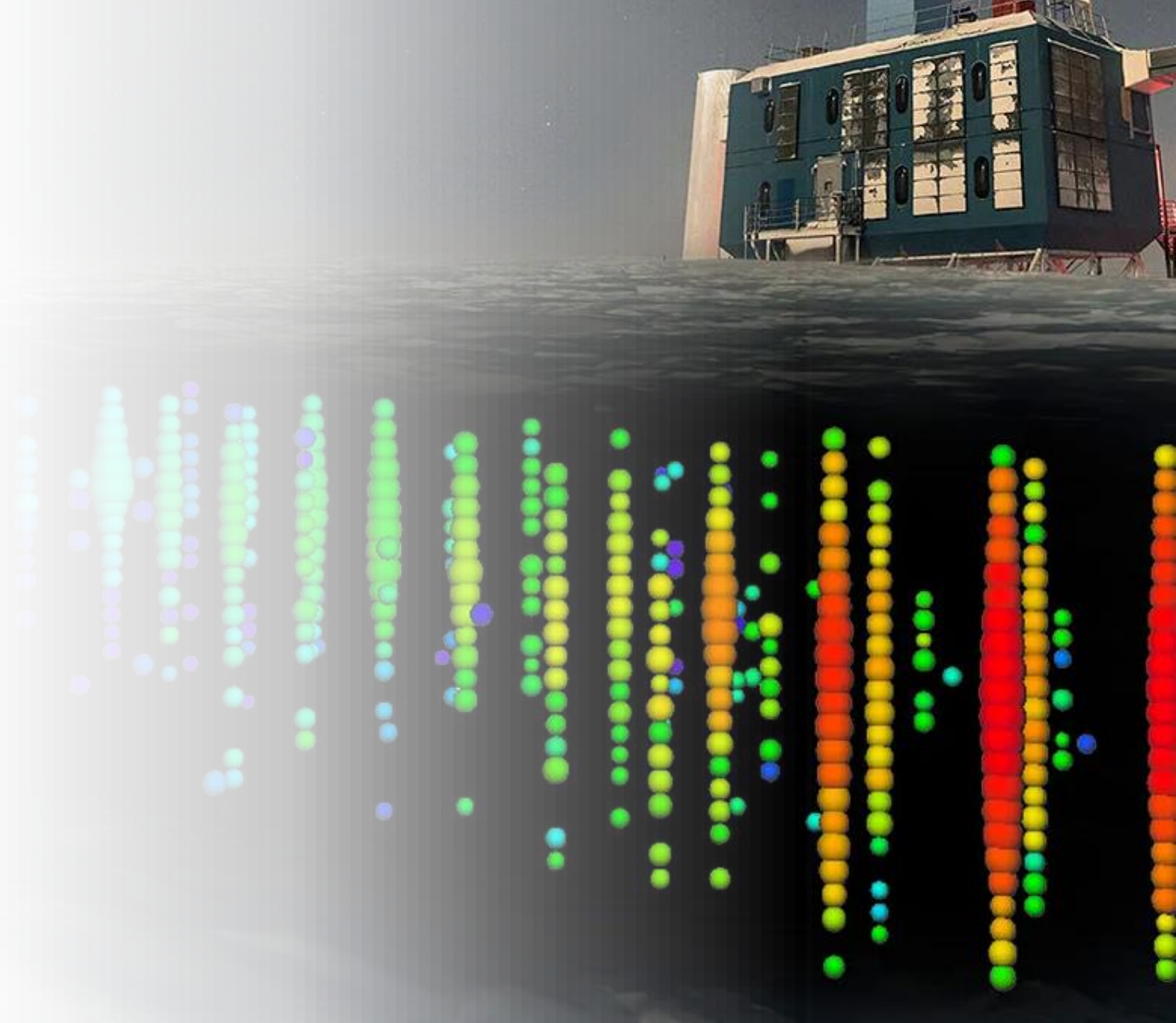


# Supporting big data science in Antarctica



## What is the situation?

- Experiments such as the IceCube Neutrino Observatory currently create >1TB of data per day
- South Pole Telescope improvements are expected to produce upwards of 40TB per day
- Sensors are needed to monitor the oceans between NZ and Antarctica
- Connectivity currently limited to that of a single house shared by all
- Based on satellites that only barely cover the region at parts of their orbits





- Overall, we must reduce our data by  $\sim 90\%$  at the South Pole to accommodate the limitations of the satellite bandwidth. This adds significantly to our power needs at the South Pole. Additionally, our Multi-Messenger Astrophysics searches are time-sensitive as all currently observed sources have been transient, e.g. compact object mergers. The transfer over satellite introduces an irreducible delay in our analysis pipeline.

- The lack of bandwidth results in the need for more physical presence in Antarctica, thus increasing the carbon and human/environmental footprint.



# National Science Foundation sponsored workshop

- Held virtually on October 1st, 2021
- 60 participants from across a wide breadth of antarctic research and infrastructure support
- Multi-national presence
- <https://www.pgc.umn.edu/workshops/antarctic-cable/>

## Goals

- Explore impact of full digital connectivity for ANTARCTIC continent
- Outline the utility of submarine cable from NEW ZEALAND to MCMURDO STATION as scientific instrument



- Smart cables & ocean sciences
- Achieving connectivity to Antarctic research facilities
- Connectivity to advance earth atmosphere & space sciences
- Connectivity to advance glaciology biology & other Antarctic field research
- Connectivity to advance education, engagement, community & human well being

# Pathway options

- Commercial cable providers now interested in the opportunity
- Advocacy and a better understanding of what would be possible is creating interest with government funders







Lots going  
on nearby...

# Commerical proposals





# Key Findings

1. Existing and future Antarctic research would be significantly enhanced if bandwidth limitations were eliminated through the availability of a modern submarine cable system.
2. A new submarine cable could be constructed with embedded instrumentation (a Scientific Monitoring And Reliable Telecommunications, or SMART, cable) that would itself enable meaningful new research and understanding of the region.
3. Robust bandwidth for interpersonal connectivity for scientists and staff, if thoughtfully approached, could be transformative for research and work functions, participation in Antarctic science, education, engagement, and community wellbeing.
4. Construction of a new SMART cable that provides essentially unlimited bandwidth to McMurdo is feasible and could also serve as the platform to extend connectivity to deep-field research sites as well as critical research programs at Amundsen-Scott South Pole Station. This level of connectivity can transform the science and research platforms for future generations.



# Find out more!

- <https://www.pgc.umn.edu/workshops/antarctic-cable/>
- <https://www.stuff.co.nz/business/122338304/fibreoptic-cable-to-antarctica-would-be-amazing-for-science>

**Wallace Chase**  
Head of IT Infrastructure  
University of Otago

@bmtfr  
wallace.chase@otago.ac.nz

