



4D seismic structure beneath Spurr volcano, Alaska

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Mount Spurr is a large volcano located 125 km west of Anchorage, Alaska. This dominantly andesitic stratovolcano with summit elevation of 3374 m is the highest volcano of the Aleutian Arc. Two historical eruptions of Spurr volcano have occurred in 1953 and 1992. Moreover, from July 2004 to February 2006 continuous non-eruptive activity was observed. Since 1988 the Alaska Volcano Observatory (AVO) collects information about Alaska seismicity. In this work we present evolution of the seismic structure beneath Spurr volcano obtained from 4D seismic tomography. In total 222605 rays (129387 P and 93218 S rays) coming from 17068 earthquakes and registered by 26 station of AVO seismic network were used for the tomographic inversion. After analysis of the seismic and volcano activity, 5 time periods were chosen. Variations of P and S wave velocity anomalies and V_p/V_s ratio in this 5 time periods were obtained after simultaneous iterative inversion of one combined matrix. Smoothness of the velocity anomalies variation in space and time are controlled by two additional matrix block. Results reveal clear correlation of the seismic structure and volcanic activity. In the first (October 1989 – July 1996) and fourth (January 2004 – January 2007) time periods, characterized by high activity, a prominent vertical channel directly beneath volcano is observed on the vertical sections. This channel is characterized by very high values of V_p/V_s ratio (increased P wave and decreased S wave velocities). During the three other periods with no volcanic activity, when the relaxation of the media took place, seismic structure becomes more homogeneous without strong velocity anomalies. Special attention is paid to estimation of the model resolution in different time periods and analysis of possible artifacts due to different ray coverage in different periods. Therefore a lot synthetic and real data tests were performed.