

Preliminary Results from North Anatolian Fault Passive Seismic Experiment: Receiver Functions and Anisotropy

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The North Anatolian Fault (NAF) is one of the world's largest continental strike-slip faults with a record of large devastating earthquakes and forms the northern margin of the Anatolian plate. The tectonic framework of the region is characterized by northward convergence of the Arabian and African plates with the relatively stable Eurasian plate. This convergence resulted in westward extrusion of the Anatolian plate during the past 5 -10 Ma. The North Anatolian Fault Passive Seismic Experiment is focused on the lithospheric structure and seismic properties of this newly coalescing continental transform plate boundary (Figure 1).

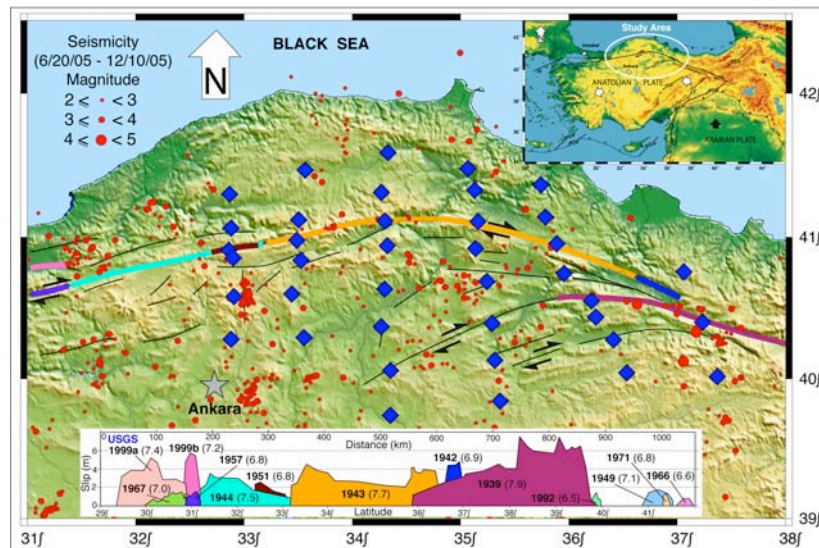


Figure 1. Seismo-tectonic map of the study area showing the geometry of the NAF network (blue diamonds) and segments of the NAF ruptured by major earthquakes in the past century.

Analysis of SKS splitting for 5 stations that were deployed 1 year ahead of the main array and GSN station ANTO indicates seismic anisotropy with delay times exceeding 1 sec. The fast polarization directions for these stations are primarily oriented NE-SW, which is oblique to the surface GPS velocity field, suggesting decoupling of the lithosphere and mantle strain of flow. Presence of similar observations from stations across the Anatolian Plateau in eastern Turkey indicates relatively uniform mantle anisotropy throughout the region. The receiver functions computed for these 5 stations revealed relatively high crustal V_p/V_s (>1.8) ratios and a flat Moho across the fault with ~ 35 km thick crust in the vicinity of the fault. Receiver functions recorded at station ALIC samples adjacent blocks across the fault and show a sharp change in upper crustal structure (0-20 km) but no Moho offset (Figure 2).

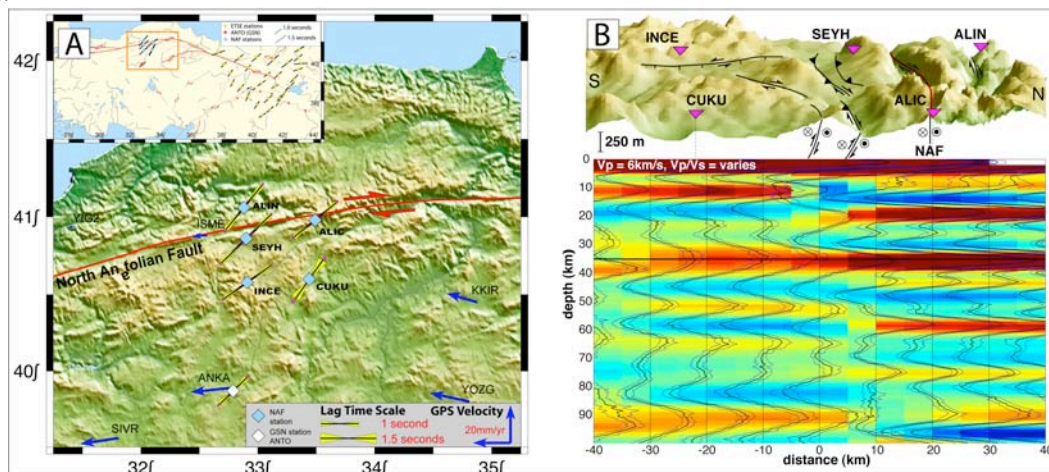


Figure 2. A) Map showing the results of anisotropy analysis and their relation to the observed surface velocities (GPS vectors). B) Illustration showing cross-section of stacked and migrated RFs for stations ALIC and CUKU and relation of the observed subsurface features with the surface tectonic features.