

## Estimates of radiated energy for shallow and intermediate-depth earthquakes beneath Northeastern Japan

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I studied radiated seismic energy for shallow (5-21km) and intermediate-depth earthquakes (64-156km) to understand the differences of source parameter scaling. In this study, I analyzed 32 shallow (MJMA 3.6 - 5.4) and 37 intermediate-depth events (MJMA 3.6 -6.5), that occurred in northeastern Japan from June 1996 to December 2001, and which were recorded by at the K-net and Freesia network stations. Because the Q structure is different at shallow and intermediate-depths, propagation effects were obtained separately for the two depth ranges. Also site response is considered to be a function of incident angle, so it was also examined separately for the two depth ranges. The results of the estimation of radiated energy show that intermediate-depth earthquakes have nearly constant energy to moment ratios. This is different from shallow events, which from previous studies are reported to have increasing energy to moment ratios as a function of moment. Comparing radiated energies for the two depth ranges at large moments, those of the shallow events are somewhat higher than intermediate-depth events, but the apparent stresses are almost the same. This implies that the seismic efficiency of intermediate-depth events is lower. For deep events more energy may go into heat and fracture formation.