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TELESEISMIC VIRTUAL-SOURCE IMAGING OF THE NORTH ZAGROS CONTINENTAL COLLISION ZONE

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Teleseismic virtual source reflection (TVR) profile method uses free surface reflection of the teleseismic P wave (PpPp phase) data to image upper crustal structure beneath the Zagros continental collision zone. The data was collected by a temporary network deployed in Iran during the September 2013 to October 2014. 46 seismic stations (yellow triangles in Figure 1) have been installed along a 550 km long profile located between the Caspian Sea shoreline (i.e., Bandar-e Anzali) and political border of Iran and Iraq (near Ilam). The trend of profile is N35°E, perpendicular to general trend of the north Zagros. The profile a crosses the Zagros fold and thrust belt, Urumieh–Dokhtar magmatic arc, Central Iran and Alborz collision to the shoreline of Caspian basin.

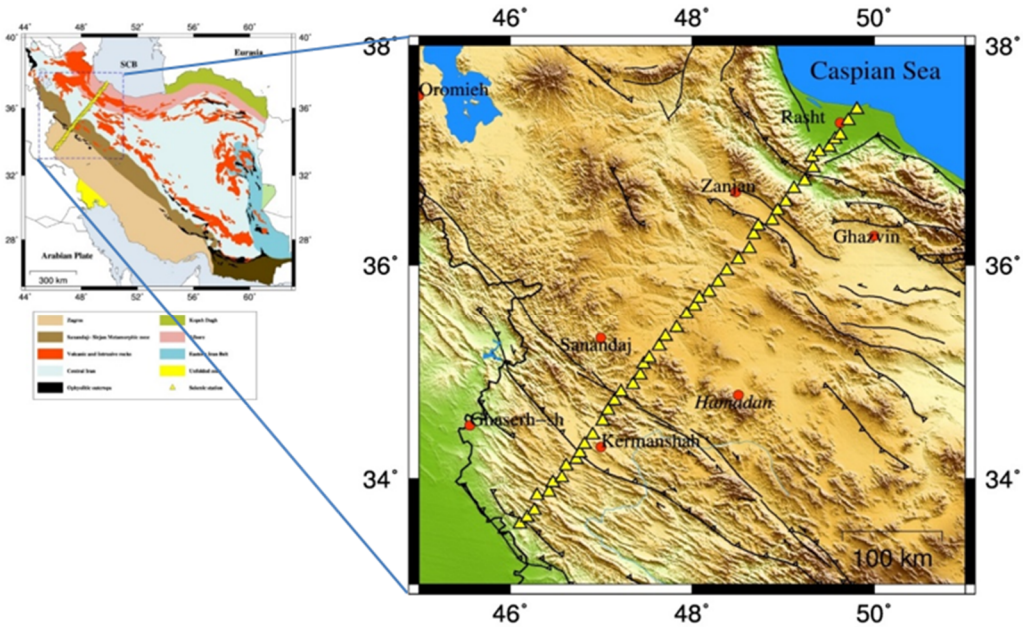

Figure 1. Study area; region covered by seismic stations (yellow triangles) along a line from the Caspian Sea shoreline to Political boundary of the Iran and Iraq.

To analyze teleseismic events recorded by the array we adopted the single-component teleseismic virtual source reflection profiling method (Li and Nabelek, 1999) to image the local reflection structures. The TVR profiling method maps the crustal reflectors by deconvolving the source time function from the reverberations of teleseismic body waves. PpPp phase can be found among P-wave coda and is considered as the convolution of P-wave source time function with the intracrustal reflection structure. By deconvolving the source time function from the P-wave coda, the PpPp can be

identified as a significant peak. The selection of teleseismic event is necessary to obtain the TVR profile. We applied event selection criteria according to near surface features generating several seconds delay time relative to direct P.

46 teleseismic events (1292 records) were selected with epicentral distance between 30° (to avoid major triplications from mantle transition zone) and 70° (to avoid destructive core phase PcP) and with depth greater than 70 km (to avoid interference of depth phases such as pP, sP with the P-wave reverberations). Then, data set were analyzed by the virtual source reflection profiling method (called autocorrelation averaging method by Li and Nabelek, 1999) and an imaged crustal upper crustal structure was obtained. The resolved PpPp delay times were stacked and converted to depth using proper velocity model reported before for each tectonic region. Thickness of Zagros sediments is in average about 9 km, Alborz sediments ~9 km and central Iran. We discovered a thick sediment basin in the Central Iran with depth of 8 km. A boundary was identified beneath the Zagros suture (i.e., Main Recent Fault) dipping northward to a depth of 25 km (8 s, Figure 3), 100 km north of the suture.

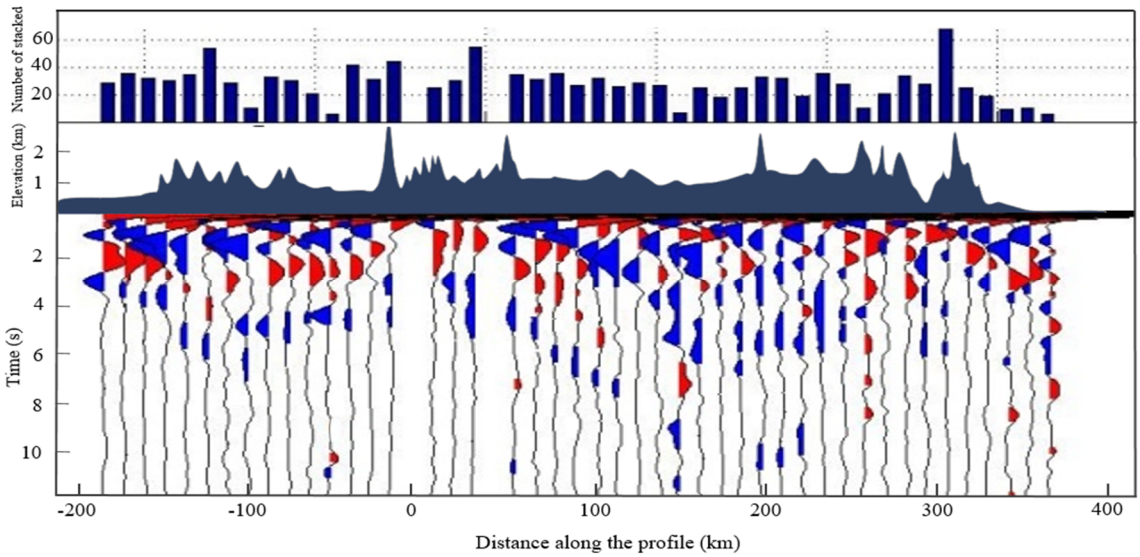

Figure 2. The stacked virtual source reflection profile employing 46 teleseismic events. Top panel shows number of stacked traces. The middle panel illustrate topography along the profile.

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