Antarctica as testing site ahead of mission to icy moons

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Researchers placing seismic nodes across the Brunt Ice Shelf. Credit: Thomas Barningham, BAS

Scientists have deployed a network of seismometers onto Antarctica's Brunt Ice Shelf in an experiment that will test the instrument's ability to operate on icy moons in the solar system.

Twenty state-of-the-art seismic 'Nodes' (the world's smallest and lightest land seismometers) have been deployed onto the ice shelf around the British Antarctic Survey's (BAS) Halley VI Research Station, along with

one 'short period' (SP) sensor. This is the first time that either of these instruments have been used in Antarctica, an environment which is the closest analogue of an icy moon found anywhere on Earth.

In addition to laying the groundwork for future space science missions, this exciting and novel experiment will also help to understand the floating ice shelf upon which the BAS Halley VI Research Station is located. The team behind the study have already started to gather useful data on seismic vibrations recorded in the ice shelf, which may help to further illuminate the evolution of cracks in the shelf, as well as the ocean conditions beneath. This data will contribute towards understanding the changing nature of the Brunt Ice Shelf which is critical to planning future Antarctic operations.

Similar SP sensors are currently recording data on Mars as part of the NASA InSight mission and a further set will be sent to the Moon as part of the NASA Farside Seismic Suite in 2024. The hope is that seismometers such as these will one day be sent to the icy moons of Saturn or Jupiter, where seismological recordings will be used to explore the moons' interiors, and to establish whether conditions exist where primitive life may have evolved. This project will test the ability of seismic instruments to perform in an environment like that found on these icy moons for the first time, and in doing so will play a key role in the search for life elsewhere in the solar system.

Thomas Barningham, Halley VI Research Station science coordinator, says:

"Halley is a great platform to test autonomous instrumentation that may be deployed in other harsh environments elsewhere on Earth, or indeed the solar system. Locally, the data may prove to be a useful compliment to the enormous amount of data we collect from various instruments that monitor the ice shelf. Such data may pave the way for more intensive ice

shelf seismic campaigns in the future."

Dr. Ben Fernando, co-lead on the project at the University of Oxford, says:

"This is an incredibly exciting opportunity to test the seismometers in one of the most extreme environments on Earth, and a valuable opportunity to explore how they might perform on one of the icy moons of Saturn or Jupiter one day."

Sue Horne, head of space exploration at the UK Space Agency, says:

"The UK is playing a leading role in space science and exploration, developing advanced technologies capable of performing in the harsh conditions found on distant worlds. This project will help prepare for future missions to the moons of Saturn and Jupiter, while using instruments first designed for Mars to monitor the formation of cracks in the Antarctic ice. It's an excellent example of how space technology is providing benefits here on Earth."

The Nodes were deployed in mid-January 2022, and commissioning of the SP sensor was completed around two weeks later. The first Antarctic deployment is expected to last 2-3 weeks, ahead of a potential longer deployment next year. The project is a partnership between BAS, the UK Space Agency, University of Oxford, and STRYDE.

Provided by British Antarctic Survey

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