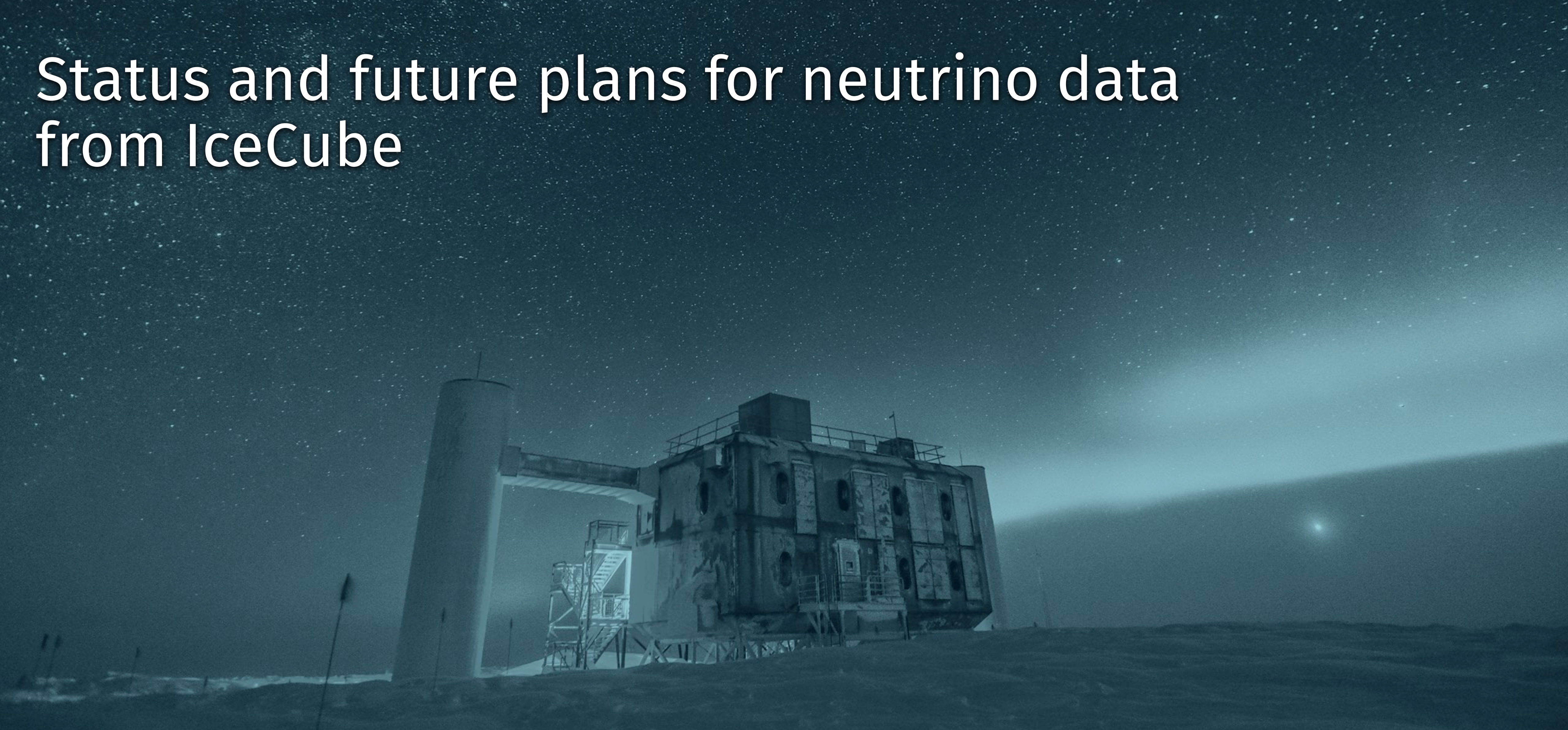


# Status and future plans for neutrino data from IceCube

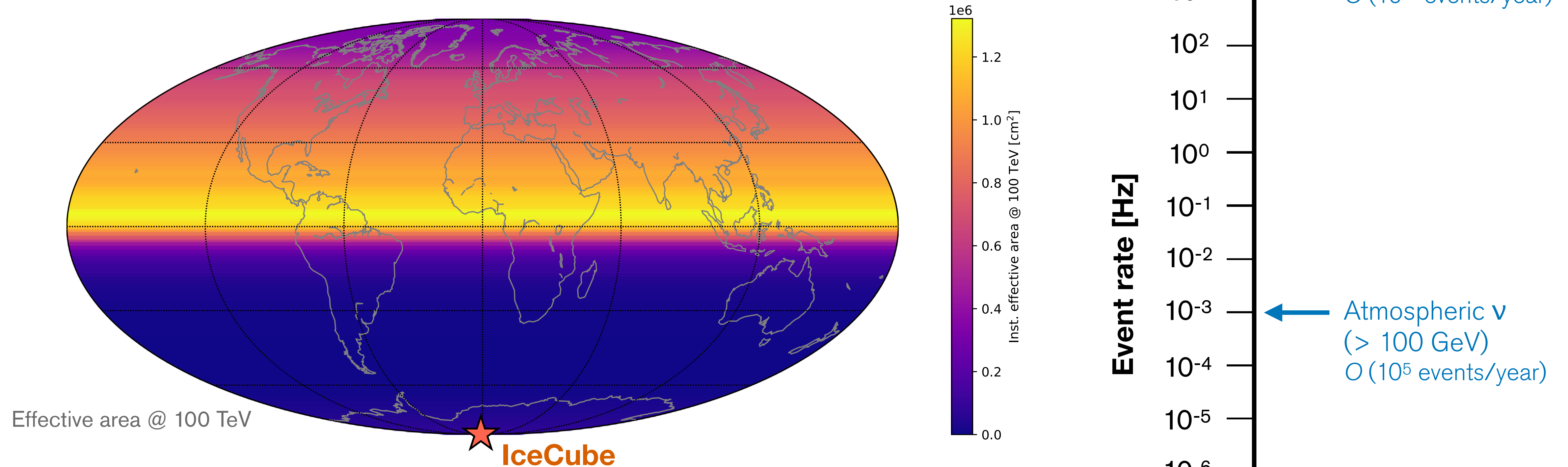


Marcos Santander\* on behalf of the IceCube Collaboration

\* University of Alabama

GADF Meeting - Sept 2021

# IceCube and its data

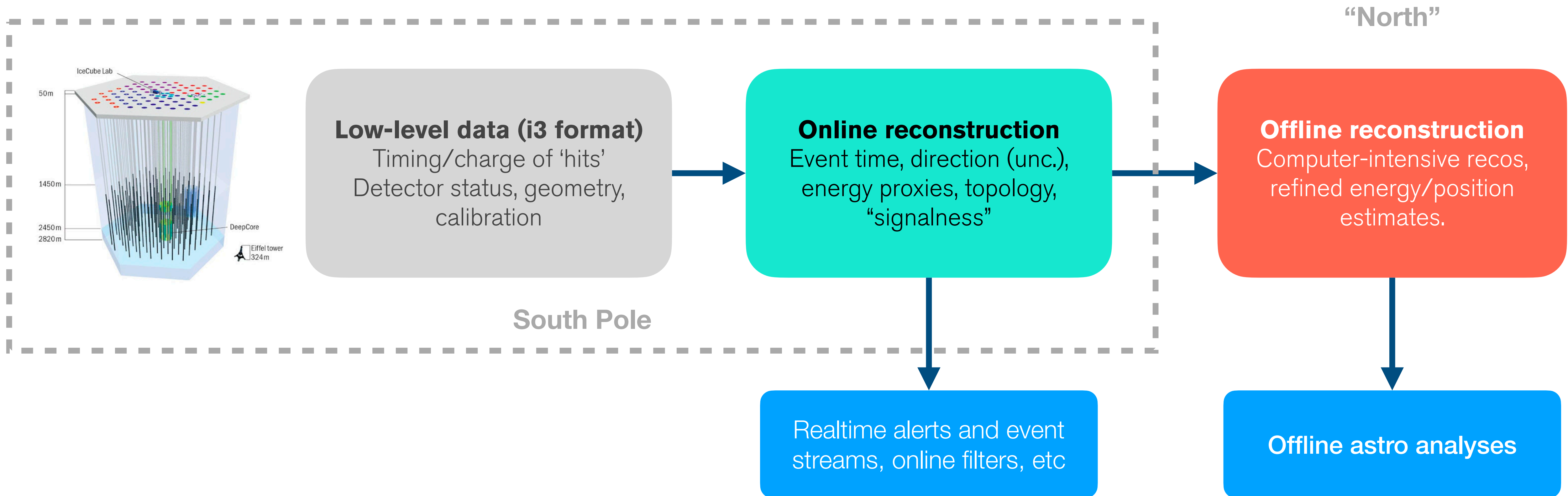


Effective area @ 100 TeV

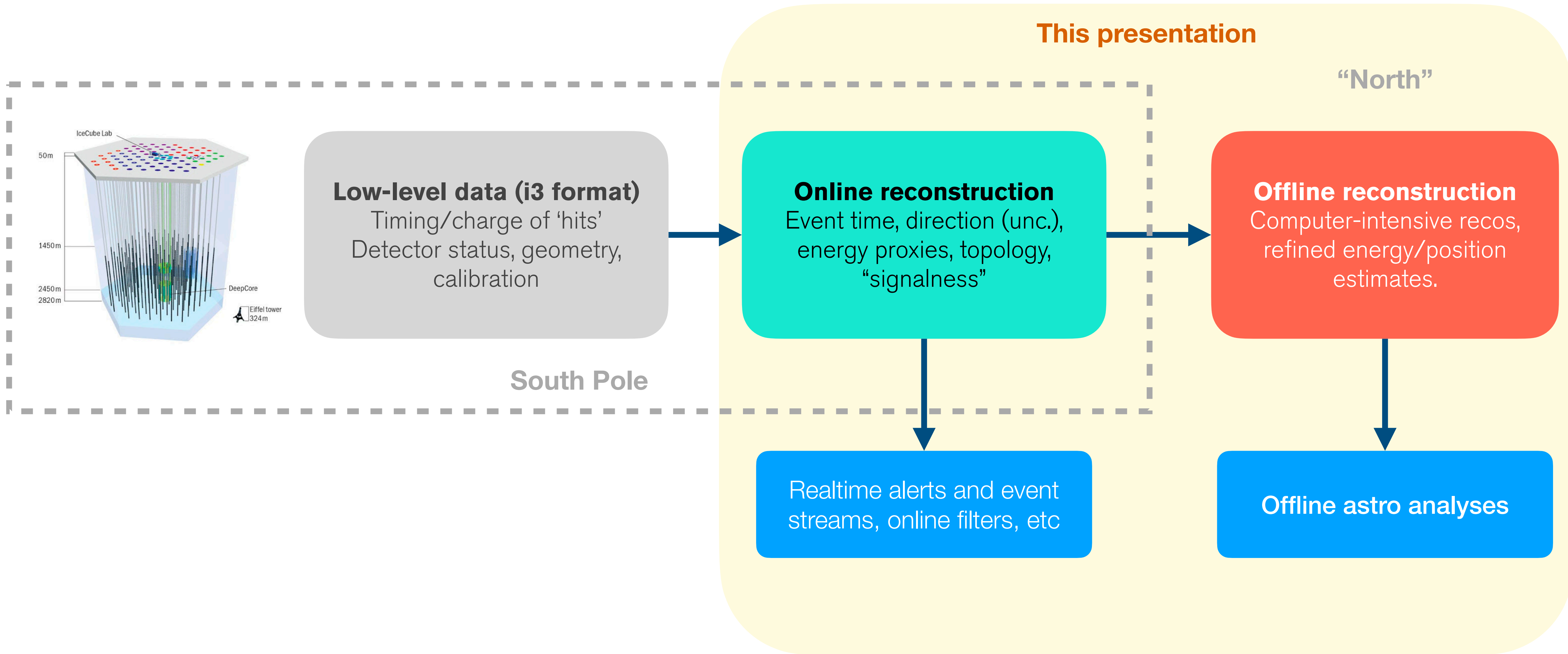
IceCube

- Cubic-kilometer neutrino telescope at the South Pole.
- $4\pi$  sensitivity (with strong declination dependence). >99% uptime. **Background dominated.**
- Two main event topologies for neutrino events:
  - **Muon tracks:** good angular resolution ( $0.5^\circ$  @ 10 TeV,  $0.3^\circ$  @ 100 TeV). Factor of  $\sim 2$  neutrino energy resolution. Bulk of neutrino source search dataset.
  - **Cascades:** good energy resolution ( $\sim 15\%$   $E_\nu$ ), poor angular resolution ( $15^\circ$  @ 10 TeV,  $8^\circ$  @ 100 TeV). High astrophysical purity.

# The IceCube data stream

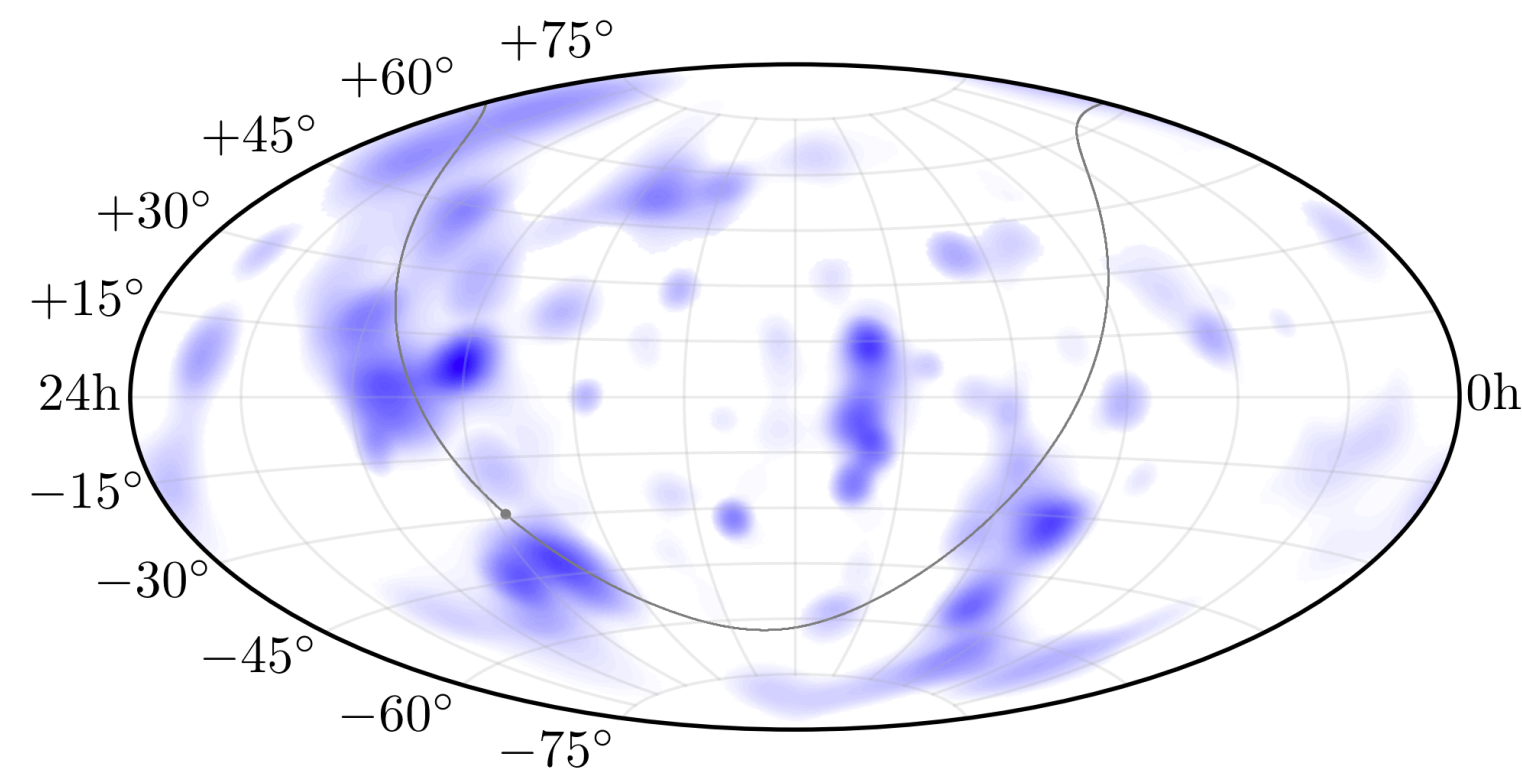


# The IceCube data stream



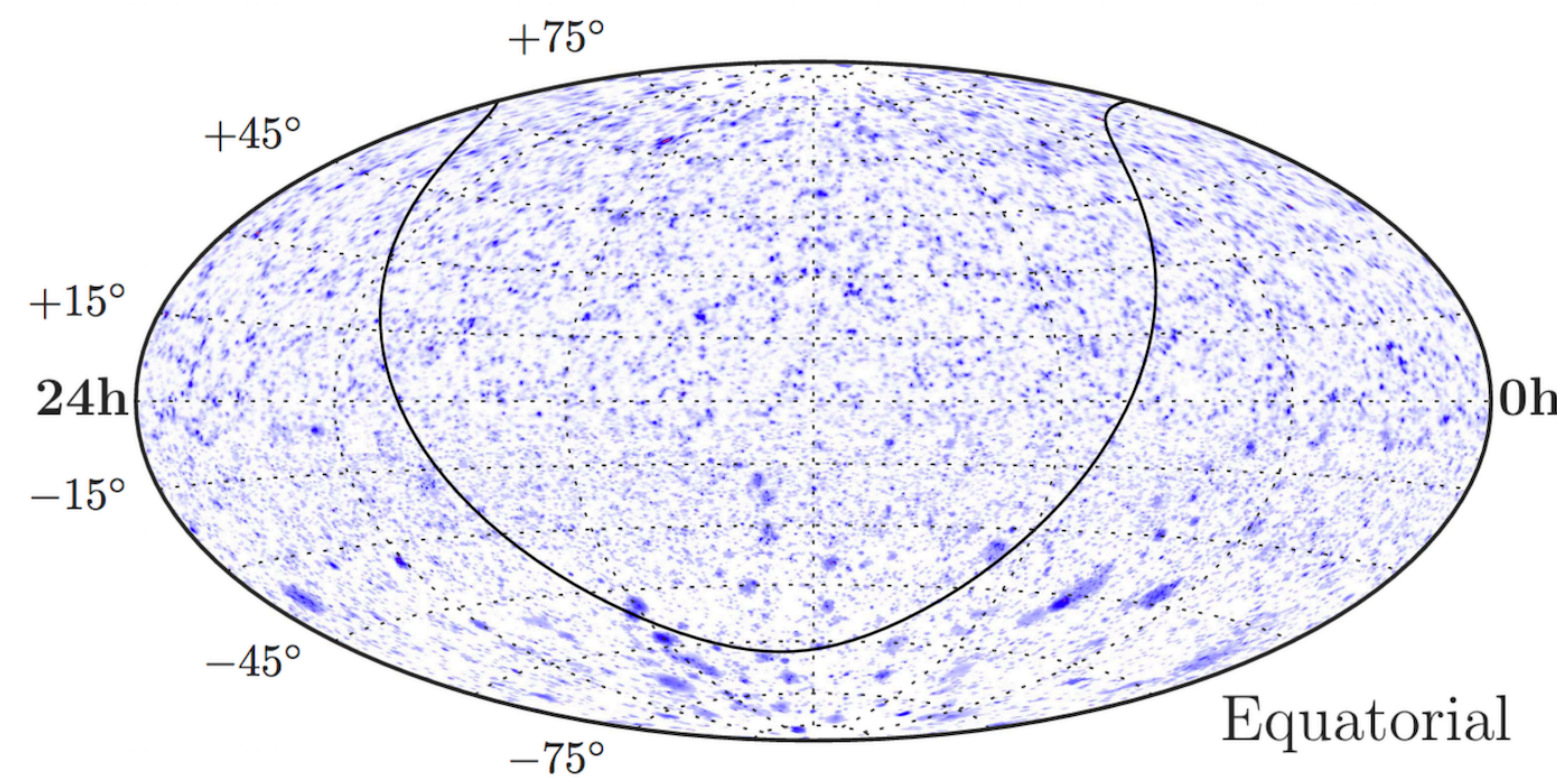
# IceCube datasets

- Multiple datasets refined for specific searches / selections, each with its own characteristic sensitivity.



## Cascade searches

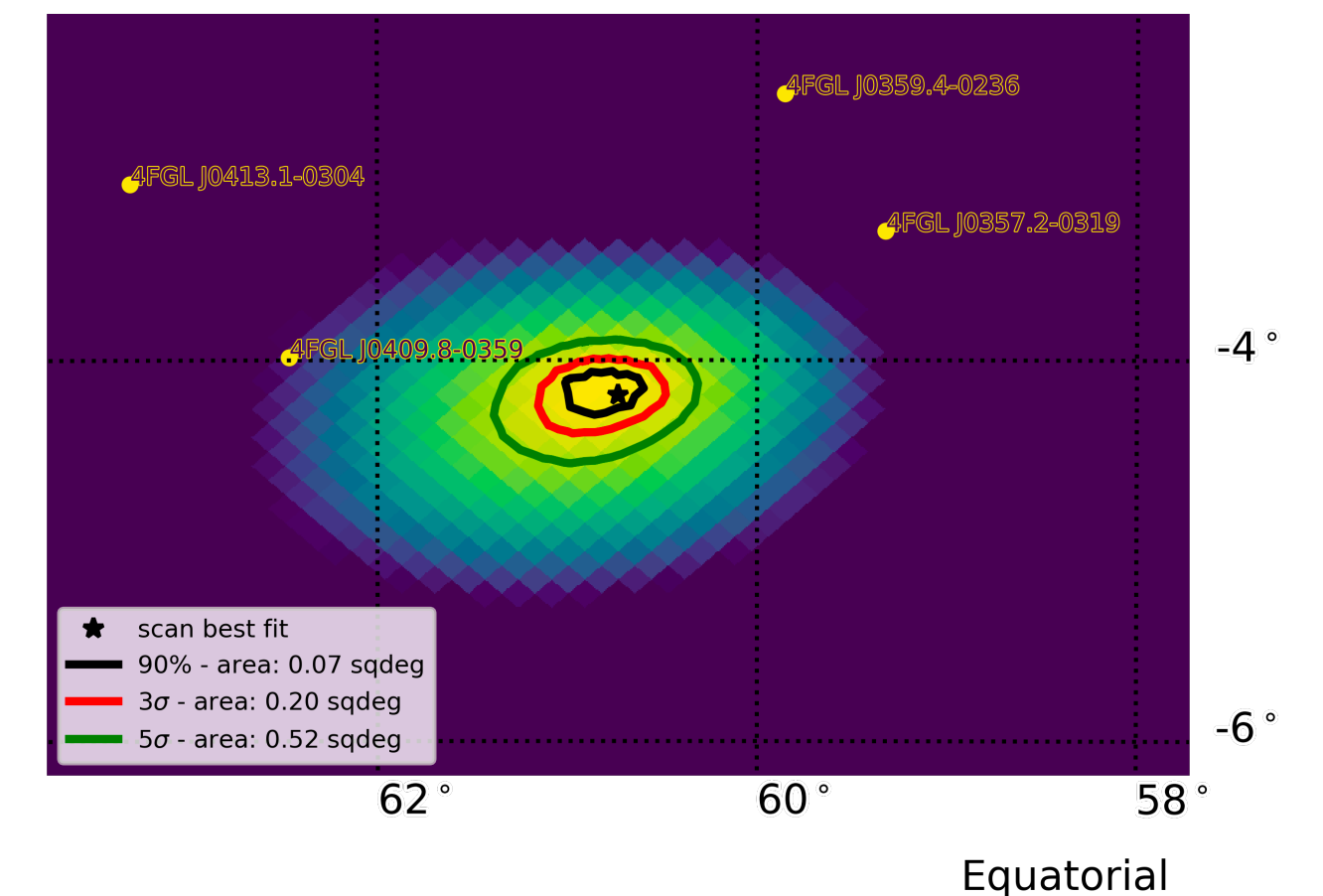
$O(10^\circ)$  angular resolution, high astrophysical probability, alerts



## Muon tracks for point-source searches

High statistics,  $O(1^\circ)$  angular resolution,  $\sim 1$  TeV, background dominated, clustering alerts.

Run: 135736 Event: 30987826 Type: HESE MJD: 59479.76204801038



## HE muon tracks

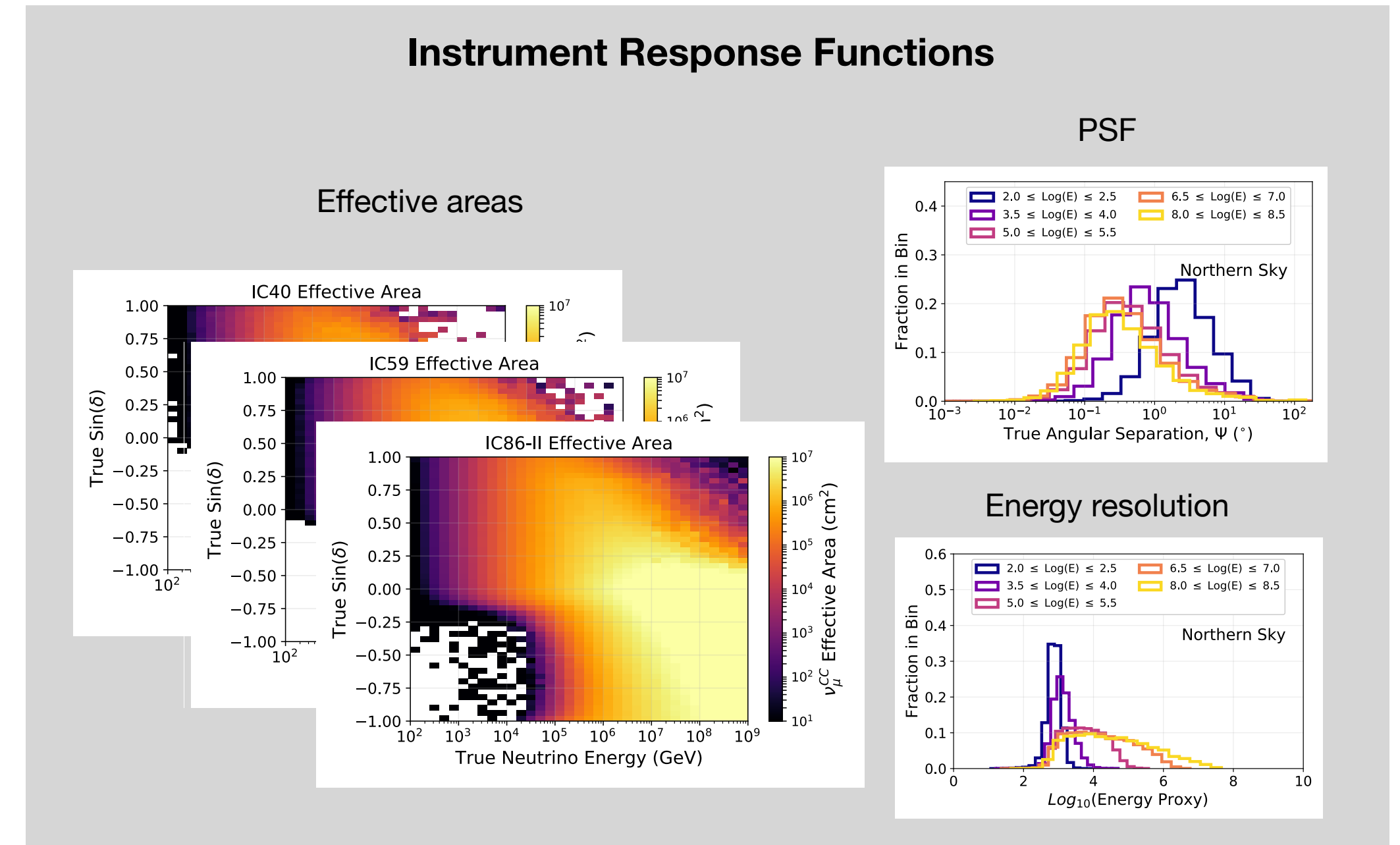
good angular resolution, low statistics, dominant astrophysical contribution  $> 100$  TeV, realtime alerts.

# Data releases

<https://arxiv.org/abs/2101.09836>

- **Typical data content:**

- Direction: best fit + uncertainty estimate (radii or 2D maps/contours)
- Muon energy proxy (see Suppl. in [arXiv/1807.08794](https://arxiv.org/abs/1807.08794))
- Time.
- “Signalness” or astrophysical probability proxy.
- Local coordinates.



- **10-year of point-source muon tracks** (direction, energy estimates, time, local coordinates) + IRFs.
  - Available through the [IceCube website](https://www.icecube.wisc.edu/) as ASCII files, and through [HEASARC](https://heasarc.gsfc.nasa.gov/).
- **Upcoming release:** Catalog of archival alerts with improved position, uncertainty, energy estimates.

# Open issues

- Standardization of data release information.
- Improvements to alert generation, curation.
- Revisions to archival data.
- Data provenance information.