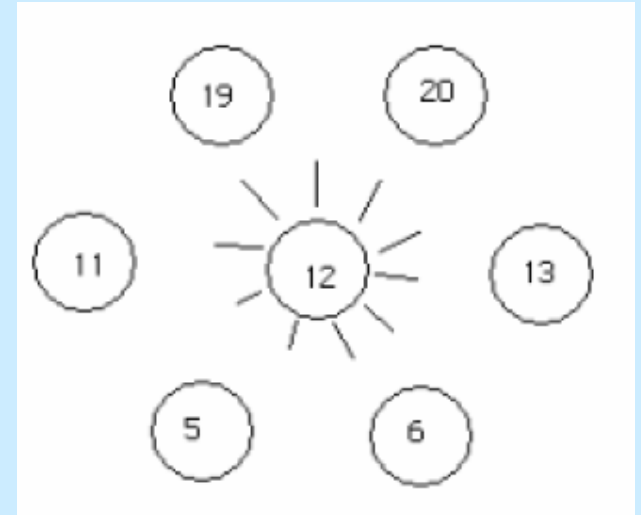
- Atmosphere: correlation of rates in IceCube with long and short term variations in the South Pole atmosphere
- Bulk Ice, Hole Ice

2- Detector:

- DOM Sensitivity: Absolute SPE, Angular sensitivity, Wavelength dependence
- Time resolution and timing offsets
- Charge measurement (fADC, ATWD): gain calibration, PMT saturation and linearity.
- Geometry stage-1: from deployment (Survey data, Drill data etc)
- Geometry stage-2: from flasher data

Systematic Effects

Flash 6 DOMs and
read out surrounding strings



Systematic Effects

2- Detector:

- Monitor
- Good Run List, Bad DOM List
-

3- Theoretical Uncertainties:

4- Analysis Methods: introduced biases

- Reconstruction: type of events, direction, energy

Systematic Effects

Tests:

- Stretched Ice: Alexander
- Stretched DOM sensitivity: ...

To be improved:

- Integration of systematic checks
- More checks at lower level, not analysis oriented
- Introduction of data quality verification
-

Procedures

Data Analysis: from the idea to the unblinding approval

- 1- Working group discussion, internal referee
- 2- Approval from working group
- 3- Plenary presentation of the unblinding proposal at the analysis call
- 4- Independent referee process
- 5- Final approval comes from the entire collaboration
- 6- Results

Publication:

- 1- First draft circulated to the entire collaboration
- 2- Internal Referee: new draft
- 3- New draft to the collaboration

Knowledge Management

DocuShare - Mozilla Firefox

4 - IceCube Analysis, Simulation and Working Groups - Mozilla Firefox

Ignacio_EffectiveArea.pdf (application/pdf Object) - Mozilla Firefox

File Edit View History Bookmarks Tools Help

https://docushare.icecube.wisc.edu/dsweb/Get/Document-48683/Ignacio_EffectiveArea.pdf

Most Visited DFG Atomic_Phys Vibrating Charges Rev... South Pole Dictionary Meeting http://thumbs.ebay.c...

Google snapshot webpage firefox

SquirrelMail Spring Collaboration ... Ignacio_Effective... webpage snapshot fr... HTML Snapshot 2.1.2... Adding...

1 / 2 102% Suchen

presentation of effective areas only makes sense if we can provide detector performance with higher accuracy (e.g. by properly incorporating local coincidence of DOMs) than what an analytical expression can provide.

It's also always possible to define effective volumes, but I'll not bother with these now.

2 Relationship between effective areas

This is a quite generic analytical expression for expected number of events:

$$N_{events} = \int_0^\infty dE_\nu \int_0^{E_\nu} dE'_\nu \int_0^{E'_\nu} dE_\mu A_\mu(E_\mu) P(E_\mu, E'_\nu) S(E_\nu, E'_\nu) \frac{dN_\nu}{dE_\nu}, \quad (3)$$

where $A(E_\mu)$ is the muon effective area, $P(E_\mu, E'_\nu)$ is the probability of a muon with starting energy E_μ being detected given a neutrino of energy E'_ν , $S(E_\nu, E'_\nu)$ is the probability of a neutrino of energy E_ν at the Earth surface producing a neutrino of the same flavor of energy E'_ν at the detector and dN_ν/dE_ν is the neutrino flux at the Earth's surface. For simplicity I've left out angular dependence due to detector asymmetries, Earth absorption, etc.

This expression is quite complicated - but it is very similar to the treatments available in the theoretical literature. The relationship between the effective areas is now thus:

Knowledge Management

The screenshot displays a Mozilla Firefox browser window with multiple tabs. The active tab is titled 'YellowBook:Conventional High-Energy Neutrino Sources - IceCubeWiki - Mozilla Firefox'. The address bar shows the URL: http://wiki.icecube.wisc.edu/index.php/YellowBook:Conventional_High-Energy_Neutrino_Sources. The page content is as follows:

YellowBook:Conventional High-Energy Neutrino Sources

Cosmic rays originating in cosmic accelerators will typically be accompanied by gamma-rays and neutrinos. This is a consequence of the inelastic hadronic processes which are involved in their production mechanism ^[1]. Candidate sources for the highest energy cosmic rays such as blazars, gamma-ray bursts (GRB), or starburst galaxies may accelerate charged particles by their scattering off plasma waves most efficiently in the vicinity of plasma shock fronts (1st order Fermi acceleration). For an efficient acceleration of the nuclei up to the observed energies of cosmic rays this scattering process has to be repeated many times. Therefore, it is necessary that the magnetic field confines the charged particle in the source over a time-scale which allows for many repetitions of the acceleration cycle.

In order to accelerate a particle with charge Z up to an energy E , the characteristic size R and magnetic field B of the candidate source has to be large enough: the gyroradius of the particle $R_{Larmor} = ZeEB$ has to be smaller than R for a magnetic confinement. This argument can be turned around to derive an upper limit on the energy, $E < ZeBR$, which is also known as the *Hillas criterion* ^[2]. Note, that this geometric argument is only a necessary condition and the general acceleration process is much more complicated. In realistic sources the maximal energy as well as breaks in the energy spectrum will be determined by the various energy loss mechanisms of the accelerated particle. On the other hand, hadronic interactions in the source may produce a flux of high-energy secondary particles, in particular neutrinos.

Hadronic neutrino production proceeds via the following steps. Accelerated electrons and other long-lived charged particles will lose their energy in the magnetic field due to

Yellow Book Navigator

Siblings in [\[edit\]](#)

Index

- [Neutrino Interactions and Observable Features](#)
- [Neutrinos Associated with Cosmic Rays](#)
- **Conventional High-Energy Neutrino Sources**
- [Exotic Neutrino Sources](#)
- [Exotic Signals at Neutrino Telescopes](#)
- [Software and Simulation Techniques](#)

Sections in [\[edit\]](#)

Conventional High-Energy Neutrino Sources

- [Hadronic Interaction Models](#)
- [Gamma Ray Bursts](#)
- [Active Galactic Nuclei](#)
- [Supernovae](#)
- [Starburst Galaxies](#)
- [Microquasars and Binaries](#)

[Up](#) / [Index](#) / [Help](#) / [Blue Book](#)

Prospects

- Maintain flow of the analysis
- Maintain efforts towards study of systematics effects
- Continue feedback distributed model
- Operate IceCube towards discovery!

IceCube-58+1 interstring (surface) distances

