EGU2020-1950
https://doi.org/10.5194/egusphere-egu2020-1950
EGU General Assembly 2020

Environmentally hardened, high-altitude, high-latitude seismic stations on Mt. Erebus, Antarctica

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The IRIS/PASSCAL Instrument Center is installing 5 seismic stations around the summit of Mt. Erebus, Antarctica. IRIS is funded by the National Science Foundation to install and maintain these stations long-term, a task undertaken by the Polar team at PASSCAL. The purpose of the network is to provide a baseline measurement of volcanic events and act as a fiducial array for future experiments. Each station's instrument package comprises a data logger recording a broadband and strong-motion seismometer, and a separate data logger recording an infrasound sensor. Station state of health and near real-time data are transmitted via Iridium modems.

The Mt. Erebus network is installed between 2000 m and 3400 m elevation spaced around the volcano summit. This is a particularly harsh environment for operating autonomous seismic stations with extreme low temperatures and high winds. Station power systems need to have enough capacity to winter-over for roughly 6-months without recharge. Station enclosures need to provide sufficient insulation to keep the data logger within its temperature operating range.

To design these stations for long term, 365/24/7 operation, we leveraged proven station enclosure and power system designs developed over the last 12 years of PASSCAL engineering seismic systems for Antarctica. The Mt. Erebus station design is modular and standardized, separating the bulk of the power storage and electronics' enclosures, allowing for streamlined upgrades or additions without having to overhaul the entire station. Power for the system will rely on lead acid batteries and solar charging; forgoing higher efficiency primary lithium thionyl chloride batteries used elsewhere in Antarctica, to reduce long-term station costs.

Station health will be monitored at IRIS/PASSCAL and low sample rate (20 sps) broadband data will be captured in near-real time. Higher sample rate data are recorded locally and collected annually during the austral summer. All data will be available from the IRIS Data Management Center.