# GNN Monthly

The Global Neutrino Network — 98th Edition — September 30, 2025

https://www.globalneutrinonetwork.org/


## First meeting of the new GNN Board

On September 18, the new GNN board met via ZOOM for its first meeting. Here is a list of the members

*Co-chairs:*
- Paschal Coyle (CPPM, Marseille, France),
- Claudio Kopper (Erlangen, Germany)

*ANTARES*
- Jürgen Brunner (CPPM Marseille, France)
- Antoine Kouchner (APC, Paris, France)
- Maurizio Spurio (Univ. Bologna, Italy)

*Baikal-GVD*
- Igor Belolaptikov (JINR, Dubna, Russia)
- Zhan Djilkibaev (INR Moscow, Russia)
- Dmitry Zaborov (INR Moscow, Russia)

*IceCube*
- Erin O'Sullivan (Univ. Uppsala, Sweden)
- Carlos Argüelles Delgado (Harvard, USA)
- Lu Lu (UW Madison, USA)

*KM3NeT*
- Marco Circella (INFN Sezione di Bari, Italy)
- Damien Dornic (CPPM Marseille, France)
- Paul de Jong (NIKEF, The Netherlands)

*P-ONE*
- Matthias Danninger (Simon-Fraser Univ., Canada)
- Darren Grant (Simon-Fraser Univ., Canada)
- Elisa Resconi (Tech. Univ. of Munich, Germany)

*RNO-G*
- Anna Nelles (DESY Zeuthen & Erlangen, Germany)
- Nick van Eindhoven (VUB-ELEM, Brussels, Belgium)
- Stephanie Wissel (Penn State Univ., USA)

*GNN Monthly editor*: Christian Spiering (ex officio)

Priority tasks discussed in the call included an update of the GNN website, the schedule for the next dissertation prize (call will go out in January and cover dissertations finished in 2025), the organization of the next MANTS meeting, and set-up of inter-project working groups. Several innovative ideas have been discussed: inter-project MoU under the umbrella of GNN (sounds very attractive but has a few formal pitfalls, therefore postponed for the moment), set-up of bi-monthly MANTS-like ZOOM calls (much support).

The board will meet for another ZOOM call in two months or so, to further develop the proposed ideas.

Further expansion of GNN was discussed, but priority was given to consolidate and to fill with life the cooperation between the present six collaborations.

## New from the projects

### KM3NeT

A next ORCA deployment is planned for week 41, to connect the 4 DUs already in the water to Node 2, and add up to 6 more. Note that this is subject to good weather conditions.

## RNO-G

The RNO-G collaboration held their annual meeting at the University of Maryland in College Park during the second week of September.

On the first day an operations review was held to get monitoring and station operations in shape for an increasingly large array. The following three days focused on early science analysis and season planning. After the 2025 field season delivered a much improved drilling performance owing to hard work by the engineering team in Madison, the installation plans for 2026 are ambitious, targeting to install more stations than ever. With a complete overhaul of the RNO-G DAQ, it is also planned to make the stations more resilient, easier to maintain, and enable a larger uptime during the winter, when wind-power is available.

The meeting closed with an analysis workshop for the younger collaboration members, introducing everyone to the open source software *NuRadio*, which was determined as default RNO-G software.

With the Sun slowly setting and currently poor weather conditions at Summit Station, some of the current stations have entered winter mode already, leaving only those with wind-turbines still operational to avoid draining the batteries. This leaves the collaboration to focus on data-analysis and construction of the stations for 2026.

(report delivered by Anna Nelles)

## IceCube

The next collaboration meeting will take place on October 6-10, 2025, at the University of Utah in Salt Lake City, USA.


*A combined timelapse of the lunar eclipse next to ICL (photo: Ilya Bodo)*

The South Pole season is coming closer and closer. The first wave of IceCube personnel is scheduled to arrive at South Pole at October 31. The planned maximum population amounts to 51 persons on ice (Upgrade + operations personnel). Here is a summary of the present status:

277 D-Eggs (+ spares) assembled in Chiba are currently stored at the Pole. 402 mDOMs (+ spares) include 50% assembled at DESY-Zeuthen, 50% at Michigan State University. mDOMs for two strings are stored at South Pole, the rest will be shipped in October.

Seven main cable assemblies (Michigan State University) / surface cables (Sweden) are complete, the surface cables are already installed at South Pole. The main cables are stored at McMurdo, to arrive at the Pole with the first traverse. Also, various calibration and special devices are on schedule; some at South Pole, the rest is to be shipped.

## Publications

The KM3NeT collaboration has posted a paper *Constraining gamma-ray burst parameters with the first ultra-high energy neutrino event KM3-230213A* at https://arxiv.org/pdf/2509.14895 (submitted to Astronmy and Astrophysics). The corresponding authors are Per A. Sevle Myhr, Gwenhael de Wasseige (both Univ. Louvain, Belgium) and Soebur Razzaque (Univ. of Johannesburg, South Africa).

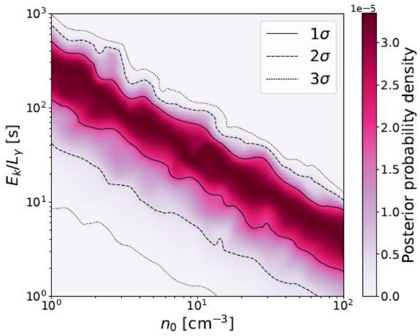
The authors use the recent observation of a 220 PeV event with KM3NeT to constrain the baryon loading of GRB blastwaves and the density of the medium in which the blastwave interacts to produce PeV–EeV neutrinos, as well as the total contribution of GRB blastwaves to the diffuse UHE neutrino flux, thereby constraining some of the relevant model parameters. They consider two different models for UHE neutrino production from GRB blastwaves. One in which the density of surrounding matter remains constant around the GRB progenitor, and another in which the density decreases radially ($R^{-2}$). Protons accelerated in the forward shock interact with afterglow synchrotron photons to produce UHE neutrinos.

Here are the relevant parameters and relations: The kinetic energy of the blastwave, $E_k$, is connected to the inferred gamma-ray luminosity during the prompt phase, $L\gamma$, through the relation

$$E_k / L_\gamma = f_b \, \eta \, t^*,$$

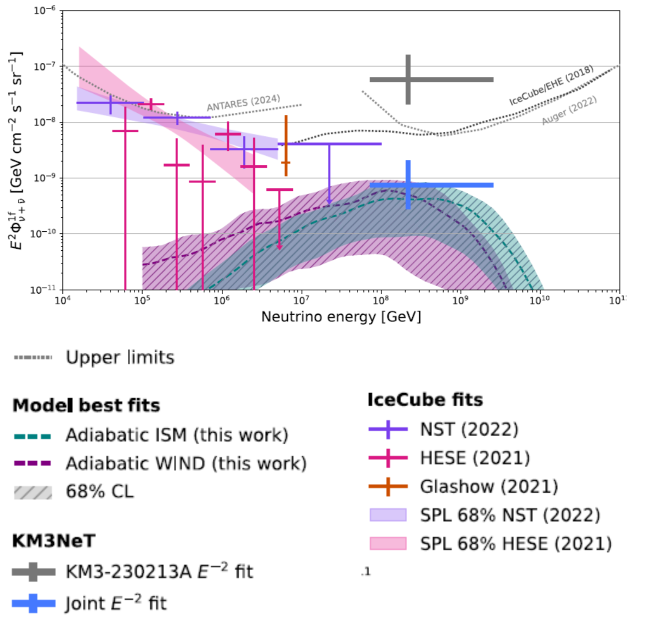
where $f_b$ is the baryon loading ratio (i.e. the baryon-to- electron ratio), $\eta$ the efficiency of converting kinetic energy to gamma-ray energy and $t^*$ is the typical time scale for the prompt emission. In their calculations, the authors set $\eta = 0.2$ and $t^* = 10$ s as typical values for these two parameters.

Here are the results for the model with constant interstellar medium density: Setting $n_0 = 1$ cm$^{-3}$, the baryon loading is constrained to be $f_b \leq 392$ at 90% confidence (as can be derived from the next figure assuming $\eta = 0.2$ and $t^* = 10$ s). By setting $n_0 = 3$ cm$^{-3}$, the best-fit baryon loading is $f_b = 65$. Note that in the forward-shock model considered in the paper, the protons come from the environment surrounding the GRB and are not the same protons as in the prompt phase (as considered in the 2016 IceCube paper). The density of protons in the blastwave can thus be significantly increased compared to the prompt phase, and the baryon loading factor can be much larger.




*The posterior probability density of the 2D scan in $E_k/L_\gamma$ and $n_0$ for the ISM model. The solid (dashed, dotted) lines show the 1σ (2σ, 3σ) contours.*

The total diffuse UHE neutrino flux is consistent with the detection of KM3-230213A within the cumulative exposure of KM3NeT, IceCube-EHE and Auger:



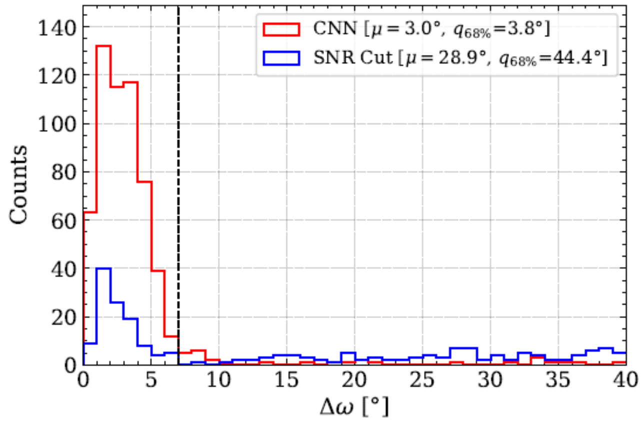

*Energy-squared per-flavour diffuse astrophysical neutrino flux assuming ($\nu_e$:$\nu_\mu$:$\nu_\tau$ = 1:1:1) flavour equipartition. The purple dashed line corresponds to the diffuse flux from the ISM (WIND) blastwave models as described in the text, with the corresponding 68% confidence interval. The reported KM3-230213A flux) and corresponding 90% neutrino energy range is indicated by the grey cross. The joint fit flux considering non-observation in the IceCube-EHE and Auger samples in the same energy range is shown by the blue cross. The 68% CL contours from the IceCube NST and HESE diffuse flux analyses are shown with the magenta and purple contours, respectively. The corresponding segmented fit analyses are shown by the magenta and purple crosses, and the IceCube Glashow resonance event is shown with an orange cross. The dotted lines show the upper limits from the ANTARES, IceCube-EHE and Auger analyses.*

The authors conclude that – although the true diffuse neutrino flux at ultra-high energies may come from additional sources, GRB blastwaves can contribute significantly to the UHE neutrino flux required for KM3-230213A whilst remaining consistent with previous limits on GRB model parameters given by IceCube in 2016. Future observations by upcoming large radio detectors like GRAND, Askaryan detectors such as RNO-G, and combined Askaryan and Cherenkov detector like IceCube-Gen2, can contribute to better characterization the UHE neutrino flux.

*One of the three radio antennas of the prototype surface station at the South Pole (photo from December 2022)*

The IceCube collaboration has posted a paper *Identification and Denoising of Radio Signals from Cosmic-Ray Air Showers using Convolutional Neural Networks* at https://arxiv.org/pdf/2508.14711 (submitted to PRD). The leading authors are Alan Coleman (formerly Bartol Research Inst, Delaware), Abdul Rehman, and Frank Schroeder (both Bartol).

Radio pulses generated by cosmic-ray air showers can be used to reconstruct key properties like the energy and depth of the electromagnetic component of cosmic-ray air showers. The radio detection threshold, influenced by natural and anthropogenic radio background, can be reduced through various techniques. This work demonstrates that convolutional neural networks (CNNs) are an effective way to lower the threshold. The authors developed two CNNs: a classifier to distinguish radio signal waveforms from background noise and a denoiser to clean contaminated radio signals. Following the training and testing phases, they applied the networks to air-shower data triggered by scintillation detectors of the prototype station for the enhancement of IceTop. Over a four-month period, they identified 554 cosmic-ray events in coincidence with IceTop, approximately five times more compared to a “reference method” based on a cut on the signal-to-noise ratio. Comparisons with IceTop measurements of the same air showers confirmed that the CNNs reliably identified cosmic-ray radio pulses and outperformed the reference method. Additionally, they find that CNNs reduce the false-positive rate of air-shower candidates and effectively denoise radio waveforms, thereby improving the accuracy of the power and arrival time reconstruction of radio pulses.




*Opening angle between the radio-reconstructed and IceTop-reconstructed directions for scintillator-triggered airshower events identified using the CNN-based method and the “reference method”. The dashed line at 7◦ indicates the quality cut applied to select well-reconstructed air-shower events.*

Impressum
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