S052-P013

Cut-off distance of waveform correlation for closely located events

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For selected 11 clusters among aftershocks of the 1995 Hyogo-Ken Nanbu earthquake, we performed the relative hypocenter determination with respect to master events and calculated cross-correlation coefficients of seismograms at two stations for pairs of events in each cluster in frequency bands of 2-4, 4-8, 8-16, and 16-32 Hz. Cross-correlation coefficients are higher below 8Hz and decrease with increasing frequency above 8 Hz. We also found that cross-correlation coefficients decay with increasing event separation. If the source time function of small earthquakes is assumed to have simple shape, we think that dependence of cross-correlation coefficients on event separation below 8 Hz are mainly influenced by the heterogeneous structure around the earthquake source. We introduced a cut-off distance where cross-correlation coefficients first become lower than 0.6 with increasing event separation. The cut-off distance exhibits a clear regional difference: it is shorter than 4.5 km in Awaji region and longer than 4.5 km in Kobe region. This result implies that heterogeneity of structure around earthquake source is stronger in Awaji region than in Kobe region. The cut-off distance may be an indicator of heterogeneous structure in earthquake-source region.