



Ground truth and detection threshold from WWII naval clean-up in Denmark

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The sea bed below the Danish territorial waters is still littered with unexploded mines and other ammunition from World War II. The mines were air dropped by the RAF and the positions of the mines are unknown. As the mines still pose a potential threat to fishery and other marine activities, the Admiral Danish Fleet under the Danish Navy searches for the mines and destroy them by detonation, where they are found. The largest mines destroyed in this manner in 2012 are equivalent to 800 kg TNT each. The Seismological Service at the National Geological Survey of Denmark and Greenland is notified by the navy when ammunition in excess of 100 kg TNT is detonated. The notifications include information about position, detonation time and the estimated amount of explosives. The larger explosions are clearly registered not only on the Danish seismographs, but also on seismographs in the neighbouring countries. This includes the large seismograph arrays in Norway, Sweden, and Finland. Until recently the information from the Danish navy was only utilized to rid the Danish earthquake catalogue of explosions. But the high quality information provided by the navy enables us to use these ground truth events to assess the quality of our earthquake catalogue. The mines are scattered though out the Danish territorial waters, thus we can use the explosions to test the accuracy of the determined epicentres in all parts of the country. E.g. a detonation of 135 kg in Begstrup Vig in the central part of Denmark was located using Danish, Norwegian and Swedish stations with an accuracy of less than 2 km from ground truth. A systematic study of the explosions will sharpen our understanding of the seismicity in Denmark, and result in a more detailed understanding of the detection threshold. Furthermore the study will shed light on the sensitivity of the network to various seismograph outages.