



Can seismic tomography detect weak velocity changes? The practical application for the volcanoes in the Tohoku region.

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Temporal variations of seismic velocities in the active volcanic areas may give us important information about its evolution and development of geologic processes inside it. Usually we use “direct” method to reveal velocity changes with use of body wave’s data. In this method, a whole period of observations is divided into a several interesting for us periods. For each period, we obtain a seismic velocity model by means of seismic tomography. Finally, a seismic velocity changes between chosen periods is a difference between inverted velocity models for these periods. In case of weak velocity changes, this approach fails due to factors of varying events location and “event-station” rays distribution which influence can raise a false and apparent velocity changes in the model. With the aim to eliminate these factors and to increase the reliability of velocity changes detection, we propose an approach, which improves the similarity of datasets used for seismic tomography in different time periods by rejection some input events and rays information. We used this approach to the data of the Japan Meteorological Agency, which includes several years before and after the Mw 9.0 Tohoku-Oki event that occurred on 11.03.2011. We performed careful testing using different synthetic models, showing that the selected data subsets reveal weak velocity changes with amplitudes above 0.5%. We detected velocity reductions of P-waves on 0.8% and S-waves on 0.6% in the central area of Honshu possibly linked with the fluid system properties changes which triggered by Tohoku-Oki earthquake.