The characteristics of three different subduction zones in Iranian plateau

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Iranian plateau is a tectonically young complex region resulting from collision of Arabian Plate with Eurasia. Existence of three different subduction zones within different geographical parts provides different tectonic and geodynamic characteristics with the plateau. In this study, we use surface wave tomography method to image S-velocity structure of upper mantle and Moho depth variations across the Iranian plateau. Our results show that there is a clear evidence for subducting of Arabian plate beneath central Iran across the Zagros collisional zone in south-west Iran. Active subduction still occurs to the southeast of Iran where the oceanic part of Arabian plate is being subducted beneath Makran coast. The oceanic crust of South Caspian Basin is being westward under thrusting under Talesh and Alborz mountains in northern part of Iran.

To image *S*-velocity structure of upper mantle and Moho depth variations of Iranian plateau ,we apply surface wave tomography based on Partitioned Waveform Inversion (PWI) method(Nolet, 1990). PWI method consists of two steps: in the first step, 1-D average S-velocity model and average Moho depth is determined for each event-station propagation path using nonlinear waveform inversion. The results are given based on absolute S-velocity variations with depth for the given path. Then, 1-D S-velocity models obtained in the previous step, are firstly reformulated (normalized) with respect to a common background model and are secondly combined using a damped linear inversion algorithm to image 3-D S-velocity perturbations and Moho depth variations for the studied area. Depending on epicentral distances and quality of the data, the selected time window for waveform-fitting in the first step is started from beginning of S phases (for $\Delta \leq 30^{o}$) or SS (for $\Delta \leq 70^{o}$) to end of fundamental mode of surface waves. This indicates that only those phases with turning point in the upper-mantle are included in the inversion. Synthetic seismograms are constructed by mode-summation using the first 30 modes of Ray leigh waves, with phase velocitiesbetween2 and 10 km/s.

The efficiency of PWI method strongly depends on path coverage of waveforms in the studied region (Fig. 1). Our dataset consist of Z-component of broadband seismograms from events with a magnitude between 5.5 and 7.7 recorded by one temporary array and two permanent networks Of nearly 3000 seismograms originally analysised, we have fitted 974 waveforms from 47 events and 39 stations (Fig. 2) which result in 11688 linear constraints on upper-mantle S-velocity structure and Moho depth for the studied area

The damped linear inversion of the constraints derived from waveform fittings yields a 3-DS-velocity model and Moho map across Iranian plateau. In the following sections, we explain the results.

Diamond record of metasomatism

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The majority of diamond population from a kimberlite carry surface features developed during accent in kimberlite magma. However, a small proportion of each diamond population shows other resorption styles reflecting diamond-dissolution events prior to the kimberlite emplacement. In order to better understand the nature of diamond-destructive fluids (or melts) in the mantle we focused this study on the latter group. Detailed study of diamond morphologies, nitrogen content and aggregation, and internal structure using cathodoluminesence images was done for micro-diamonds from four kimberlite pipes from the Ekati Mine, Canada.

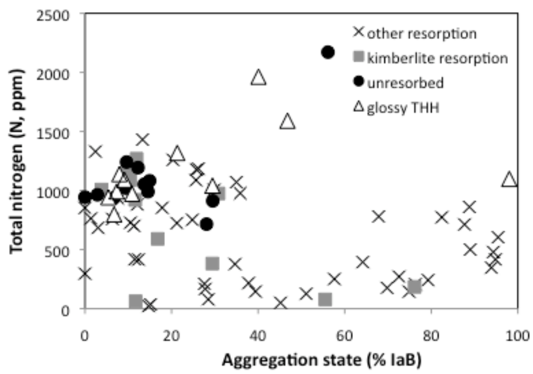

Figure 1: Nitrogen data for morphological groups.

We defined four groups: 1) unresorbed octahedral diamonds and those with "kimberlitic" resorption features; 2) stones with deep hexagonal and trigonal etch pits; 3) several types of step-faced crystals; 4) other surface features different from the "kimberlite-induced" resorption. A correlation between the resorption style and nitrogen content and aggregation state of diamonds determined by Fourier Transform Infrared analyses (Fig. 1) indicates similar thermal /crystallization history of diamonds with similar resorption style. Comparison to the products of high-pressure experiments [2] suggests diamond interaction with water-rich fluids in the mantle source. Further work will refine diamond grouping. The conditions of these resorption events will be constrained through diamond dissolution experiments.

[1] Fedortchouk *et al* (2010) *EPSL* **298**, 549-559. [2] Khokhryakov & Pal'yanov (2010). *Amer. Miner.*, **95(10),** 1508-1514.