Comparison of Automated Seismic Event Detection Approaches in East Antarctica

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Antarctica is almost completely covered by the world's largest ice sheet, and its hidden geologic structure partially controls the behavior of the ice layer. Recent advances in geophysical and remote sensing tools have allowed us to observe various transient phenomena, such as tectonic earthquakes, glacial bed slip events, and iceberg calving signals, all of which can be used to investigate solid Earth – cryosphere interactions. We analyzed seismic data collected by the TAMNNET temporary deployment as well as other stations in East Antarctica to identify and locate local icequakes, earthquakes, and other seismic events that occurred between 2012-2015. We employ two event detection approaches. The first is based on phase match filtering and waveform cross-correlation, which uses known events as templates to search through continuous data and to identify similar seismic signals. The second uses EQtransformer, a deep-learning-based event signal detector and phase picker. Event detections identified with both approaches will be compared to assess the effectiveness of these methods in East Antarctica. We also plan to use the combined constraints from our initial approaches to train a new machine-learning model and to assess its performance. Ultimately, our results will be used to evaluate automated event detection approaches for polar environments and to address fundamental questions related to tectonic-cryospheric interactions.