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Towards an Improved Catalogue of Shallow Ground Truth Events in Eastern North America

Depth estimation is an important part of discriminating anthropogenic from non-anthropogenic events. For small events in sparsely instrumented regions, there are few methods available for depth estimation. Ground-truth (GT) events at shallow depths will be a key part of any scheme to validate new methods. Although the ISC catalog contains more than a thousand GT events with $1 \text{ km} < \text{depth} < 5 \text{ km}$, just four of these are in Canada and just two more are in eastern North America. Rock bursts and other mining-related events in underground mines can be considered shallow ground truth events, inasmuch as the hypocentre can be constrained by direct observation. At CHIS we have good working relationships with many mine operators. In mid-2016, we began requesting depth information when confirming events. Up to present, we have assembled a catalogue of shallow GT blasts and mining-related events consisting of 161 events $2 \leq \text{MN} < 3$ and 25 events $3 \leq \text{MN} \leq 3.9$ ($\text{MN} \approx \text{MW} + 0.5$). These events form eight clusters, spanning 1600 km across Ontario and Quebec. We present this catalogue, and a preliminary investigation into methods of depth estimation using it, including regional depth phase and crustal Rayleigh wave modeling.

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