

Chapter 6

Concluding Remarks

6.1 Introduction

Teleseismic receiver function analysis has been shown to be a powerful technique. It extracts information down to at least the boundary between the upper and lower mantle, because it takes the advantage of teleseismic body wave data that have much stronger energy and longer wave lengths. Usually, controlled sources (explosions and/or vibrations) are not able to generate strong enough power to reach such a depth.

The receiver function method has less resolution than the near vertical and wide angle reflection methods because of the longer wave period (1-10s) of teleseismic body waves, therefore, it is less sensitive to small structural variations within the crust.

6.2 Crust-Mantle Boundary

The natural source receiver function technique shows that the Moho depth is smoothly increasing from 30 km west of the DST to about 35 km beneath the DST, and continues to deepen to nearly 40 km at the eastern most stations under the Jordan highlands along the linear controlled source array without any indication of a sudden difference at the DST.

The general trend of a continuous Moho depth is confirmed by the DESERT Group, (2003) and by the interpretation of potential field data (Al-Zoubi and Ben-Avraham, 2002).

At the northern and southern ends of the station network, the Moho depths are shallower than along the linear controlled source array. This would suggest that the Moho east of the DST forms a trough-like feature with deepest parts where the wide angle reflection/refraction profile is located (Fig.5.16).

The crustal thickness along Araba fault, between the Dead Sea and the Red Sea is 32-35 km depth.

6.3 Lower Crustal Discontinuity (LCD)

A lower crustal discontinuity (LCD) is observed beneath the DST and extends to the east. No similar feature is observed west of the DST. This indicates that the internal crustal structure east and west of the DST is different and the DST is of deep seated nature extending at least to the Moho. The receiver functions indicate no Moho or LCD deepening north and south of the linear array, which means that the crustal thickening across the DST towards the east is probably a local feature.

The DESERT Group (2003) has reported that the Araba fault reaches down to the mantle. On the basis of thermo-mechanical modeling by Sobolev et al. (2003) and observing the SKS splitting in this area by Rümpker et al. (2003) have also remarked that the DST cuts through the whole lithosphere, thus accommodating the motion between the African and Arabian plates.

6.4 The 410 and 660 km Discontinuities

Due to the uneven (irregular) distribution of distant earthquakes only information about the upper mantle transition zone east of the DST has been obtained. The two global discontinuities at 410 and 660 km are observed but the timings are delayed by about 2 s relative to the IASP91 global reference model.

The conversion times of the 410 km discontinuity are late for a typical continental upper mantle (Li et al., 2003), indicating that the upper mantle east of the DST is warm and 3-4 % slower than the standard model. This would indicate that the upper mantle across the DST is still strongly influenced by several geodynamical processes involving rifting, uplift and magmatism above the transition zone and below the Moho.