Chapter-6

SEAWARD DIPPING REFLECTORS AND CRUSTAL STRUCTURE
6.1 Introduction

The western continental margin of India is considered as a typical passive rifted margin (Biswas, 1982, 1987; Chandrasekharam, 1985; Mahadevan, 1994) evolved during three distinct rifting episodes as discussed in chapter-2. The southern part of the WCMI is generally considered as a non volcanic passive margin produced during the break-up between southern India and eastern Madagascar. Whereas, the northern part of the WCMI is a volcanic passive margin, developed during breakup of India-Laxmi Ridge-Seychelles continental block contemporaneous with predominant Deccan volcanic episode of excess volcanism. Despite the fact that the India-Madagascar break-up produced an extensive volcanic province along eastern Madagascar and basaltic flows and intrusives on the SWCMI as well as southwest Indian shield, the nature of this margin is not yet investigated enough to classify it as a volcanic margin.

In this chapter, the seaward dipping seismic reflectors identified from three MCS reflection profiles RE23, RE19 and RE17 along the western flank of the Laccadive Ridge, are analyzed under constraints of seismic refraction derived P-wave velocities. As discussed later in this chapter, these reflectors are interpreted as Seaward Dipping Reflectors (SDRs) – one of the diagnostic tectono-magmatic features of the volcanic continental margin.

Further, 2D gravity modeling is carried out along five transects (RE23, RE21, RE19, RE17 and RE15) of the southwest continental margin of India to achieve consistent geological models, which can account for interpreted feature of the present study and provide improved picture on crustal models reported earlier. Improved crustal structure of the SWCMI is important in constraining the geometry and structural parameters of the continental margins as well as continent-ocean transition.
6.2 Seaward dipping reflectors

Volcanic passive margins differ from non volcanic passive margins mainly due to presence of diagnostic tectono-magmatic features. These characteristic features are the huge volume of magma emplaced during initial stage of seafloor spreading typically as seaward dipping reflector sequences, numerous intrusive/extrusive bodies emplaced into the sedimentary basin (Berndt et al., 2001), and a lower crustal body with high P-wave velocity of more than 7.1 km/s (Planke et al., 1991; Eldholm et al., 1995). The studies carried out so far on passive continental margins worldwide suggest that Seaward Dipping Reflectors (SDRs) - one of the most distinctive features of a volcanic passive margin - represent flood basalts rapidly extruded during either rifting or initial stage of seafloor spreading. These Seaward Dipping Reflectors mark the offshore limit of the continent crust, thereby used to define Continent-Ocean Transition (COT) - a transitional boundary between continental and oceanic crust.

SDRs are a stack of laterally continuous, divergent and offlapping reflectors capable of yielding important evidence of evolution of continental margins. During continental break-up extensive extrusive constructions are emplaced along divergent volcanic margins. These constructions commonly include formations which appear as SDR sequences in the seismic record (Figure 6.1). Therefore, the SDRs are interpreted as voluminous basaltic flows emplaced sub aerially and/or in a shallow sub-aqueous environment during the latest period of rifting and earliest phase of sea floor spreading (Hinz, 1981; Austin and Uchupi, 1982; Mutter et al., 1982; Mutter, 1985; Planke and Eldholm, 1994; Gladczenko et al., 1998). These flows may be interbedded with sediments similar to those drilled on the Hatton Bank (Roberts et al., 1984). According to Hinz (1981) and Mutter et al. (1982) the regions of SDRs generally mark areas of rifted continent and their dips arose from the subsidence due to isostatic compensation of enormous volumes of basaltic lava flows emplaced during initial continental split-up.

The seaward dipping reflectors show diagnostic appearance in the seismic reflection profiles. Mutter (1985) noticed following consistent features of the SDR
Figure 6.1 Schematic diagrams showing genesis of SDRs along a linear zone of dyke injection in attenuated continental crust (Hinz, 1981).
sequences based on observations made from the multi-channel seismic reflection profiles acquired along the Norwegian continental margin.

i) The reflector sequences dip ubiquitously seaward. At the landward limit of the sequences they often assume a horizontal to near-horizontal attitude.

ii) The reflectors usually exhibit arcuate shapes indicating upward convexity.

iii) The reflectors diverge seaward and show an overall seaward offlap.

iv) The reflectors are distributed in the form of a seaward dipping wedge or fan shaped configuration. The seaward limit of the wedges is seldom well defined and shows no distinct basal reflector.

It has been observed that the SDRs occur immediately landward of the oldest mapped seafloor spreading type magnetic lineation, where the magnetic lineations could jointly define with the SDR sequences on a continental margin. In some cases they are associated directly with the oldest part of the anomaly sequence (Mutter et al., 1982). Seaward transition of SDRs to presumed oceanic crust could be marked by a topographic high. The SDR sequences are generally characterized by broad feather edge to the seaward and thin progressively landward to its interpreted apex. Feather edge of the SDRs have been used to demarcate seaward extent of the continental crust of the Voring Plateau of Norwegian margin, Argentina margin and east coast of US (White et al., 1987).

6.2.1 Seismic characters and identification of SDRs

In the present study, a set of westerly dipping seismic reflectors are observed below sedimentary column at three locations (Figure 6.2) along the western flank of the Laccadive Ridge imaged in the MCS reflection profiles RE23, RE19 and RE17. The dipping reflectors are a stack of laterally discontinuous to continuous, high amplitude, divergent and offlapping, westerly dipping reflectors (Figures 6.3, 6.4 and 6.5).

The MCS reflection profile RE23 depicts two sets of westerly dipping reflector sequences (u1 and u2) separated by ~5 km (Figure 6.3). These reflector sequences, occur at a depth of ~4.2 s TWT, are overlain by ~0.9 s TWT thick sediments and extend seaward for about 27 km. Another well developed dipping
Figure 6.2 Locations of SDRs identified along western flank of the Laccadive Ridge depicted in the seismic lines. Location of refraction station L08V (11.9067°N, 71.1750°E) is not shown in the map as it nearly falls on the SDR location of RE17. Other details are given in the Figure 5.1.

reflectors which extends seaward for about 27 km and overlain by ~1.2 s TWT thick sediments is identified along the profile RE19 (Figure 6.4). The top of the dipping reflectors lies at a depth of ~3.6 s TWT. Along the profile RE17 (Figure 6.5), the westerly dipping reflectors are overlain by ~0.95 s TWT thick sediments. Individual reflectors can be traced for about 15 km down dip and the depth to the highest distinguishable point of the reflectors is ~3.8 s TWT.
Figure 6.3 SDRs interpreted along part of the seismic profile RE23 depicting western flank of the Laccadive Ridge. u1, u2 and reflector L1-top are explained in the text.

In order to investigate the nature of the dipping seismic reflectors, published results of DSDP Site 219 (Whitmarsh et al., 1974) and refraction study at site L08V (Naini and Talwani, 1983) located on the crest and western flank of the Laccadive Ridge respectively are used. The velocity structure at site L08V (Table 6.1) which is close to the dipping seismic reflectors observed at seismic line RE17 shows the interval velocities of 1.65-2.12 km/s, 4.4 km/s, 5.6 km/s, 6.3 km/s and 7.2 km/s. The presence of chert layer of P-wave velocity 4.0 km/s of Early and Middle Eocene age overlain by about 1 km thick sediment over the Laccadive Ridge was inferred at DSDP Site 219. The chert layer appears as a strong diffuse reflector often with irregular surface and sawtooth appearance.
(Whitmarsh et al., 1974). Chaubey et al. (2002b) observed that reflection character of chert layer is of high-amplitude, and discontinuously associated with numerous diffraction hyperbolae.

Such reflection character at bottom of the sedimentary strata (Figures 6.3, 6.4 and 6.5) is not observed in the study area. Instead, it displays high amplitude and continuous reflector of the seismic sequence boundary L1-top. Below the reflector L1-top discontinuous to continuous, high amplitude, divergent, westerly dipping and offlapping reflectors are observed in the profiles RE23, RE19 and RE17.

The velocities in the range of 5.8-6.4 km/s are generally considered as characteristic of granitic layer in continental crust (Tucholke et al., 1981). From a compilation of global crustal model Mooney et al. (1998) suggested 6.1-6.3 km/s.
velocity to upper-middle crustal layer of extended continental crust. Deep seismic sounding investigations of the western Indian shield suggested that seismic velocity of Deccan flow basalt, lying below thick sediment column, varies between 4.7 to 5.1 km/s (Kaila et al., 1979, 1981; Reddy, 2005). From the study of dipping reflector sequence on Hatton Bank, White et al. (1987) suggested that the seismic velocities increase through the SDRs from typically 3.5 km/s at the top to about 6 km/s at the base. Therefore, seismic velocity of ≥4.4 km/s is assigned (below sediment column of velocity 1.65-2.12 km/s) for the dipping seismic reflectors considering the velocity structure of refraction station L08V (Table 6.1) located close to the dipping seismic reflectors on RE17. These seismic reflectors are therefore interpreted as volcanic reflectors. Considering the geographic location...
and seismic characters, these dipping volcanic reflectors are interpreted as Seaward Dipping Reflectors (SDRs).

The dipping volcanic reflectors, interpreted as SDRs, do not represent dipping normal faults because the seismic reflectors are not associated with half-graben structures which are formed during initial stage of continental rifting. Further, in the locations where the SDRs are interpreted, the sub-surface is clearly devoid of normal fault characteristics. In view of this, the dipping volcanic reflectors identified on the western flank of the Laccadive Ridge are well developed SDRs. Considering the genesis of SDRs, it is suggested that the dip of the SDRs arose by subsidence of basaltic lava flows subsequent to their emplacement during initial continental split-up.

Since the SDRs are interpreted as voluminous basaltic flows emplaced during the latest period of rifting, the identified SDRs along the western flank of the Laccadive Ridge are interpreted as indicative of rifted continental margin and the volcanism prior to the onset of seafloor spreading. The seaward feather edge of the SDR sequences indicates location of continent-ocean transition along western margin of the Laccadive Ridge. These results are published as a scientific research paper (Ajay et al., 2010).

Table 6.1 Seismic velocity of crustal layers at refraction station L08V.

<table>
<thead>
<tr>
<th>Layer velocity (km/s)</th>
<th>1.50</th>
<th>1.65</th>
<th>2.12</th>
<th>4.40</th>
<th>5.60</th>
<th>6.30</th>
<th>7.20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer thickness (km)</td>
<td>2.12</td>
<td>0.41</td>
<td>0.42</td>
<td>0.66</td>
<td>1.49</td>
<td>4.69</td>
<td>8.40</td>
</tr>
<tr>
<td>Layer thickness ([TWT (s)])</td>
<td>2.83</td>
<td>0.50</td>
<td>0.40</td>
<td>0.30</td>
<td>0.53</td>
<td>1.49</td>
<td>2.33</td>
</tr>
<tr>
<td>Cumulative layer thickness ([TWT (s)])</td>
<td>2.83</td>
<td>3.33</td>
<td>3.73</td>
<td>4.03</td>
<td>4.56</td>
<td>6.05</td>
<td>8.38</td>
</tr>
</tbody>
</table>

6.3 Crustal structure of SWCMI

Crustal structure of the southwest continental margin of India is obtained by 2D forward modeling of the free-air gravity anomalies along five traverses of the margin. Ship-borne as well as satellite altimetry derived free-air gravity anomalies are considered for the gravity modeling. Although crustal structure derived from gravity modeling is non-unique, modeling under constraints of seismic reflection
and refraction data provide better constrained results and thereby improve the interpretational reliability of the crustal structure.

### 6.3.1 Seismic velocity and density of crustal layers

2D gravity model studies are carried out under the constraints of seismic reflection and refraction results. For this purpose, the interpreted seismic reflection profiles of the present study, and refraction velocities (Francis and Shor, 1966; Rao, 1970; Naini and Talwani, 1983) from the stations 54V, 55V, 70V, 73V, 74V, 64V, 65C, 66C, 67C, 68C, 69C, 84C and ST2-3 in the Arabian Basin, L13V, L08V and L12V along the Laccadive Ridge, 85C, 88C, 87C and S4 along the continental shelf (Table 3.3) are used. Published results of Deep Seismic Sounding (DSS) on western Indian shield (Kaila et al., 1979, 1981; Krishna et al., 1991 and Reddy, 2005) are used to estimate the Moho depth on the continental shelf region.

The DSS investigations along Kavali-Udipi profile in the south, and Koyna-I and Koyna-II profiles in the north of the peninsular India shield revealed that the P-wave velocities vary between i) 4.7 and 5.1 km/s in Deccan Traps; ii) 5.5 and 5.8 km/s in Cuddapah sediments and Dharwar schists, and iii) 5.8 and 6.2 km/s in granites and granitic gneisses (Kaila et al., 1979; 1981, Reddy, 2005). The refraction velocity data, compiled from SWCMI, comprise of 1.65-3.5 km/s, 4.1-4.6 km/s, 5.4-5.7 km/s, 6.1-6.4 km/s and 7.2-7.4 km/s (Table 6.2). The seismic velocities 1.65-3.5 km/s represent sedimentary column, whereas 4.1-4.6 km/s represent basaltic flows/Chert. The rocks with velocities of 5.4-5.7 km/s and 6.1-6.4 km/s below sedimentary strata are similar to the velocities observed in Dharwar schists/Cuddapah sediments and granitic gneisses respectively. Therefore the seismic velocities 5.4-5.7 km/s may be considered as metasediments. The velocities 7.2-7.4 km/s may represent lower continental crust and heavily intruded lower crustal body. It may be noted that the granitic crustal velocities 6.1-6.4 km/s are slightly higher compared to those of DSS results. The high velocity may indicate altered granitic layer due to intrusive volcanism during rift related extensional tectonics and/or hotspot magmatism. The Arabian Basin characterized by the refraction velocities 2.15-3.74 km/s, 5.3-5.75 km/s and 6.36-6.65 km/s represents sedimentary layer, layer 2 and layer 3 of the oceanic crust respectively.
The seismic refraction velocities, discussed above, have been used to infer the density configuration for the continental as well as the oceanic crust. Densities for various crustal layers were obtained from velocity-density conversion table of Barton (1986) and presented in Table 6.2. The crustal velocities of the continental shelf, Laccadive Basin and Laccadive Ridge suggest four layers of densities 2.1, 2.65, 2.8 and 2.9 g/cm³. The density of 2.1 represents a sedimentary layer. The density 2.65 g/cm³ may represent a thick metasedimentary layer. The densities 2.8 and 2.9 g/cm³ represent upper and lower stretched continental crust respectively. In the model, a high density 3.0 g/cm³ is assumed for heavily intruded lower crust of the Laccadive Ridge. In addition a density of 2.4 g/cm³

Table 6.2 Crustal seismic velocities and inferred densities (after Barton, 1986)

<table>
<thead>
<tr>
<th></th>
<th>Thickness (km)</th>
<th>Velocity (km/s)</th>
<th>Average Velocity (km/s)</th>
<th>Density (gm/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arabian Basin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment</td>
<td>0.48-3.55</td>
<td>2.15-3.74</td>
<td>2.65</td>
<td>2.1</td>
</tr>
<tr>
<td>Oceanic Layer-2</td>
<td>1.28-2.43</td>
<td>5.3-5.75</td>
<td>5.5</td>
<td>2.7</td>
</tr>
<tr>
<td>Oceanic Layer-3</td>
<td>2.41-3.1</td>
<td>6.36-6.65</td>
<td>6.6</td>
<td>2.95</td>
</tr>
<tr>
<td>Moho</td>
<td>-</td>
<td>8.1-8.3</td>
<td>8.2</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laccadive Ridge, Basin and Shelf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment</td>
<td>0.43-2.8</td>
<td>1.65-3.5</td>
<td>2.58</td>
<td>2.1</td>
</tr>
<tr>
<td>Chert/Trap</td>
<td>0.66-2.0</td>
<td>4.1-4.6</td>
<td>4.35</td>
<td>2.4</td>
</tr>
<tr>
<td>Metasediment</td>
<td>1.49-1.93</td>
<td>5.4-5.7</td>
<td>5.55</td>
<td>2.65</td>
</tr>
<tr>
<td>Upper crust</td>
<td>1.84-4.69</td>
<td>6.1-6.4</td>
<td>6.25</td>
<td>2.8</td>
</tr>
<tr>
<td>Lower crust</td>
<td>7.99-8.4</td>
<td>7.2-7.4</td>
<td>7.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Lower Crustal Body (LCB)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3.0</td>
</tr>
<tr>
<td>Moho</td>
<td>-</td>
<td>&gt;8.0</td>
<td>-</td>
<td>3.3</td>
</tr>
</tbody>
</table>
is used for basaltic-flow/chert, and 2.65 g/cm$^3$ density for SDRs in this study. In the Arabian Basin the crustal velocities suggest three layers of densities 2.1, 2.7 and 2.95 g/cm$^3$ representing sediment, layer 2 and layer 3 of the oceanic crust respectively. A uniform value of 3.3 g/cm$^3$ is assumed for the upper mantle.

6.3.2 Gravity modeling

Five uniformly spaced transects of the SWCM1 are selected along the lines RE23, RE21, RE19, RE17 and RE15 to carry out gravity modeling under the constraints of seismic reflection and refraction results. The four seismic lines RE23, RE21, RE19 and RE17 were extended into deep Arabian Basin till 68°E for the purpose of crustal modeling from known oceanic crust of the Arabian Basin to continental shelf. Satellite altimetry derived gridded free-air gravity anomaly database of Sandwell and Smith (1997) are used to reconstruct the gravity profile where the ship-borne free-air gravity anomaly data are either partly available or absent along the seismic lines. The resolution of the satellite data was first evaluated by comparing profiles extracted from the gridded satellite gravity data with coinciding ship-borne gravity profile. The very good match between the gravity profiles from two different data sources (Figure 6.6) gave confidence that the resolution of the satellite-derived gravity data was adequate for crustal structure modeling.

![Figure 6.6 Match between ship-borne as well as satellite altimetry derived gridded free-air gravity anomaly data along the seismic line RE17.](image)
For gravity modeling, main crustal layers and its thicknesses are identified based on seismic reflection results of the present study, and refraction results (Francis and Shor, 1966; Rao, 1970 and Naini and Talwani, 1983) reported for the study area. 2D gravity modeling was carried out using the GM-SYS software. Modeling was performed by applying small adjustments to the geometries of crustal layers in order to obtain a crustal model which satisfies both the geometrical constraints and an acceptable fit between observed and calculated free-air gravity anomalies. In order to obtain an acceptable fit between the observed and calculated gravity anomalies over the Laccadive Ridge, a high density (3.0 g/cm$^3$) Lower Crustal Body (LCB) is introduced below the Ridge. A reasonable fit between the computed and observed gravity anomalies is obtained with an RMS error <5 mGal. In the models, igneous intrusive bodies are expressed only in sediments and water column as there is no appreciable lateral density contrast with other adjoining crustal layers.

6.3.3 Results on crustal structure

Crustal structure obtained from 2D gravity modeling along five representative transects of the southwest continental margin of India are presented in Figures 6.7, 6.8, 6.9, 6.10 and 6.11. The crustal models suggest two major crustal domains: continental and oceanic. The stretched continental crust; comprised of continental shelf-slope, Laccadive Basin, and Laccadive Ridge and characterized by a number of magmatic intrusive/extrusive bodies; gradually thin towards west and juxtaposed with the oceanic crust of the Arabian Basin. The models show average crustal thicknesses of 22.5, 19 and 6.5 km for the outer shelf, Laccadive Ridge and Arabian Basin respectively. The COT is demarcated immediately west of the Laccadive Ridge, seaward of the SDRs, where the free-air gravity anomaly shows a prominent low and the Moho is characterized by significant shoaling to an average depth of 10.5 km to the Arabian Basin. Despite having a number of common structural characteristics, each of the transect exhibits considerable variation in crustal thickness and several unique structural features, therefore they are described individually in the following sections.
6.3.3.1 Transect RE23

Transect RE23 extends 923 km to west from continental shelf to the oceanic domain of the Arabian Basin (Figure 6.7). The 2D gravity model along the transect shows very good fit between the long wavelength components of the observed and calculated anomalies. However, the short wavelength components show minor misfits which may be largely attributed to the presence of tilted faulted blocks, grabens, igneous intrusive bodies and SDRs along the transect. Maximum crustal thicknesses of 22, 19.5 and 6.3 km are estimated for the continental shelf, Laccadive Ridge and Arabian Basin respectively from the crustal model.

Moho depth is highly varying between 5 and 22 km along this transect. The Maximum Moho depth estimated below outer continental shelf, Laccadive Ridge and Arabian Basin are 22, 21 and 10 km respectively. The Moho is shallow (13.5 km) and more or less flat below major part of the Laccadive Basin. The Moho below the Arabian Basin shows gradual rise from 10 km near west of Laccadive

![Figure 6.7 2D crustal model based on free-air gravity anomaly across the southwest continental margin of India along the seismic line RE23. PR: Prathap Ridge, SDRs: Seaward Dipping Reflectors, LCB: Lower Crustal Body, COT: Continent-Ocean Transition.](image)

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Ridge to 9.3 km at the WSW end of transect. A lower crustal body of maximum thickness 11.4 km is interpreted below the Laccadive Ridge indicating heavily intruded lower continental crust of the Laccadive Ridge. The ridge is associated with several magmatic structures such as igneous intrusives, basaltic flows/Trap and SDRs. COT is demarcated immediately west of the Laccadive Ridge, seaward of the identified SDRs, where the Moho shows a sharp rise to a depth of 10 km with a prominent drop in free-air gravity anomaly. The Prathap Ridge, associated with a significant free-air gravity anomaly high, is interpreted as uncompensated feature as it does not show flexure in the Moho.

6.3.3.2 Transect RE21

The transect RE21 extends from the continental shelf for 840 km to the oceanic domain of the Arabian Basin (Figure 6.8). Maximum crustal thicknesses estimated below the continental shelf, Laccadive Ridge and Arabian Basin are 19, 17.3 and 6.8 km respectively. The Moho depth varies between 9.8 and 19 km along this transect. A maximum Moho depth of 19 km is estimated below outer shelf and Laccadive Ridge. Below the Arabian Basin the maximum depth to Moho is 10 km. The Moho shoals from 19 km below the outer shelf to 13.3 km beneath the

Figure 6.8 2D crustal model based on free-air gravity anomaly across the southwest continental margin of India along the seismic line RE21.
Laccadive Basin. The Moho is more or less flat beneath the basin. The Moho shows gradual decreases in depth from 10 to 9.8 km, below the Arabian basin to the WSW end of the transect. The LCB interpreted below the Laccadive Ridge has a maximum thickness of 9 km. COT is demarcated immediately west of the Laccadive Ridge where the Moho is characterized by a sharp shoaling to a depth of about 10 km associated with free-air gravity anomaly low. The Prathap Ridge is associated with relatively subdued gravity high. The uncompensated ridge is overlain by significantly thick sediment in the Laccadive Basin.

6.3.3.3 Transect RE19

Transect RE19 extends from the continental shelf to the Arabian Basin for about 780 km (Figure 6.9). The continental shelf, Laccadive Ridge and Arabian Basin, shown in the model, are characterized by maximum crustal thicknesses of 23, 19.5 and 8 respectively. The Moho depth is highly varying between 10.2 to 23 km along this transect. Maximum Moho depths of 23, 20.8 and 11 km are estimated below the outer shelf, Laccadive Ridge and Arabian Basin respectively. The Moho...
risees below Laccadive Basin to a depth of 16 km. The Arabian Basin is characterized by gradual decrease in Moho depth from 11 km near west of the Laccadive Ridge to 10.2 km to the WSW end of the transect. The Laccadive Ridge is associated with several intrusive bodies showing prominent gravity anomaly high. The interpreted LCB has a maximum thickness of 8.7 km. The COT is demarcated to the west of the Laccadive Ridge, seaward of the SDRs, where the Moho depth decreases sharply to a depth of 11 km associated with a prominent free-air gravity anomaly low.

6.3.3.4 Transect RE17

Gravity model along the 754 km long transect RE17 extends from the continental shelf to the Arabian Basin (Figure 6.10). The model suggests maximum crustal thicknesses of 25, 18.9 and 7 km for continental shelf, Laccadive Ridge and Arabian Basin. The Moho depth varies from 10 to 25 km along the transect. The maximum Moho depths estimated below the continental shelf, Laccadive Ridge and Arabian Basin are 25, 19.3 and 10.5 km respectively. Below the Laccadive Ridge, the Moho depth decreases to a depth of 11 km associated with a prominent free-air gravity anomaly low.

Figure 6.10 2D crustal model across the southwest continental margin of India along the seismic line RE17.
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Basin the Moho rises gradually to a depth of 15.4 km. The Moho depth below the Arabian Basin gradually decreases to the SW end of the transect from 10.5 to 10 km. The LCB interpreted below the Laccadive Ridge has a maximum thickness of 7.6 km. The COT is demarcated to the west of Laccadive Ridge, seaward of the identified SDRs, where the Moho shows sharp shoaling to a depth of 10.5 km associated with a low in free-air gravity anomaly. The uncompensated Prathap Ridge is associated with prominent free-air gravity anomaly highs in the Laccadive Basin.

6.3.3.5 Transect RE15

Transect RE15 extends for about 832 km from the continental shelf to the Arabian Basin (Figure 6.11). The continental shelf, Laccadive Ridge and Arabian Basin show maximum crustal thickness of 23.6, 20.2 and 6.9 km respectively. The Moho depth, along the transect, is varying between 10.5 and 23.6 km. The maximum depth to Moho estimated below the continental shelf, Laccadive Ridge and Arabian Basin are 23.6, 22 and 11 km respectively. The Moho depth below the

![Figure 6.11 2D crustal model across the southwest continental margin of India along the seismic line RE15.](image-url)
Laccadive Basin decreases to 18 km. Below the Arabian Basin the Moho is characterized by gradual rise from 11 to 10.5 km to the end of the profile. The interpreted LCB shows a maximum thickness of 9 km. COT is demarcated west of the Laccadive Ridge where the Moho shows a sharp rise to a depth of 11 km associated with a free-air gravity anomaly low. The Prathap Ridge as well as the uplifted flat summit structural high, covered by the sediment, shows prominent free-air gravity anomaly highs in the Laccadive Basin.