

Variable feeding regimes of the Kljuhevskoy group volcanoes (Kamchatka, Russia) derived from time-dependent seismic tomography

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We present the results of time-dependent local earthquake tomography for the Kljuhevskoy group of volcanoes in Kamchatka. We consider the time period from 2001 to 2008, which covers several stages of activity for Kljuhevskoy and Bezymianny volcanoes. During the entire period, we robustly observe a mantle channel below 25 km depth with anomalously high V_p/V_s values (up to 2.2), which is interpreted to be the main feeding source of the volcanoes of the group. In the crust, we derived complex structure that varies over the observation time. During the preeruptive period, we detected two levels of magma sources: one in the middle crust and one just below Kljuhevskoy volcano. In 2005, a year of powerful eruptions of Kljuhevskoy and Bezymianny volcanoes, we observe a general increase in V_p/V_s throughout the crust. In the relaxation period following the eruption, the V_p/V_s values are generally low, and no anomalous zones in the crust are observed. We propose that very rapid variations in V_p/V_s are most likely due to abrupt changes in stress and deformation regime, which cause fracturing and the active transport of fluids. This causes positive feedback, and the excessive stresses in the crust lead to volcanic eruptions.