



Crust-scale tomography in Finland based on earthquake and explosion data

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A three-dimensional travel time tomography is applied to earthquake and explosion data in order to derive crust velocity model for southern and central Finland. The observations for the study include P and S wave first arrivals from local explosions and earthquakes recorded by the 1998-1999 SVEKALAPKO seismic station array. In addition, previously measured P and S wave arrivals of local events registered at twelve Finnish permanent seismic stations in 1992-1993 are included as well as the phase picks of the shots of the DSS experiments in 1981, 1982, 1991 and 1994, recorded at geophones along the profiles and at permanent stations. Finally, all available first arrival readings from the 1979-2003 earthquakes, which have been recorded at the regional station network inside the target area, are added to the data base. Altogether 10100 first P arrivals and 10200 first S arrivals from 240 explosions and 460 earthquakes inside the study area (59-67N, 18-34E) are used in the inversions. The main objective is to create smooth P and S velocity models with highest optimal resolution in good agreement with the observed data and error limits. All non-controlled source events and earthquakes are relocated with grid search technique from the semi-final tomography model by minimizing the travel time differences between the synthetic and observed rays. Lateral resolution is estimated to be at least 60 km in the central study area to depth of 40 km. The distribution of the P and S velocities and the velocity ratios are varying locally in the whole crust. Especially, the velocity ratio anomalies lineate several distinct bodies and belts, which can be associated with the main geological units, i.e., the Archeozoic and Paleoproterozoic terranes, the Bothnian, southern and eastern Finland schist belts, the Central Finland Granitoid Complex and the Laitila and Wyborg rapakivi areas.