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A Robust P-Wave-Based Source Measure of the North Korean-Declared Nuclear Test

We explore the utility of additional phases in the initial P-wave packet for a more-transportable source estimator as well as to gain diagnostic insights into the 2013 North Korea-declared nuclear test (NK3). The amplitudes and periods of the "Pa" phase (first zero-to-peak), the "Pb" phase (first peak-to-first trough) and the "max" cycle are measured, with the associated station mb(Pa), mb(Pb), mb(Pmax) computed and then averaged across the IMS network for deriving the NK3 event mb(Pa), mb(Pb), mb(Pmax) of 4.62, 4.79, and 5.02, respectively. The magnitude differentials are then compared against the patterns of historic nuclear test sites reported in Jih et al. (1994). NK3 appears to be similar to the tests at Novaya Zemlya and Orenburg; and different from those in Nevada, Semipalatinsk or Argir. Since Pa phase is the initial down-going P wave which does not interact with the free surface above the explosion, the corresponding mb(Pa) is therefore a more direct measure of the isotropic source than mb(Pmax). The mb(Pa)-yield formula (Jih et al., 1993) results in 8.9±3KT for NK3. Other successful stories of using mb(Pa) as a more-transportable size estimator will be described. (Disclaimer: The views presented do not necessarily reflect those of the US Government.)

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