

Executive summary

Development of an in-situ calibration device of firm properties for Askaryan neutrino detectors

What is this contribution about?

The interpretation of radio detector data for the detection of ultra-high-energy (UHE) neutrinos ($E > 10^{17}$ eV, e.g. ARIANNA/RNO-G/IceCube-Gen2 experiments) requires a good understanding/monitoring of ice properties. In this contribution we show

- 1) data from an in-situ monitoring device of the snow accumulation.
- 2) how the monitoring setup can be extended by an additional transmitter to also measure the index-of-refraction in the upper 40m of the ice sheet.

Why is it relevant / interesting?

It allows for an improved characterization of the ice (including potential temporal variations) which will decrease systematic uncertainties in the energy and direction reconstruction of UHE neutrinos.

What have we done?

- 1) Analyzed 14 months of data to provide a snow-accumulation measurement every 12 hours -> also an important proof of concept of D'n'R technique
- 2) Determined the optimal position of two emitters in a simulation study.

What is the result?

- 1) Snow accumulation can be measured with 1mm accuracy which is much better than the required precision for reconstruction purposes.
- 2) Recommendation for improved measurement setup for index-of-refraction measurement.