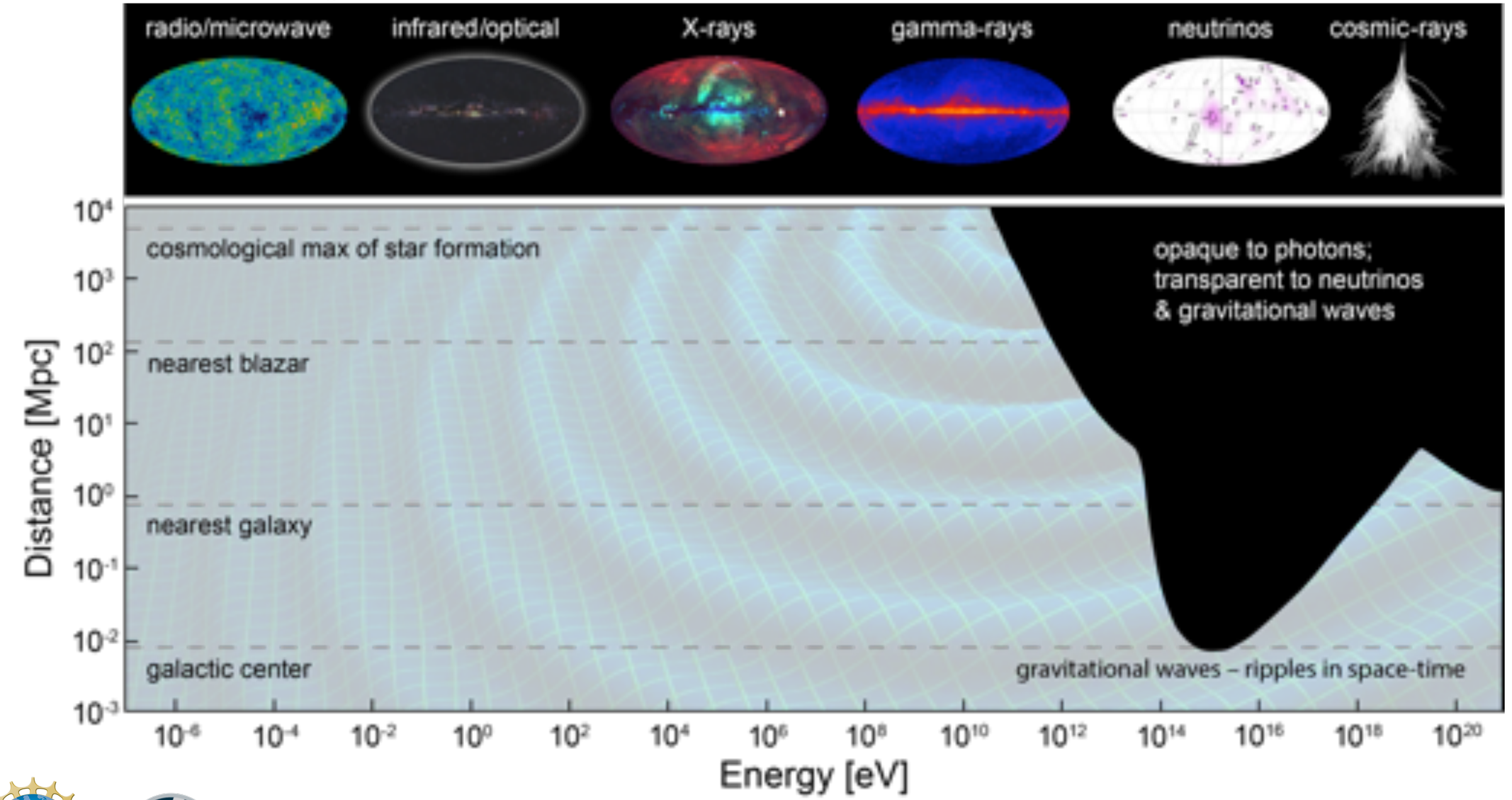
IceCube-Gen2

The IceCube-Gen2 Collaboration
Mike DuVernois (Univ. Wisconsin-Madison)

Neutrino Drilling
IDP Virtual Drill Workshop
2 April 2020

IceCube
GEN2

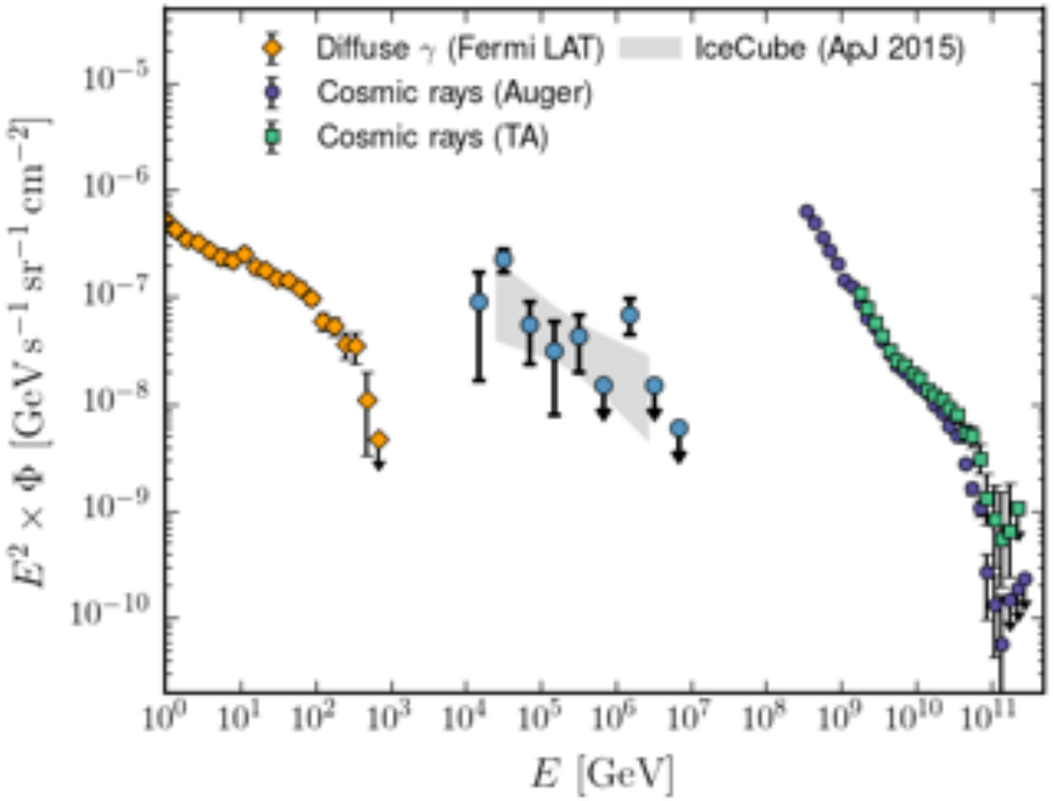
The energy frontier in astronomy



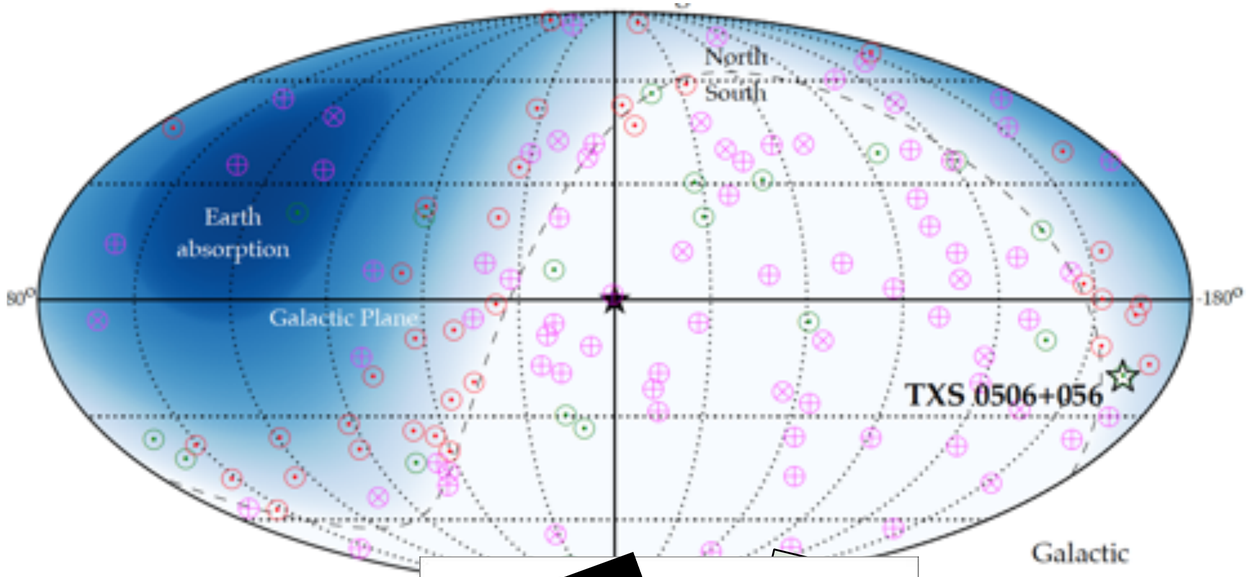
Universe opaque to photons for ¼ of the spectrum

10 yrs of IceCube - a first view on the PeV Universe

Multimessenger spectroscopy



First sky map of cosmic neutrinos



Some highlights:

2013: Discovery of cosmic PeV neutrino flux

2018: Evidence for Blazars as neutrino sources

2019: Observation of first tau neutrino

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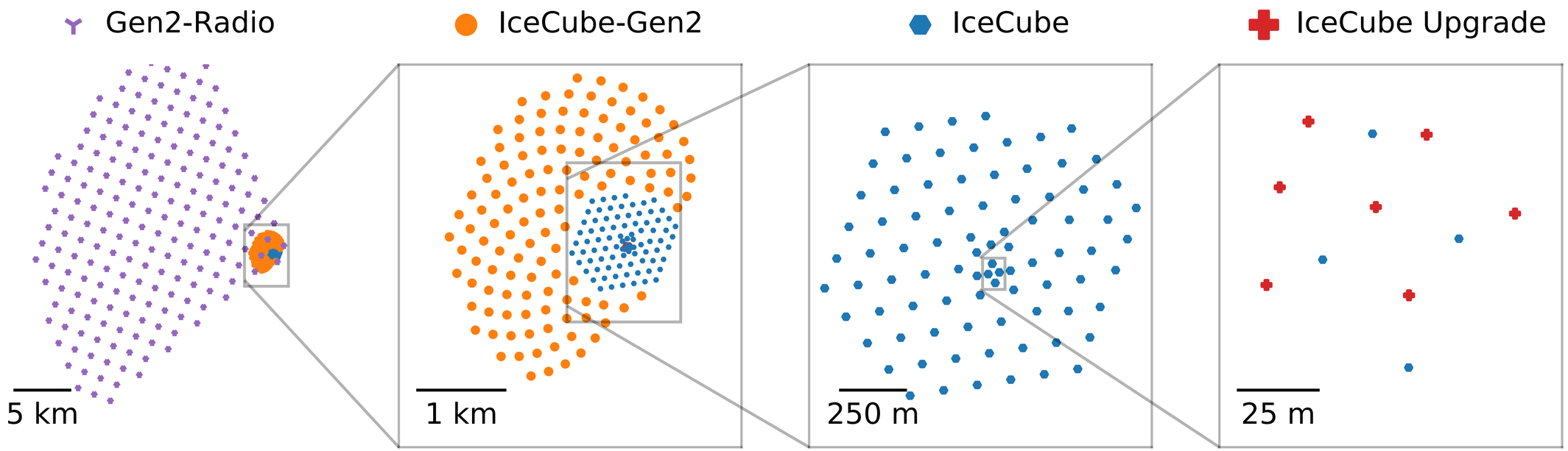
IceCube GEN2

IceCube-Gen2 — Scope

IceCube and Gen2 on different scales reflecting different energies



10 PeV **10 TeV** **1 TeV** **few GeV**

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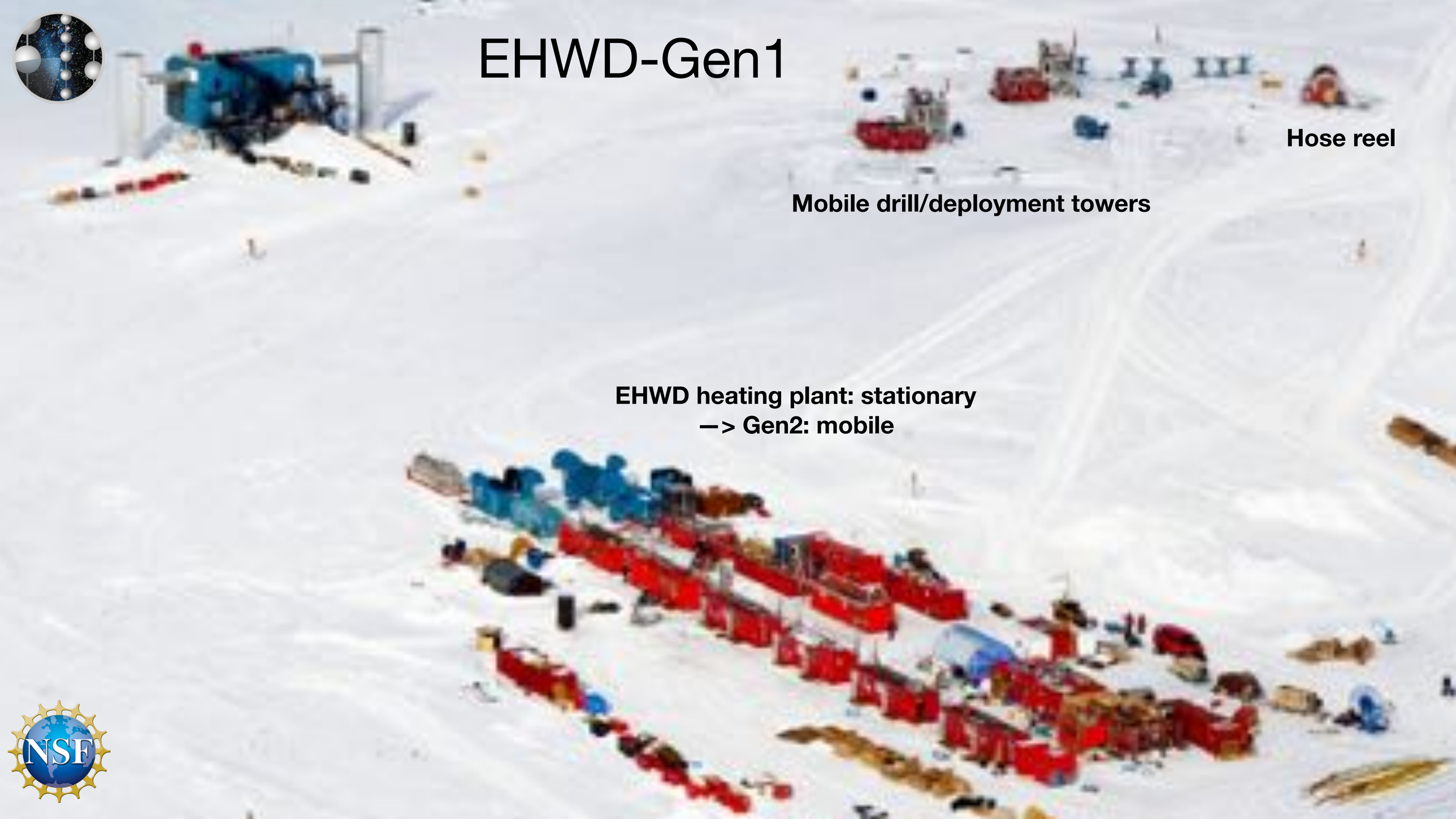
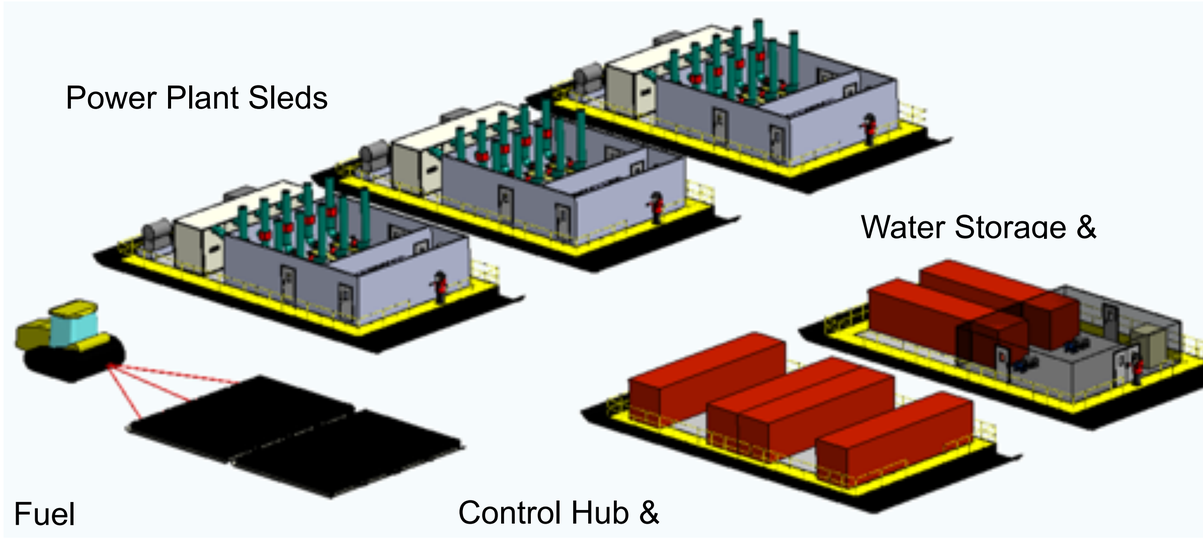
ICECUBE GEN2

EHWD-Gen1


Hose reel
Mobile drill/deployment towers
EHWD heating plant: stationary
—> Gen2: mobile

Gen2 hot water drill - changes in requirements

- Mobility: IceCube drill was stationary per season. Gen2 string spacing requires a mobile drill. Drill will be moved multiple times per season.
- Improved efficiency and lower maintenance technology
- Aim for higher drill speed. (Gen1: 2.1 m/min, Gen2: target close to 3 m/min)

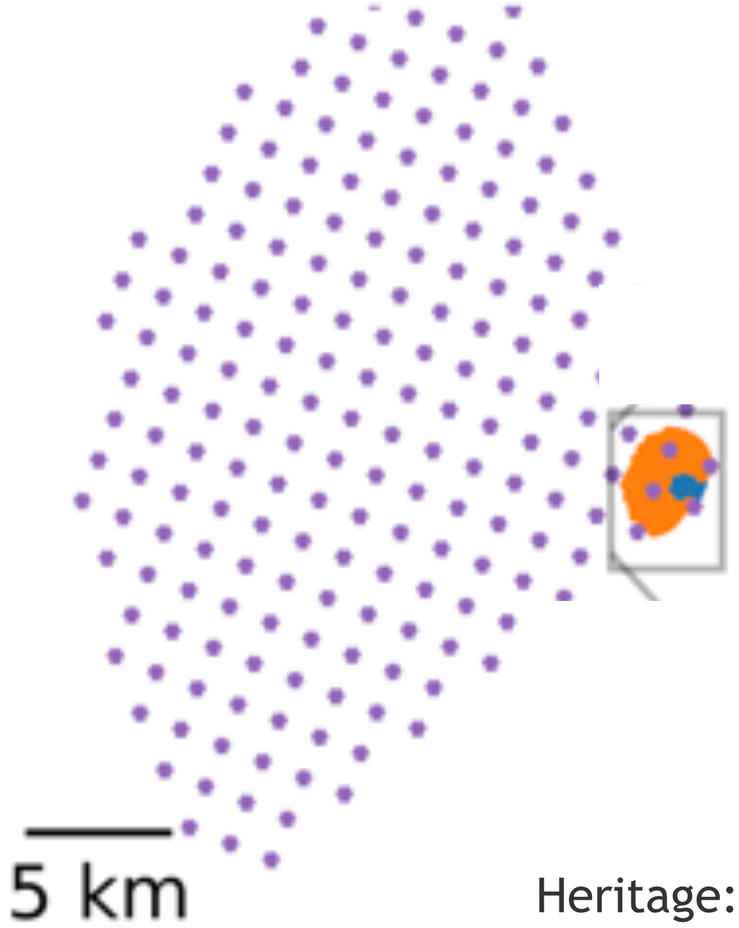


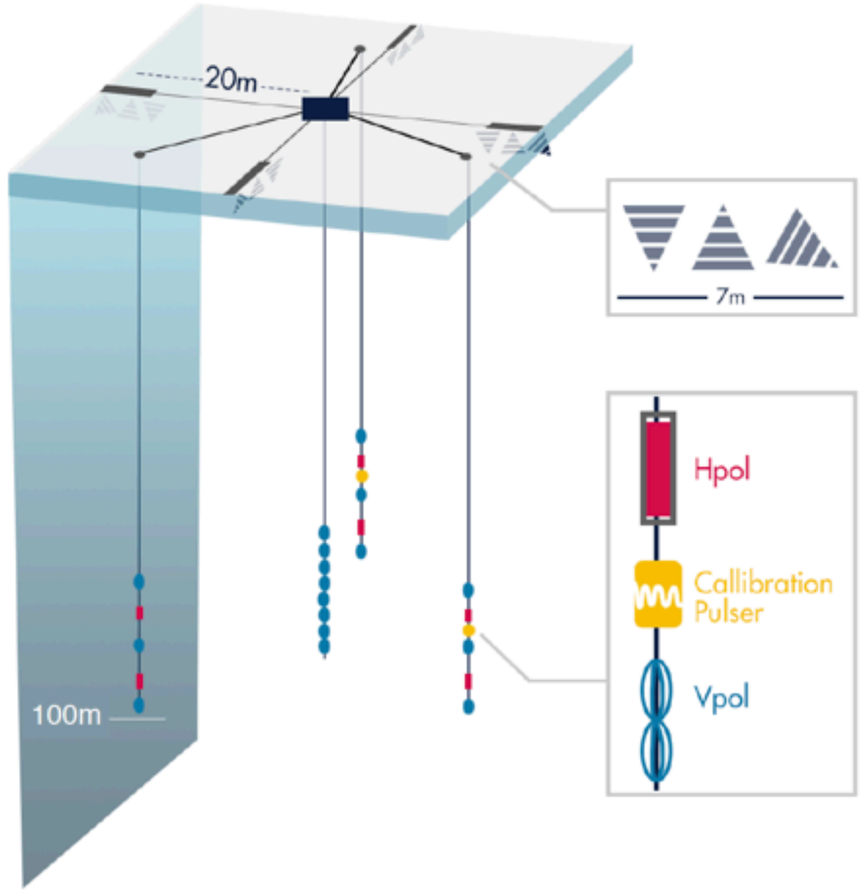
IceCube GEN2

The Gen2 radio array

200 stations
~500 km^2

- A daunting scale! Impact on Gen2 deployment.
- Highly efficient deployment will be critical.





Heritage:
RICE, ARA, ARIANNA

RNO-G (Greenland) first deployment summer 2020

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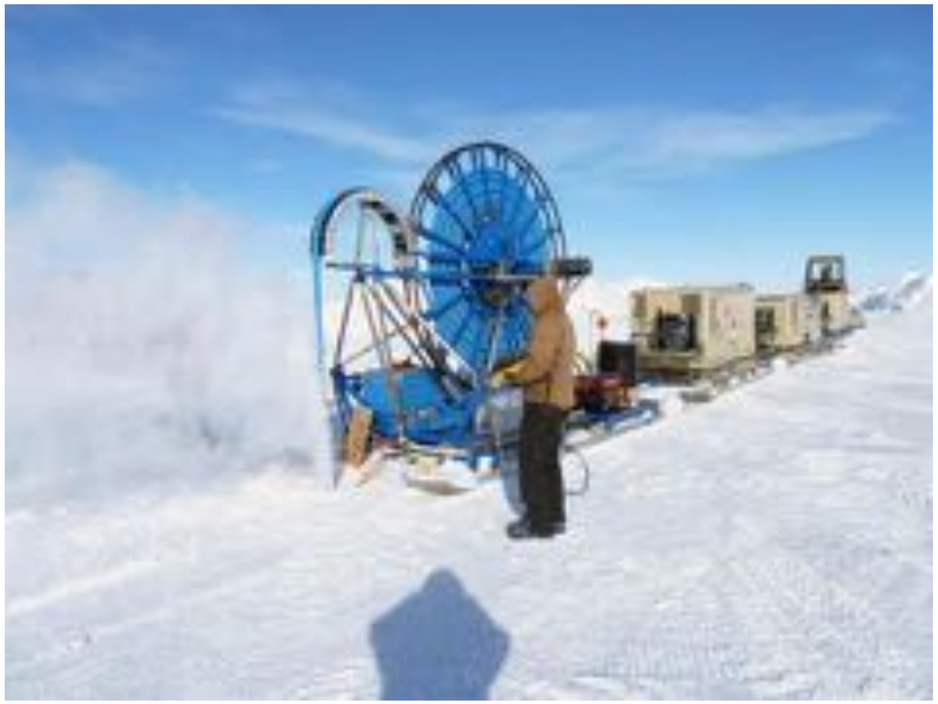
IceCube GEN2

Radio/Shallow Drilling for the radio component



ASIG Drill

RAM Drill optimized for Pole, 5”

BAS drill option as well (more automated)

100m deep holes

5” diameter

600 holes total

Up to 150/season

RNO-G 2020 trial

@ Summit Station

Timeline

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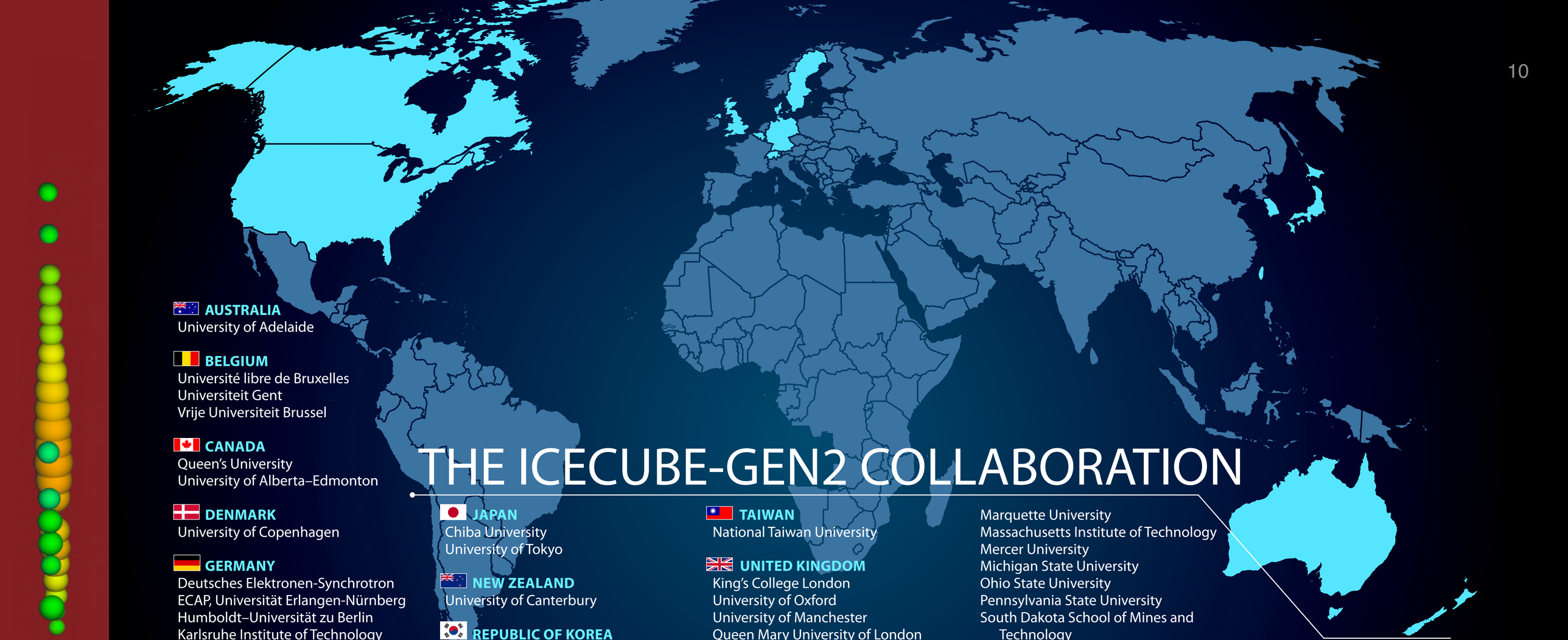

THE ICECUBE-GEN2 COLLABORATION

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Vrije Universiteit Brussel

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University of Alberta–Edmonton

DENMARK
University of Copenhagen

GERMANY
Deutsches Elektronen-Synchrotron
ECAP, Universität Erlangen-Nürnberg
Humboldt–Universität zu Berlin
Karlsruhe Institute of Technology
Max-Planck-Institut für Physik
Ruhr-Universität Bochum
RWTH Aachen University
Technische Universität Dortmund
Technische Universität München
Universität Mainz
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University of Wisconsin–Madison
University of Wisconsin–River Falls
Yale University

Neutrino astronomy with the next generation IceCube Neutrino Observatory
https://arxiv.org/pdf/1911.02561.pdf

IceCube South Pole Neutrino Observatory
icecube.wisc.edu