

Seismic Spectral Ratios between North Korean Nuclear tests: Implications for their Seismic Sources

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Seismic spectral ratios between the 2017 North Korean nuclear test(NKT2017) and four other Korean tests conducted in 2009(NKT2009), 2013(NKT2013), January, 2016(NKT2016J) and September, 2016 (NKT2016S) are investigated. All the observed teleseismic P-wave spectral ratios exhibit a unique notch at approximately 2.5Hz that is not observed for regional P- and Lg-wave spectral ratios. Meanwhile, the network-averaged Lg-wave spectral ratio is similar to that of regional P-wave, but with the source corner frequencies significantly reduced. We demonstrated that the observed notch of teleseismic P-wave spectral ratios may be well modeled by interference between pP- and P-wave, while regional P-wave spectral ratios may be well fitted with source spectral ratios predicated by classical explosion source models including MM71, DJ91 and their two hybrids. Results obtained indicate that for NKT2017's buried depth in the range of 600-1100m, the MM71-related models give a yield estimation about 100-300kt for NKT2017, 3-7kt for NKT2019, 6-15kt for NKT2013 and NKT2016J and 10-25kt for NKT2016S, while yield sizes obtained by model DJ91 are much smaller.

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