



# **GNN Meeting Mainz 2016**

**Christian Spiering, DESY**

# GNN Monthly

- Should flank NEWS on the webpage, but also distribute more internal information
- Make it accessible via the webpage (with or without password) ?
- “Monthly” imposes a rhythm which not always follows the appearance of news
- “GNN Monthly” → “GNN News” ?
- Need your assessment and advice on quality and style
- Need continuous input with appropriate news (including grants, prizes etc.)
- Invited contributions?

# GNN Science Motivations

- combination of sky maps
- source checks in complementary energy ranges
- cross-checks of results with different systematics
- coordination of alert and multi-messenger policies
- exchange and mutual checks of software
- creation of a common software pool
- common standards for data representation
- ....

# GNN Science Motivations

- combination of sky maps
- **source checks in complementary energy ranges**
- cross-checks of results with different systematics
- **coordination of alert and multi-messenger policies**
- exchange and mutual checks of software
- creation of a common software pool
- **(common standards for data representation)**
- ....

# Combining Data

## Published:

- **All-sky point source**

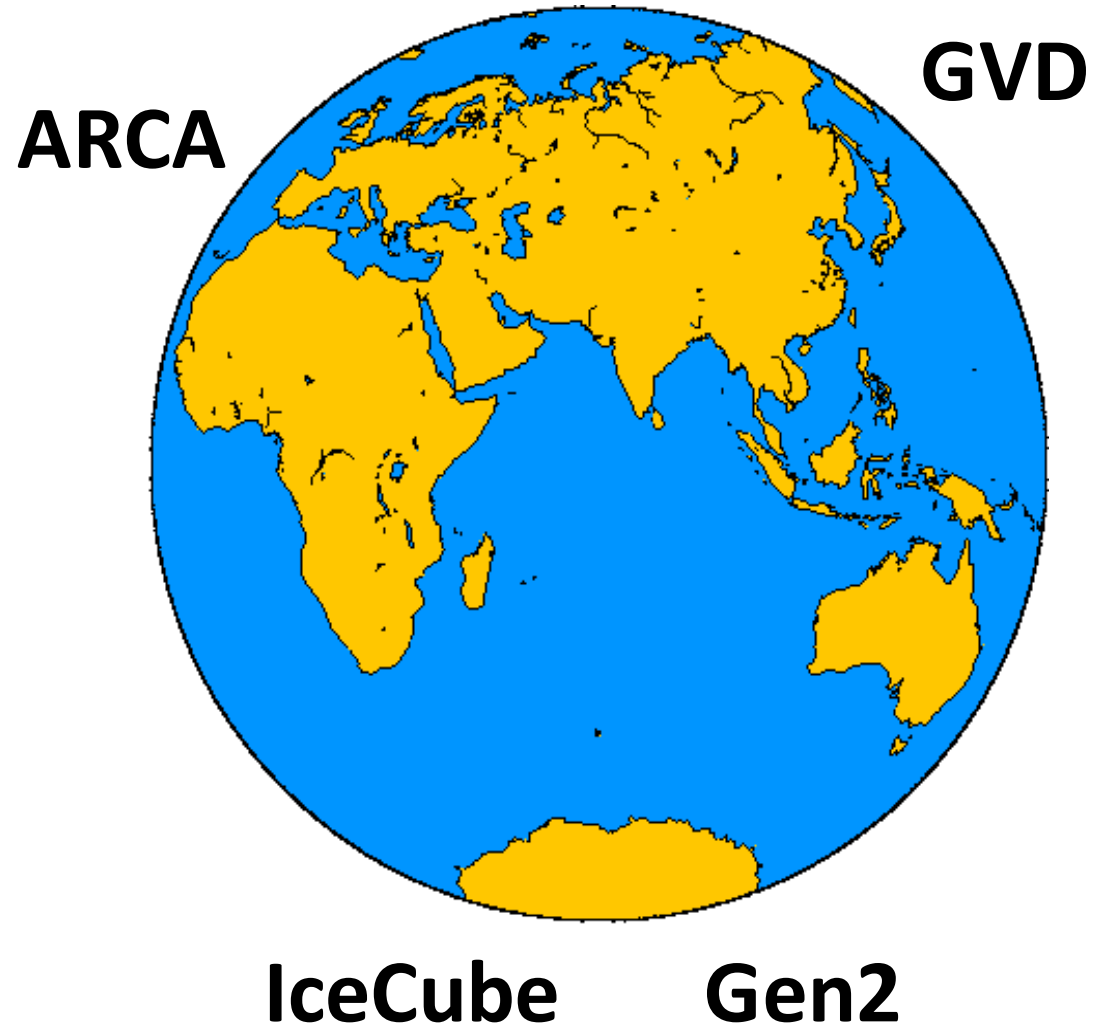
## Plan:

- **Galactic plane**
- **Dark matter**
- **More general paper on sensitivities and how detectors in South and North complement each other**

# Global Policy Aspects

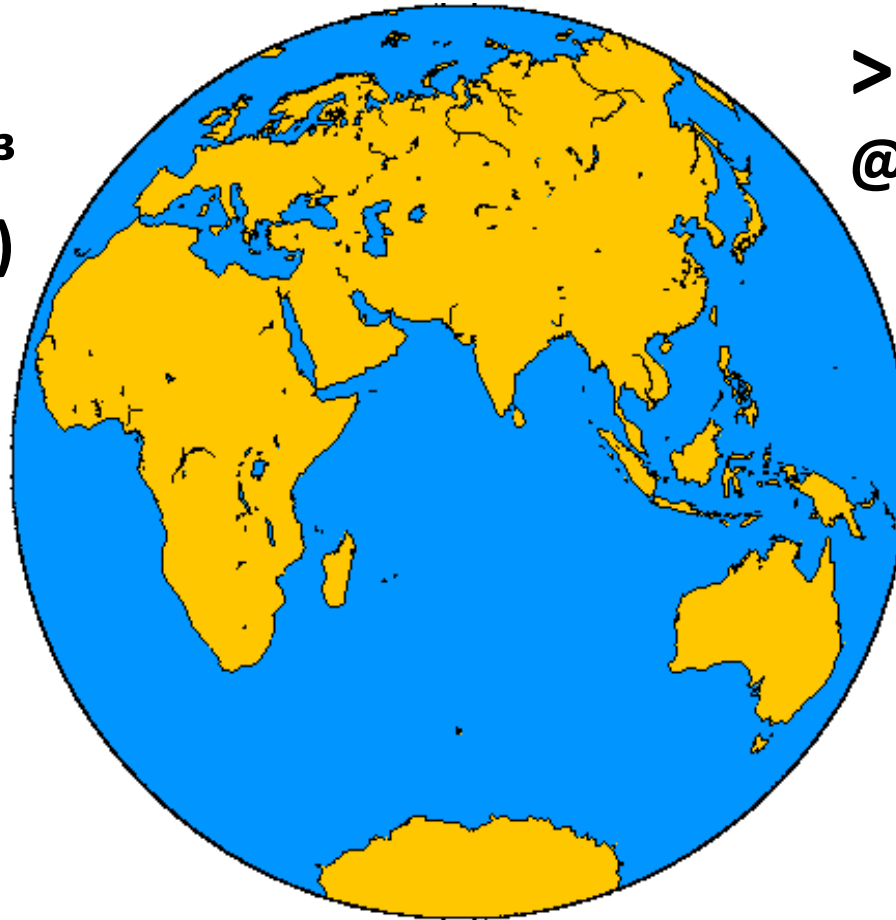
- The existence of GNN played (likely) a positive role in some decisions.
- The outside world considers us as a forum for defining a common strategy.
- In reality this applies only to some aspects.
- At this moment, it seems very hard to reach consensus about a “common” PINGU/ORCA strategy. In this field, the 2 communities are just competitors.
- The more important is it, to work out a global policy for the high-energy part!
- Keyword: **Complementarity**

# Complementarity



# Optimized to ...

**>1 TeV**  
**@ 1.4 km<sup>3</sup>**  
**(4-5 km<sup>3</sup>)**



**>10 TeV**  
**@ 0.4 km<sup>3</sup>**  
**(1.5 km<sup>3</sup>)**

**>1 TeV**  
**@ 1 km<sup>3</sup>**

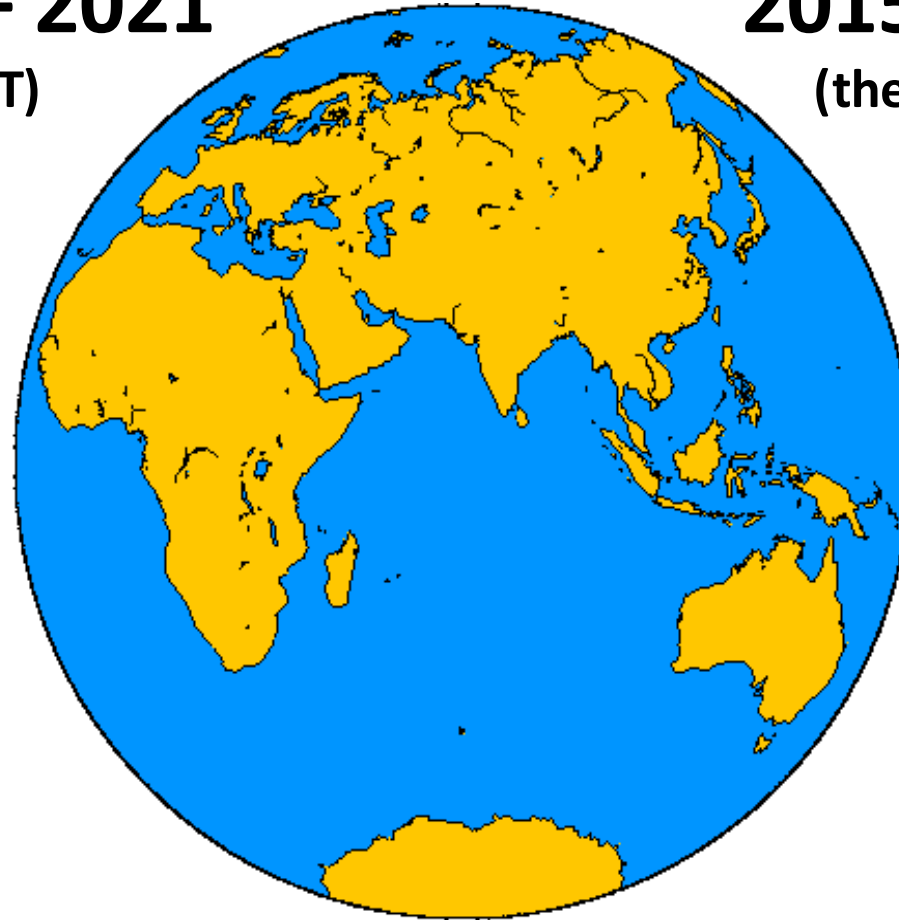
**>30 TeV**  
**@ 10 km<sup>3</sup>**



# Construction

**2015 (18) – 2021**  
(then full KM3NeT)

**2015 -2021**  
(then phase 2)

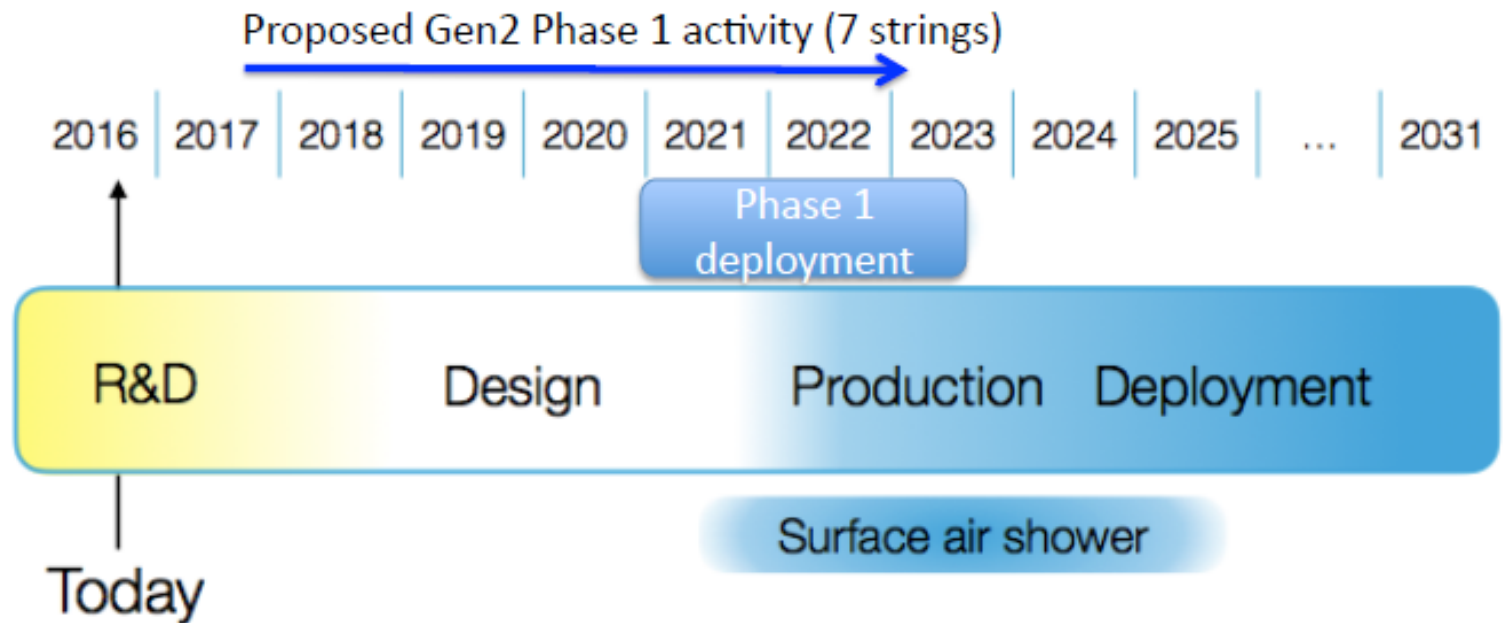


**operating 2021 - 2031**

# Construction

**2015 (18) – 2021**  
(then full KM3NeT)

**2015 -2021**  
(then phase 2)

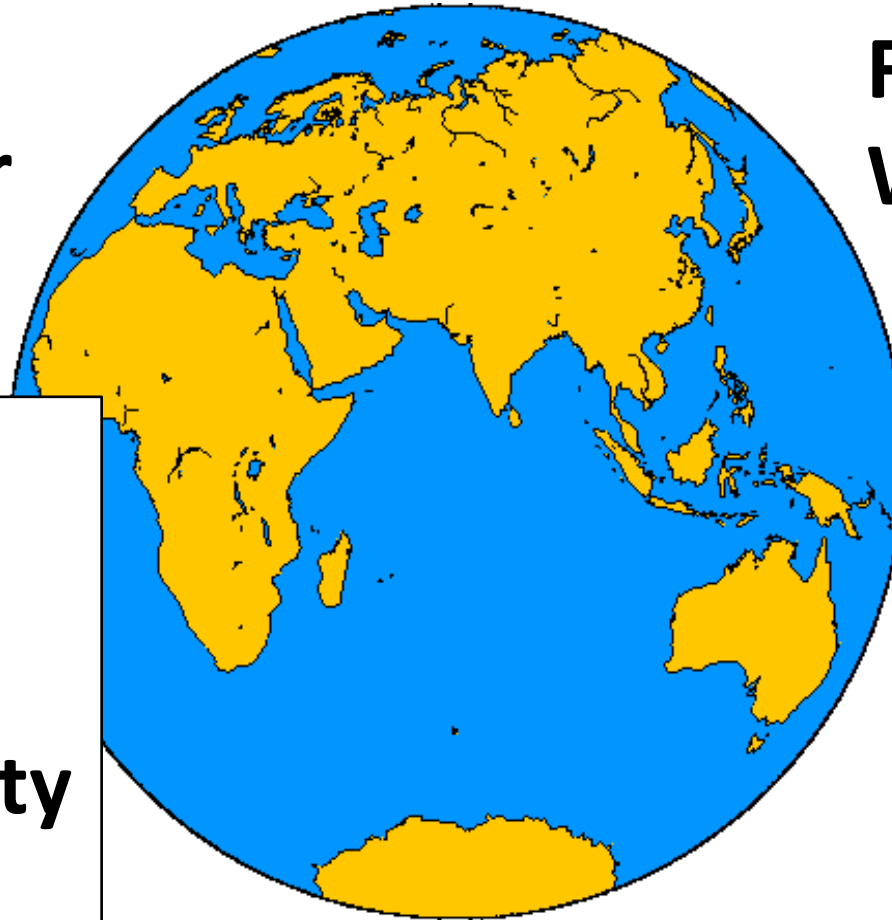


**operating      2021 - 2031**

# Medium

**Sea  
Water**

**Fresh  
Water**



**optical noise  
light scattering  
light absorption  
medium homogeneity**

**...**

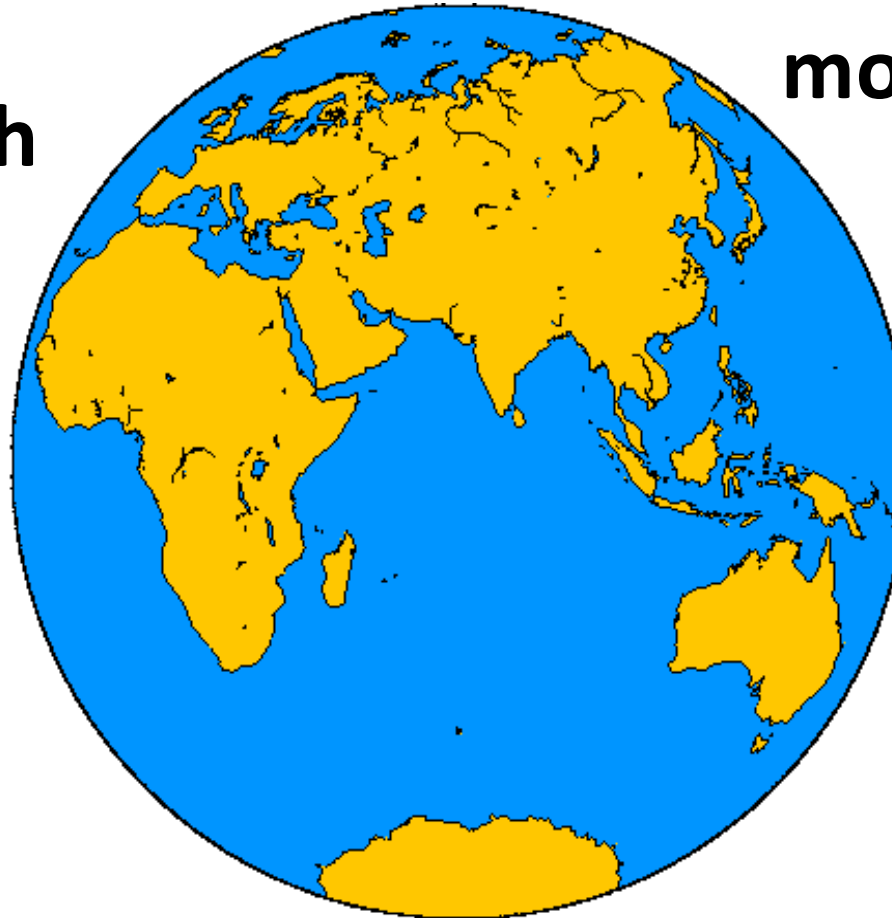
**Ice**

# Angular resolution

... as ONE consequence of the medium

high

moderate  
-high



moderate

**Others:**

Energy resolution

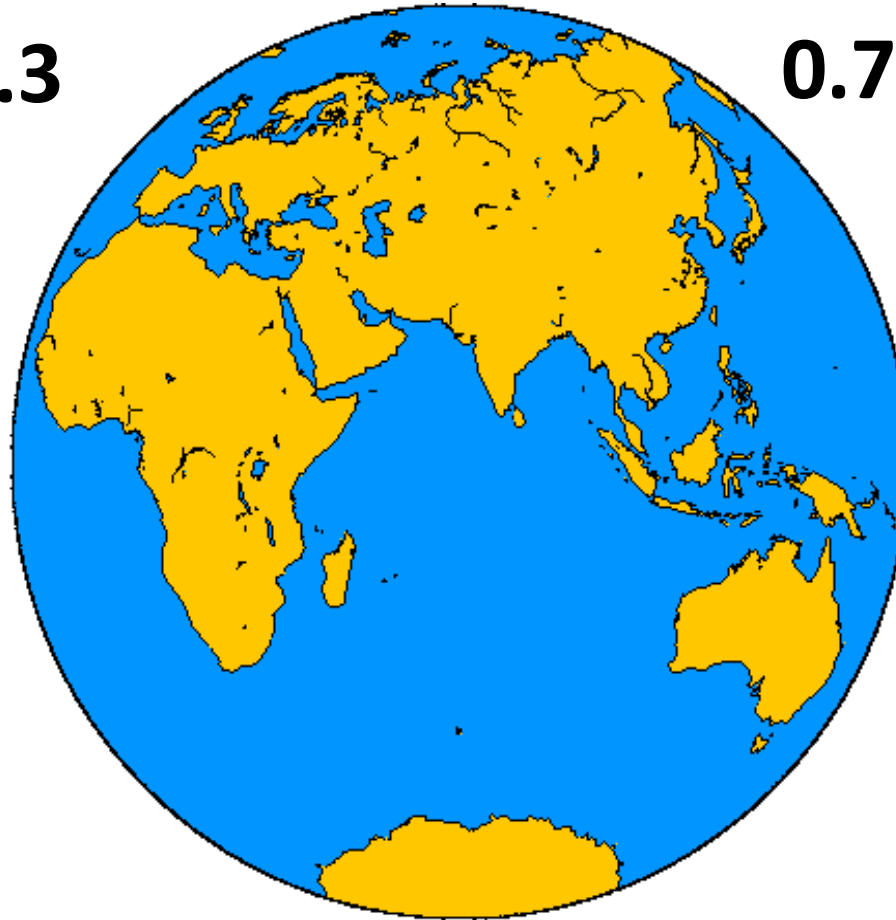
SN MeV burst detection

....

# Depth (km)

2.7-3.3

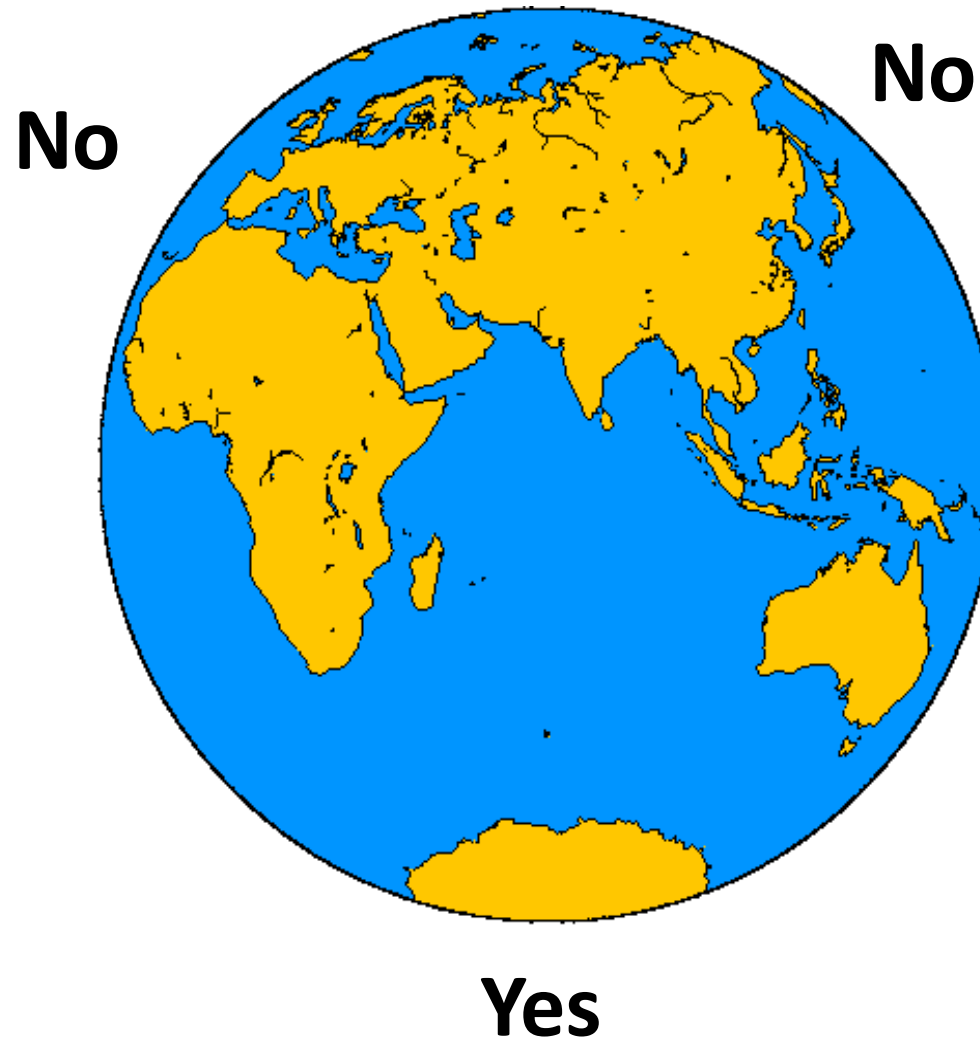
0.7-1.2



1.4-2.4

1.4-2.7

# Surface veto



# “Legacy of our field” project

- Digitize relevant papers/workshops before the arXiv time (and may be the most relevant until now).
  - Search function w.r.t. author, collaboration (if any), title, key words and year and conference name (if any).
  - Not just a CD but Web Page, possibly organized like a Wiki.
- Explore technical possibilities. CS will come with a proposal in the next 2 months. ☹️
- **The 1976 DUMAND Workshop is scanned.**

Proceedings of the  
**1976 DUMAND Summer Workshop**

University of Hawaii  
Honolulu, Hawaii  
September 6–19, 1976

# “Legacy of our field” project

- Digitize relevant papers/workshops before the arXiv time (and may be the most relevant until now).
  - Search function w.r.t. author, collaboration (if any), title, key words and year and conference name (if any).
  - Not just a CD but Web Page, possibly organized like a Wiki.
- Explore technical possibilities. CS will come with a proposal in the next 2 months. ☹
- **The 1976 DUMAND Workshop is scanned.**
- **John Learned, C.S. “The DUMAND 1976 Workshop and the Origins of Large Neutrino Detectors”  
CERN Courier July/August 2016**



# AI<sup>3</sup>

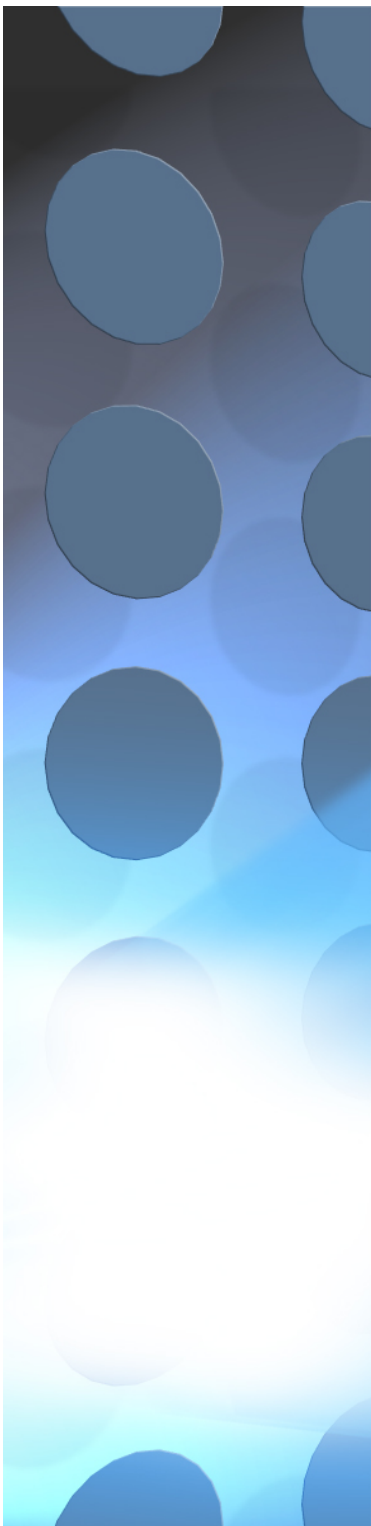
*Astroparticle Immersive Synthesizer<sup>3</sup>*

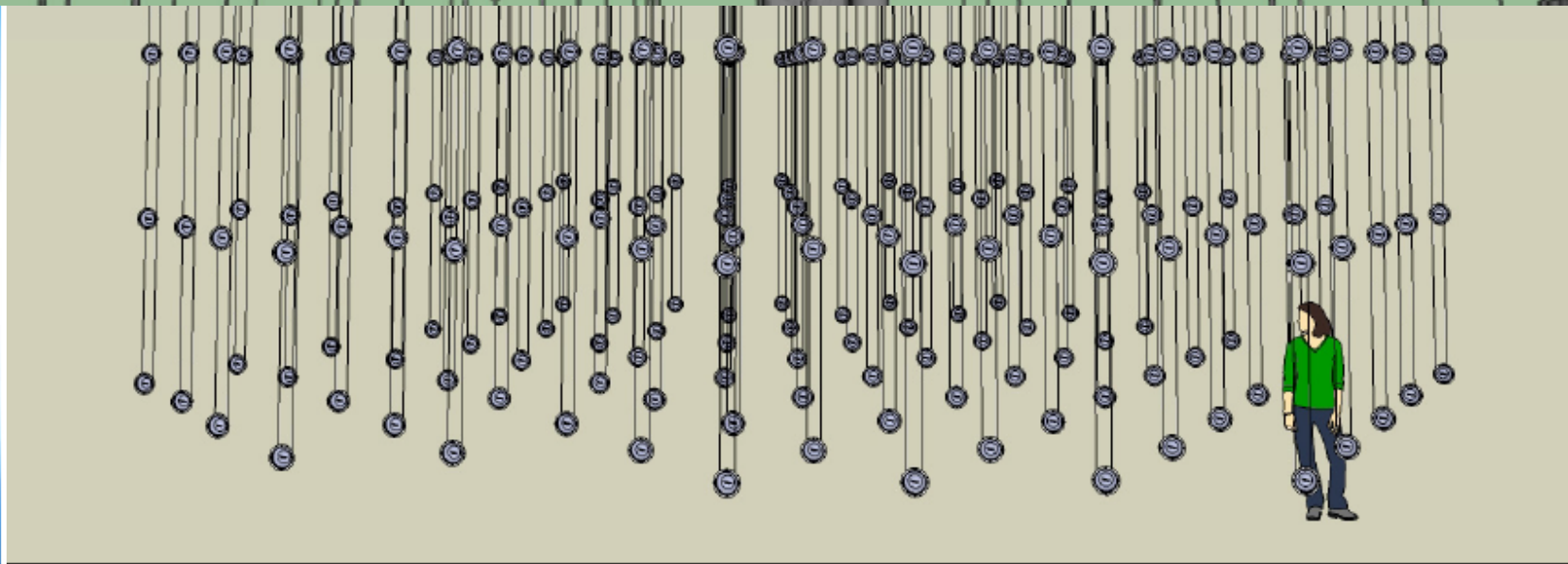
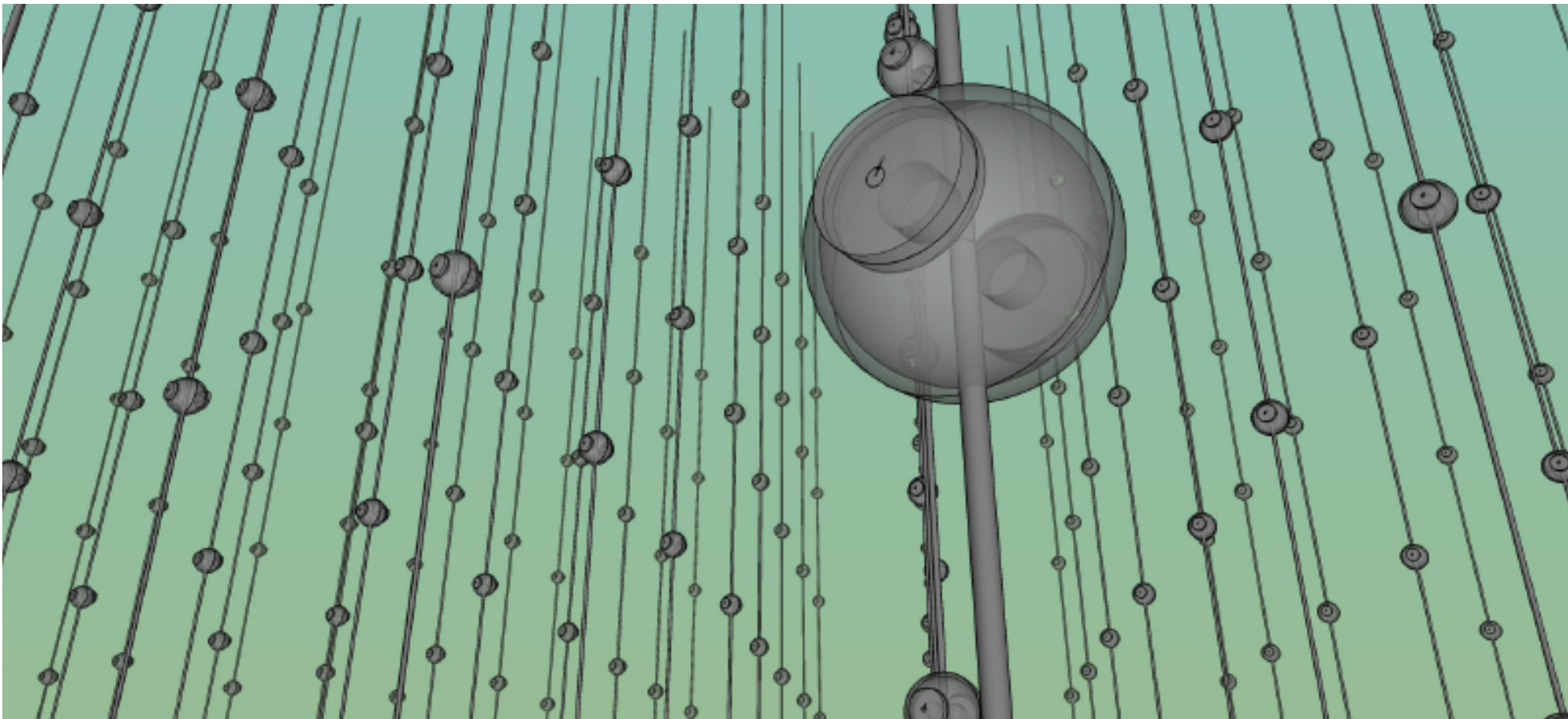
## Flashes of cosmic brilliance

Tim Otto Roth's minimalist art installation reflects the complexity of cosmic radiation, explains **Martin Kemp**.

At present to be supported  
by ApPEC and DESY

# AIS<sup>3</sup>









**Looking for exposition  
locations all over Europe**

# GNN Dissertation Prize

- 10 theses submitted (3 Antares, 7 IceCube)
- Criteria
  - scientific quality
  - form and didactic level
  - introduction & description of context
- Prize Committee
  - Rosa Coniglione, Thierry Pradier, Dorothea Samtleben, Juande Zornoza (Antares)
  - Dmitri Chirkin, Spencer Klein, Christian Spiering, Ignacio Taboada (IceCube)
  - Zhan Djilkibaev (Baikal)

# The Winners

Lars  
Mohrmann



Agustín  
Sánchez Losa



Chris  
Weaver



# The Winners

- Lars Mohrmann

*Characterizing Cosmic Neutrino Sources  
(A Measurement of the Energy Spectrum and Flavor  
Composition of the Cosmic Neutrino Flux Observed  
with the IceCube Neutrino Observatory)*

- Agustín Sánchez Losa

*Search for high energy cosmic muon neutrinos from  
variable gamma-ray sources and time calibration of  
the optical modules of the ANTARES telescope*

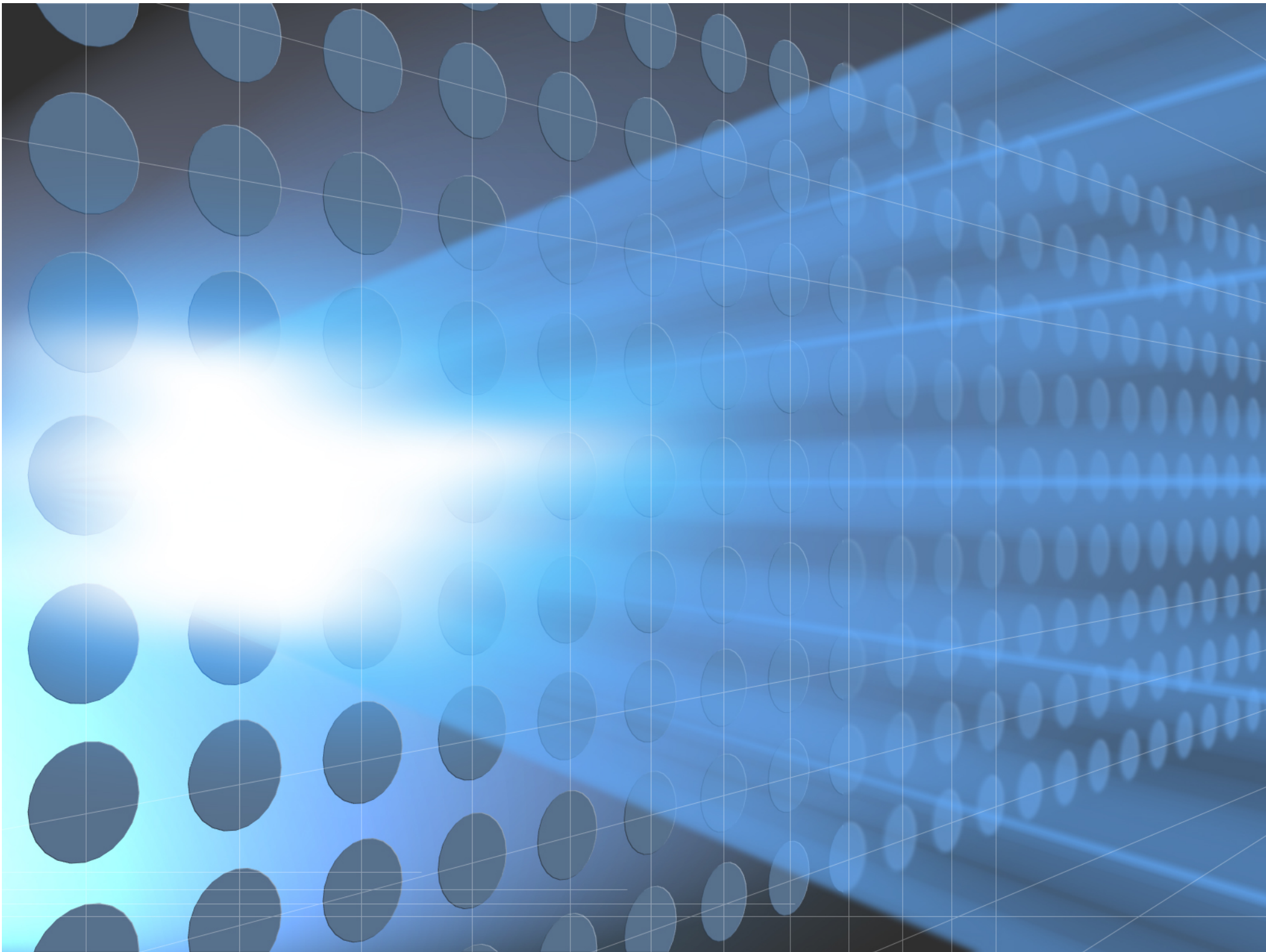
- Chris Weaver

*Evidence for Astrophysical Muon Neutrinos from the  
Northern Sky*



**And now:**

**On to science!**



# Characterization of the Atmospheric Muon Flux in IceCube

arXiv:1506.07981, *Astroparticle Physics Journal*

In this paper, techniques for the extraction of physical measurements from atmospheric muon events are described and first results are presented. The multiplicity spectrum of TeV muons in cosmic ray air showers for primaries in the energy range from the knee to the ankle is derived and found to be consistent with recent results from surface detectors. The single muon energy spectrum is determined up to PeV energies and shows a clear indication for the emergence of a distinct spectral component from prompt decays of short-lived hadrons. The magnitude of the prompt flux, which should include a substantial contribution from light vector meson di-muon decays, is consistent with current theoretical predictions.

The variety of measurements and high event statistics can also be exploited for the evaluation of systematic effects. In the course of this study, internal inconsistencies in the zenith angle distribution of events were found which indicate the presence of an unexplained effect outside the currently applied range of detector systematics. The underlying cause could be related to the hadronic interaction models used to describe muon production in air showers.

Comparisons with measurements from the upcoming water-based KM3NeT detector [91] will be invaluable to decide whether the inconsistencies seen in IceCube data are due to the particular detector setup, or represent unexplained physics effects.