

Small fluctuation of seismic structure around Mount Iwate detected by coherence analysis of multiplet earthquakes

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The waveform similarity of multiplet seismic events is expected to be lowered when seismic structure changes with time. In this paper, we examine the waveforms of multiplet earthquakes, in order to detect the temporal and spatial change of the structure beneath Mount Iwate, which had many volcanic earthquakes and significant crustal deformation in 1998.

We choose 85 pairs of multiplet earthquakes that occurred at the Pacific plate boundary from 1995 to 2000. Most of the earthquakes are located in the east and northeast of the volcano with epicentral distance from 80 to 290 km. We use the vertical component of the seismic waveforms of the multiplets at the 17 stations within 80 km distant from the summit of the volcano. We apply a band-pass filter of 1 to 16 Hz to the waveforms and select the waveforms with a signal to noise ratio larger than 5.

We evaluate the waveform similarity by coherence value of the waveforms at a frequency of 2 Hz over 10 seconds from the arrival of P-wave. Most of the coherence values obtained at the stations range from 0.9 to 1.0. We average the coherence values of all stations for one multiplet pair and calculate deviation of the coherence at each station from the average. The coherence values change spatially. Stations in the north and east of the volcano show coherence values near the average and its deviations are within 0.04. On the other hand, stations in the west and south of the volcano, to which seismic waves propagate through under the volcano, show coherence values slightly lower than the average. The maximum deviation is -0.16. These spatial change of the coherence values implies that the seismic structure around the volcano fluctuate in time for the period from 1995-2000.