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SEISMIC, THERMAL, AND GRAVITY MODELING OF THE IRANIAN LITHOSPHERE

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We investigate the Moho variations and upper-mantle structure across the Iranian plateau along the Ilam – Tehran transect using the joint inversion of P-receiver function (PRF) and a composed of group and phase surface-wave dispersion data (Figures 1 and 2). The robustness of the S-wave velocity model is evaluated by estimating the Bouguer anomalies obtained from conversion of the seismic velocity into density and comparing the results with the observed Bouguer anomalies. The results show a moderate variation of the Moho depth along the entire cross-section with a maximum of 58 km located beneath the Sanandaj-Sirjan Zone (SSZ) and Urumieh-Dokhtar Magmatic Arc (UDMA).

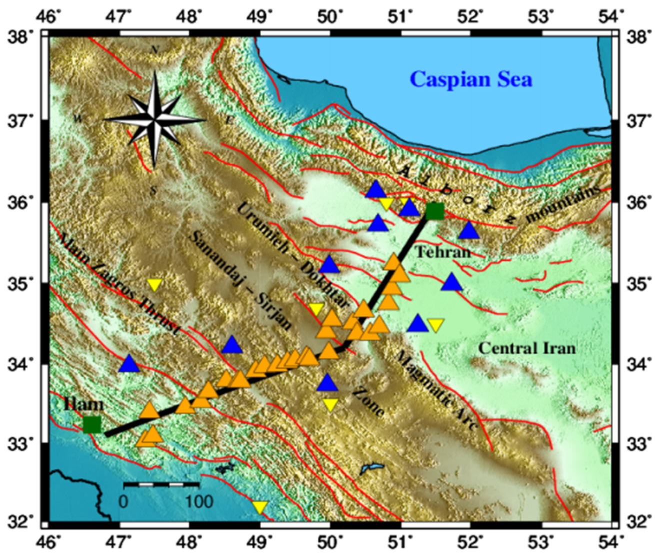

Figure 1. Topographic map (color pattern) from ETOPO1 between Ilam and Tehran covered by seismic stations along a broken line.

We interpreted the seismic velocity variations in terms of thermal anomalies using a mineral-physics approach and we traced the thermal LAB as the depth of the 1300˚C isotherm (Figure 3). Thick lithosphere is identified beneath the Mountain Front Fault (MFF) and the Arabian plate, while the lithosphere-asthenosphere boundary (LAB) shallows beneath the Main Zagros Thrust (MZT), consistently with previous geophysical data. The thin thermal lithosphere under the MZT indicates an upcoming of the asthenosphere, which is in agreement with Bouguer anomaly values. The thermal model suggests a channel-like structure beneath the UDMA, which connects the subsurface magmatic activities to the deep mantle processes. Furthermore, the abrupt temperature variations along the border between the Central Iran (CI) and Alborz Mountains suggests the presence of a structural boundary between the Iranian microplate and South Caspian block.

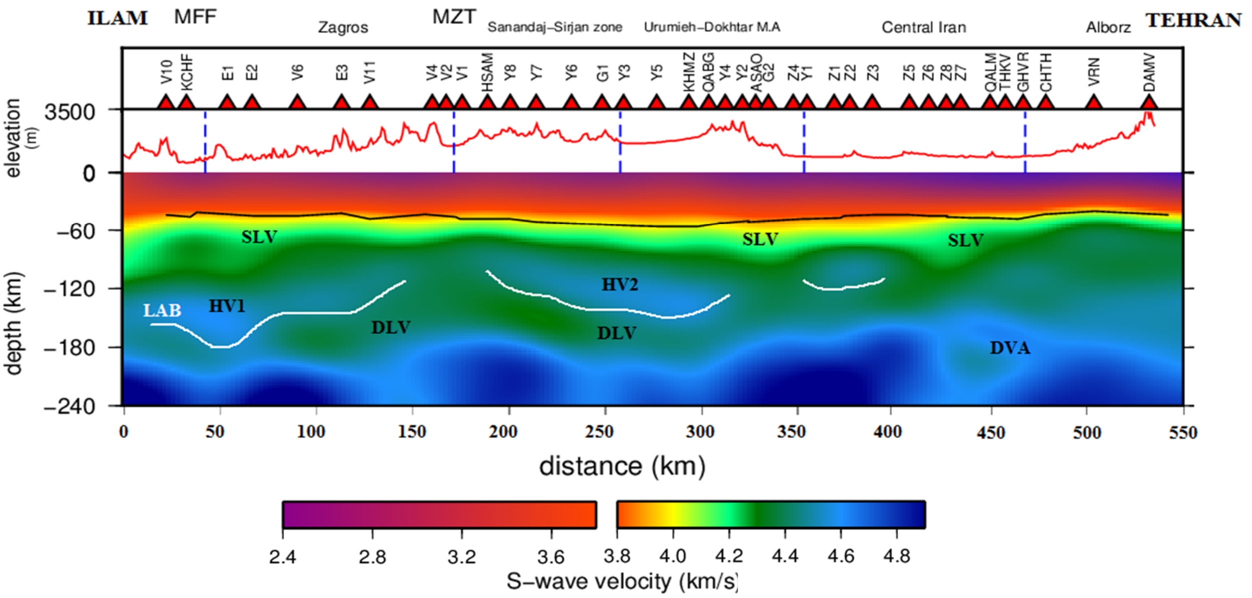

Figure 2. Crust and upper mantle velocity structure beneath Ilam – Tehran cross-section (see Figure 1 for its location) down to 240 km depth.

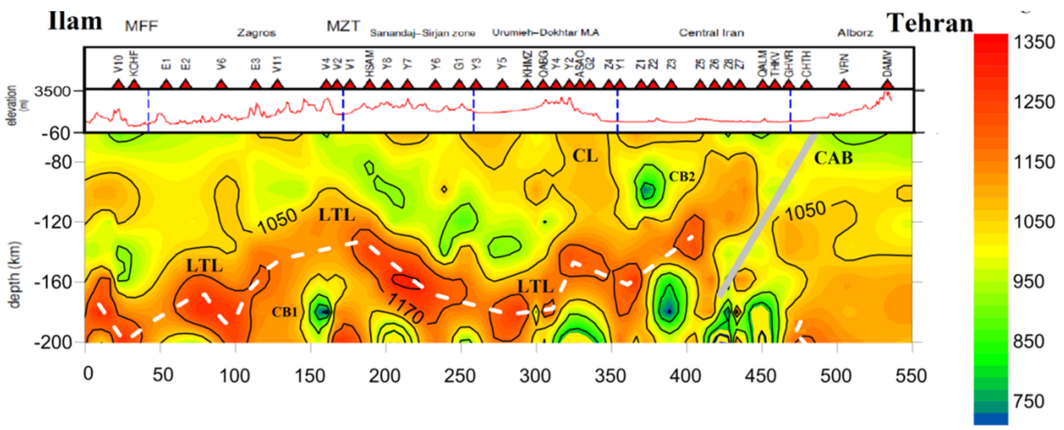

Figure 3. Temperature distribution beneath Ilam – Tehran cross-section within the upper mantle from a depth of 60 km down to 200 km.

REFERENCES

Julia, J., Ammon, C.J., Herrmann, R.B., and Correig, A.M. (2000). Joint inversion of receiver function and surface wave dispersion observations. *Geophysical Journal International*, *143*(1), 99-112.

Langston, C.A. and Hammer, J.K. (2001). The vertical component P-wave receiver function. *Bulletin of the Seismological Society of America*, *91*(6), 1805-1819.

Goes, S., Govers, R., and Vacher, A.P. (2000). Shallow mantle temperatures under Europe from P and S wave tomography. *Journal of Geophysical Research: Solid Earth*, *105*(B5), 11153-11169.