

The Radio Neutrino Observatory in Greenland (RNO-G): Experiment Status and Overview

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1. Introduction:

Neutrinos are ideal messengers to identify ultra-high energy (UHE) sources in the universe. The goal of RNO-G is to extend multi-messenger neutrino astronomy to energies above 10 PeV.[1]

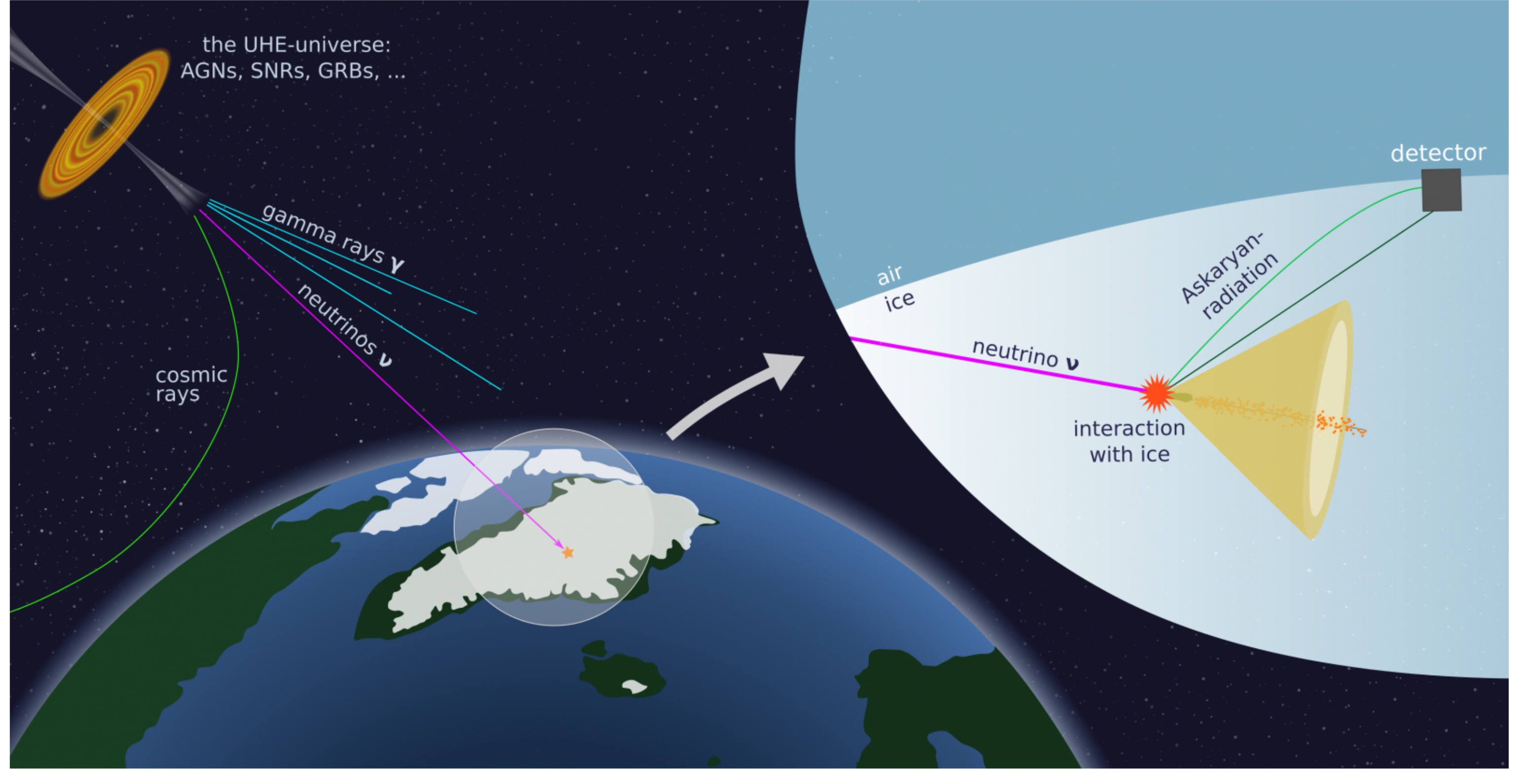


Fig. 1: Illustration of UHE neutrino production and detection in RNO-G. Source: K. Terveer (ECAP).

2. Detector array:

RNO-G is under construction near Summit Station, Greenland. The array will consist of 35 detectors; 8 are operating and 4 more will be deployed in 2026.

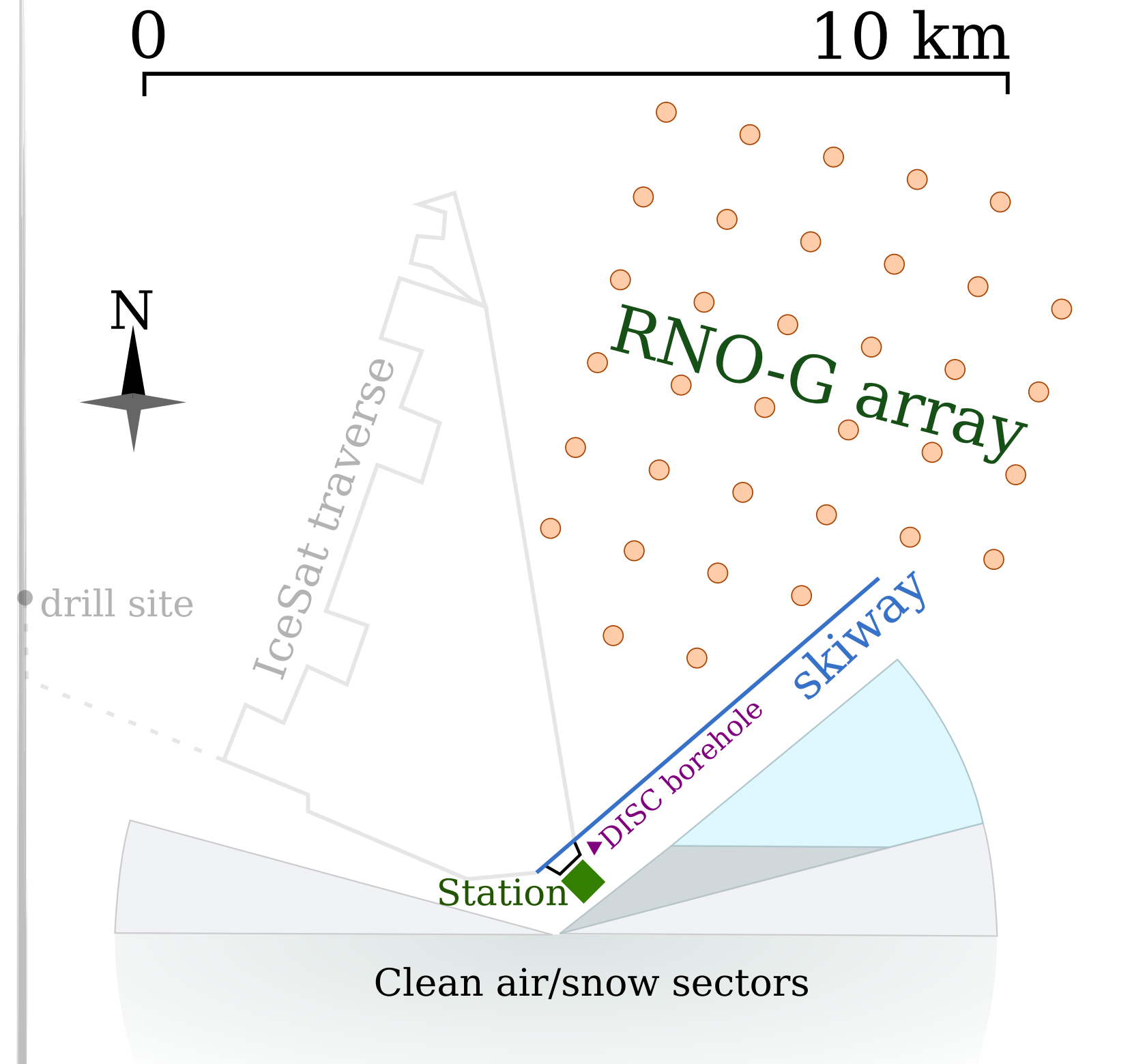


Fig. 2: Planned RNO-G station layout.

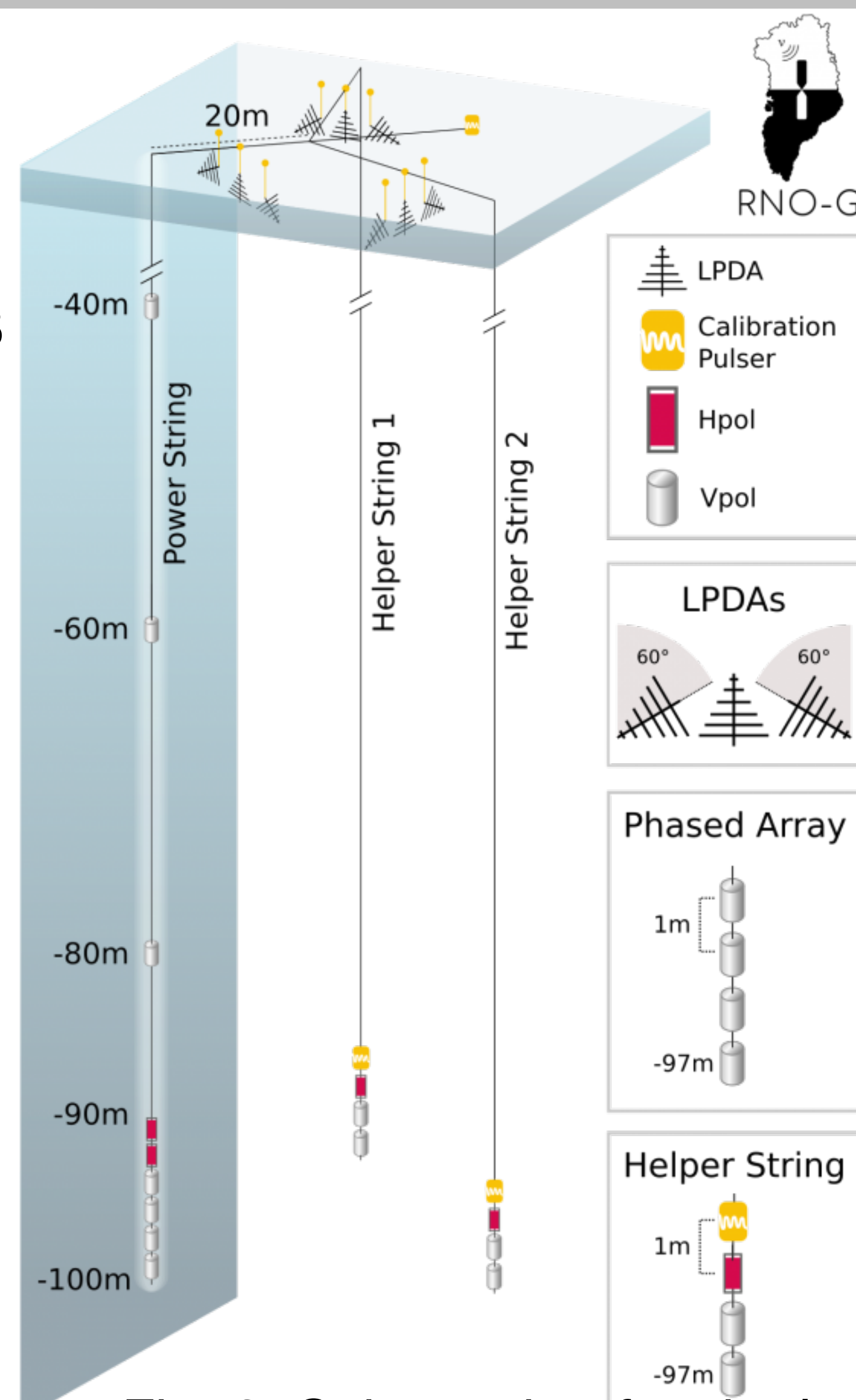


Fig. 3: Schematic of a single RNO-G station.

Each RNO-G station monitors an $O(1 \text{ km}^3)$ volume of ice, searching for short radio pulses produced by the Askaryan effect—the coherent radio emission generated by neutrino-induced particle showers.

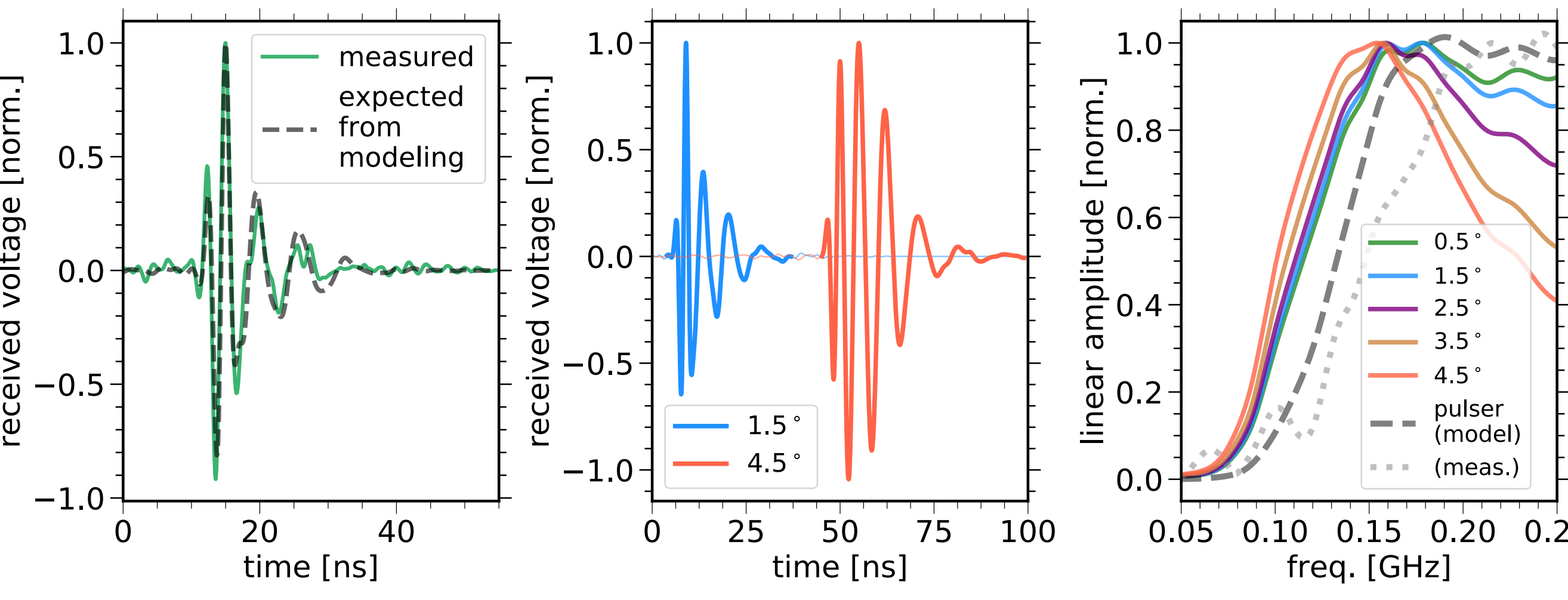
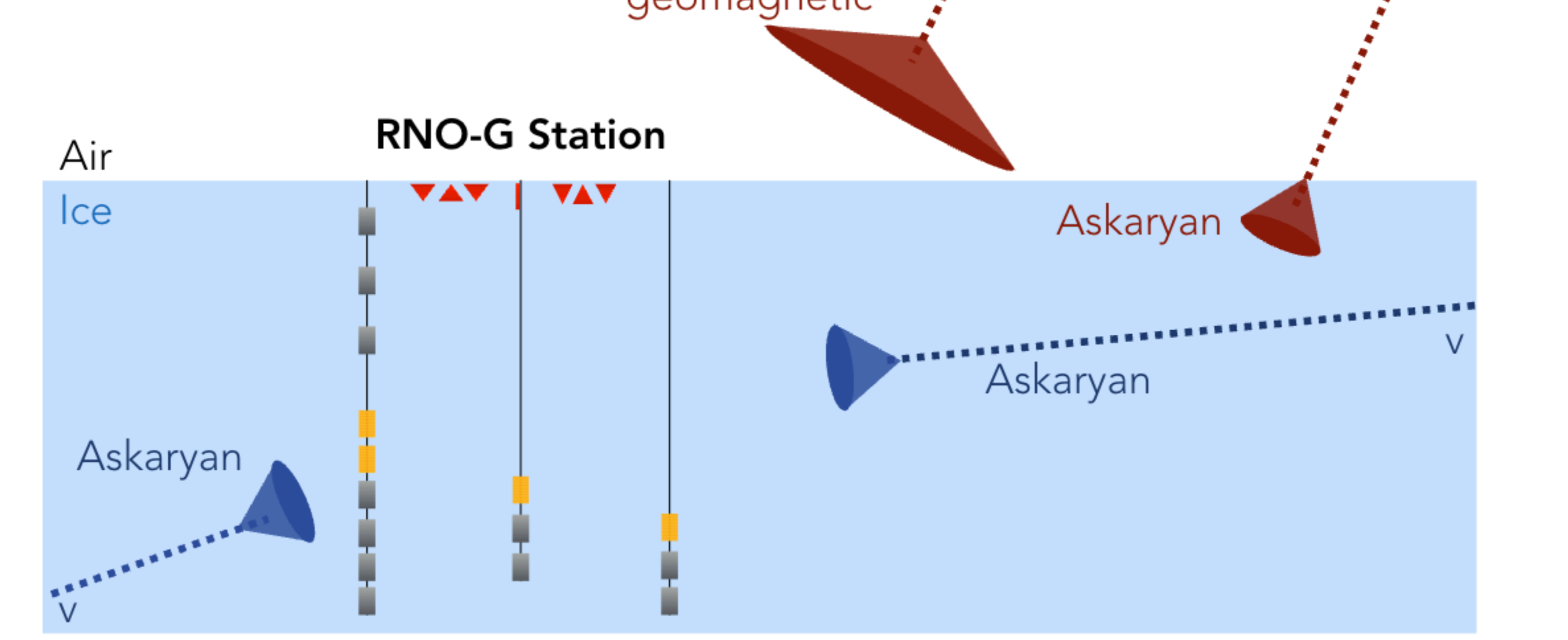


Fig. 4: Comparison of calibration measurements and simulated neutrino signals, including their waveforms and power spectra. [2]

3. Cosmic rays

Cosmic-ray air showers serve as a natural test beam for validating the detection technique.



RNO-G can detect cosmic rays in two ways:

- Air showers: Candidates have been identified. [3]
- In-ice cascades: Askaryan emission can mimic neutrino signals; analysis is ongoing. [4], [5], [6]

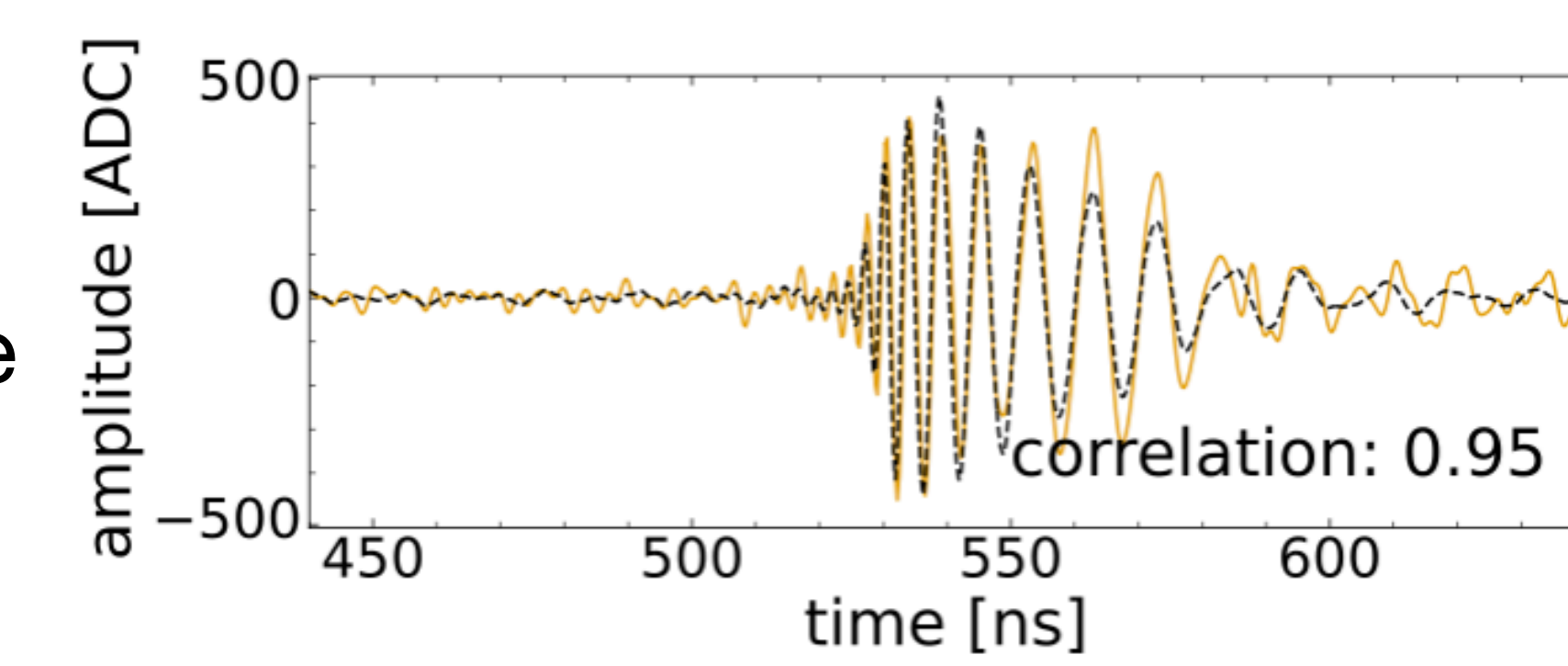


Fig. 5: Waveform of a UHE cosmic ray candidate.

4. Towards neutrinos and multi-messenger capabilities

- RNO-G is building toward its first search for the diffuse UHE neutrino flux. [7]
- Wide Northern Hemisphere coverage enables a broad range of multi-messenger studies.
- Experience gained with RNO-G helps guide the development of IceCube-Gen2 Radio.

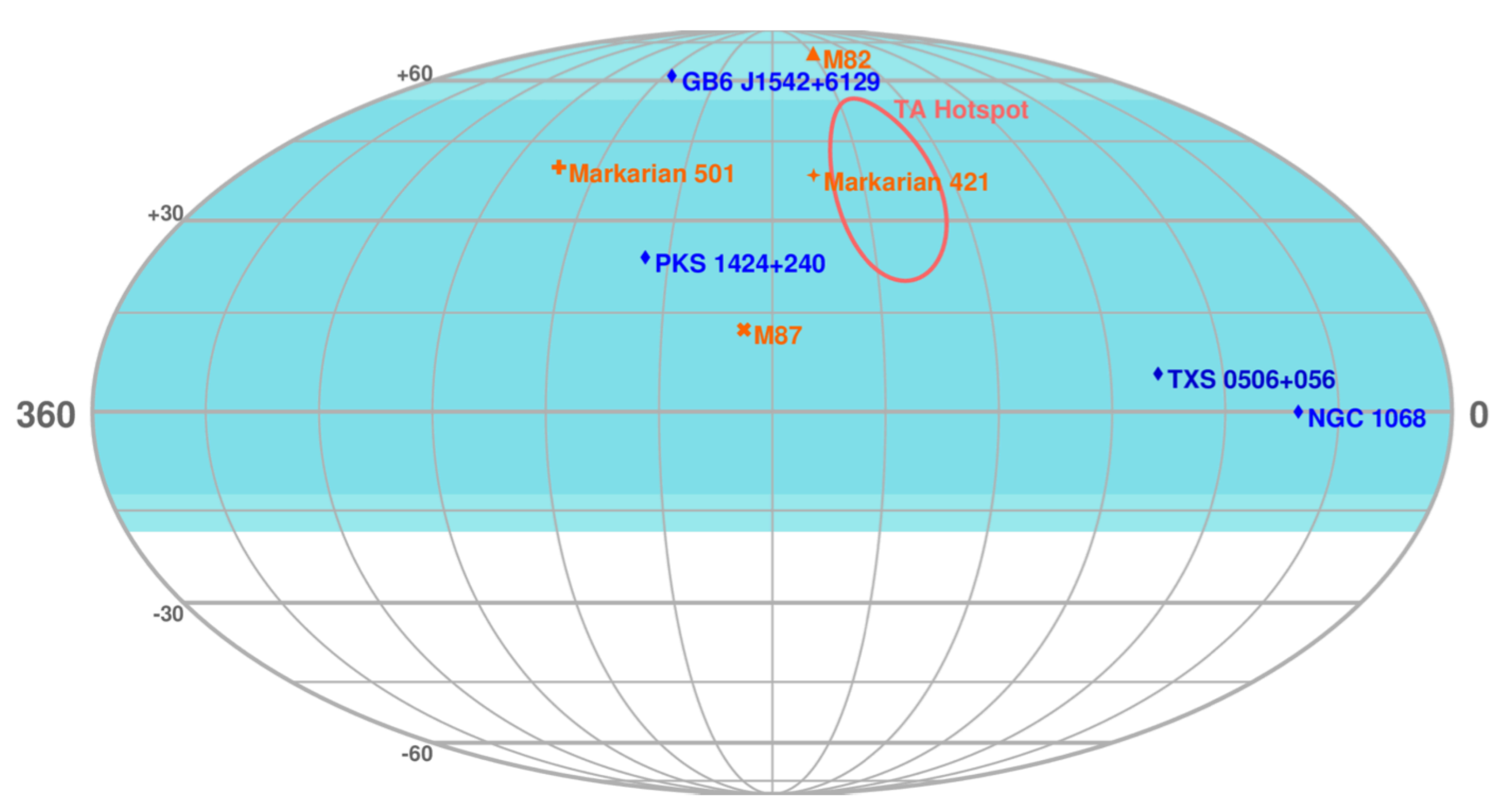


Fig. 6: RNO-G field of view with highlighted multi-messenger targets and source candidates.

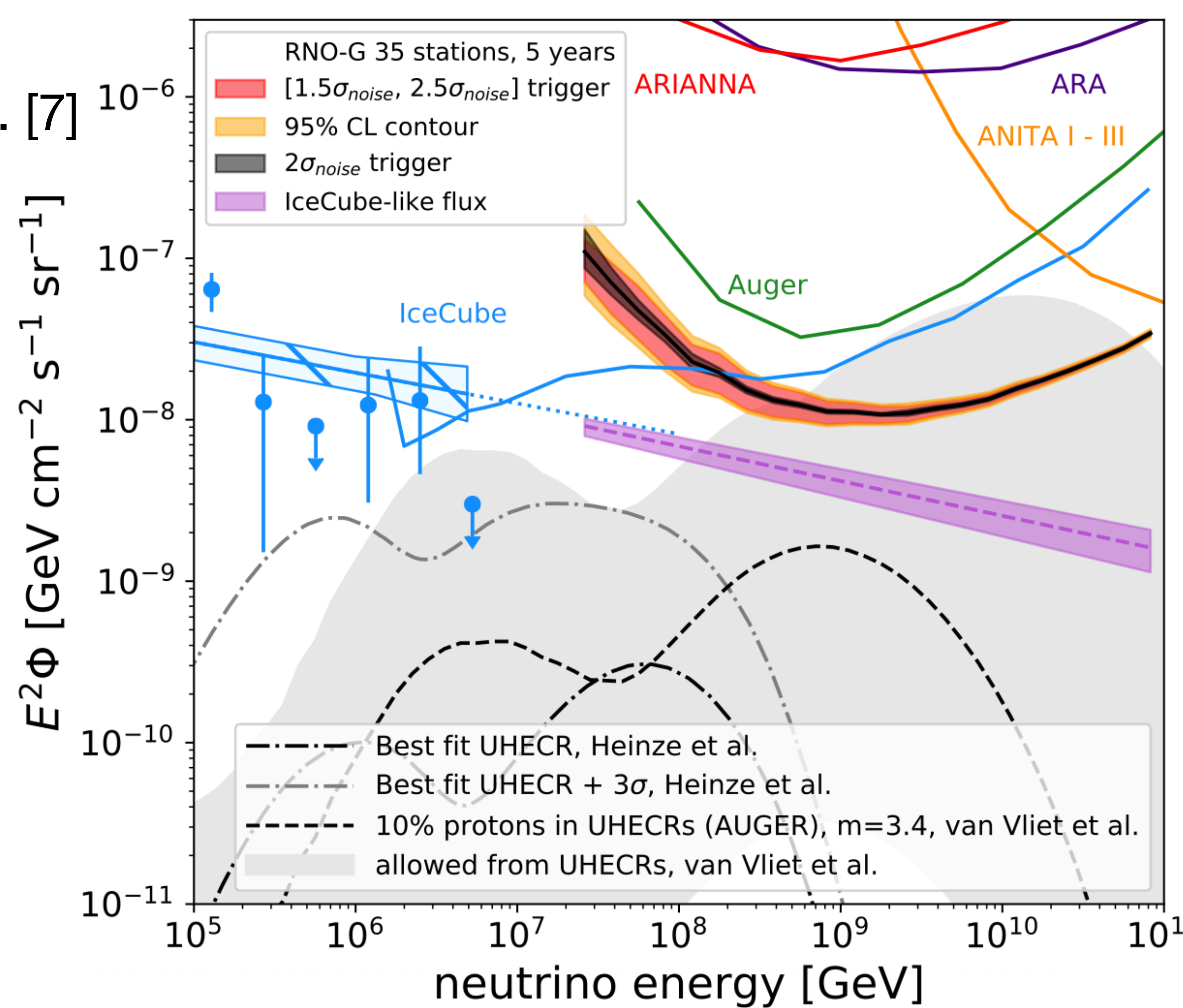


Fig. 7: Projected five-year all-flavor diffuse neutrino sensitivity of the full RNO-G array.

References: [1] Aguilar et al., JINST 16 (2021) P03025. [2] Agarwal et al., JINST 20 (2025) P04015. [3] Agarwal et al., arXiv:2512.17664 (2025). [4] B. Hendricks, PoS(ICRC2025)1057 (2025). [5] M. Lui, PoS(ICRC2025)319. [6] N. Punsuebsay, PoS(ICRC2025)366. [7] B. Clark, PoS(ICRC2025)1204 (2025).