

Constituents of Rayleigh-Wave Coda in Long Periods Revealed from Array Analysis

Takuto Maeda[1], Haruo Sato[2], Masakazu Ohtake[3]

[1] Geophys.Sci.,Tohoku Univ., [2] Geophysics, Science, Tohoku University, [3] Dept. of Geophysics,Tohoku Univ

Vertical-component seismograms in long periods are composed of multiple Rayleigh-wave arrivals propagating around the Earth, and scattered wave trains caused by topographical variations and other heterogeneities. Recently, Sato and Nohechi (2001) successfully synthesized envelopes of vertical-component seismograms until 20,000s in lapse time using a single isotropic scattering model for Rayleigh waves of the fundamental mode. However, it became clear that the amplitude of synthesized envelope is systematically smaller than observed envelope at large lapse times even if multiple scattering effects are taken into account. Here, we clarify the constituent elements of later envelopes by applying the f-k analysis to array data of the 1999 Kocaeli, Turkey earthquake (Mw 7.4). The result shows that direct and scattered Rayleigh waves of the fundamental mode are dominant in envelopes at lapse times earlier than about 30,000s, but the fundamental mode waves disappear and higher modes with large phase velocity are dominant later than 30,000s. Based on the above observation, we interpret the whole envelope up to 60,000s in lapse time by a composition of two dominant effects; single scattering of Rayleigh waves of fundamental mode for the early part, and dispersion and scattering of higher mode Rayleigh waves for the later part. The difference in wave constituent is attributed to smaller exponential decay of higher mode waves.