

Chapter 4

Data

4.1 Introduction

In this chapter, teleseismic earthquakes recorded by DESERT temporary seismic stations (Fig. 4.1) have been used to study the crust and the upper mantle discontinuities in the DST region. The temporary seismic network has been provided by the GeoForschungsZentrum (GFZ), Potsdam, Germany. Descriptions of the seismic stations, statistical aspects of the dataset and the data selection are discussed in the designated sections.

4.2 Seismic Stations

The passive seismological part of the DESERT, was started in April 2000. A temporary seismic network consisting of broadband and shortperiod seismic stations (Table 2.1, Appendix B) had been set up in the area (Fig. 4.1). Their coordinates and elevations are given in Table 2.1, Appendix B. These stations have been in operation between April 2000 and June 2001. The maximum number of the stations came into operation in November 2000.

The aperture of the network is approximately 250 km in the NW-SE direction from the Mediterranean Sea near Gaza city crossing Wadi Araba fault into the highland area in Ma'an/Jordan and 150 km in S-N direction between the Dead Sea and the Red Sea along Wadi Araba fault. Shortperiod seismic stations were equipped with 1 Hz mark L4, while the broadband seismic stations were equipped with Guralp 40-T, 3-T and Streckeisen STS2, respectively.

During one year of successful operation, data were continuously recorded in the field at 50 Hz sample frequency. The raw field data were converted to miniseed format and archived as full seed volume in the public GEOFON data center of the GFZ, Potsdam / Germany.

4.3 Data Selection

The data which have been used for this study, from three component seismic stations, were selected according to the following criteria:

1. Only teleseismic earthquakes with epicentral distances ranging from 30° to 93° have been used to calculate receiver functions.
2. Earthquakes with magnitudes greater than 5.5° and clear records of P onsets with high signal-to-noise ratio have been selected.
3. Earthquakes within all depth ranges (shallow, intermediate and deep) were selected.

The waveform data of each teleseismic earthquake record are requested in a time window from 100 s before the theoretical P arrival and 300 s after P arrival.

A total number of 92 useful teleseismic earthquakes (shown in Table 1.1, Appendix A) according to the described criteria have been used in this study. The epicenters of the selected earthquakes are shown in Fig. 4.2, where most of the events are in the NE quadrant.

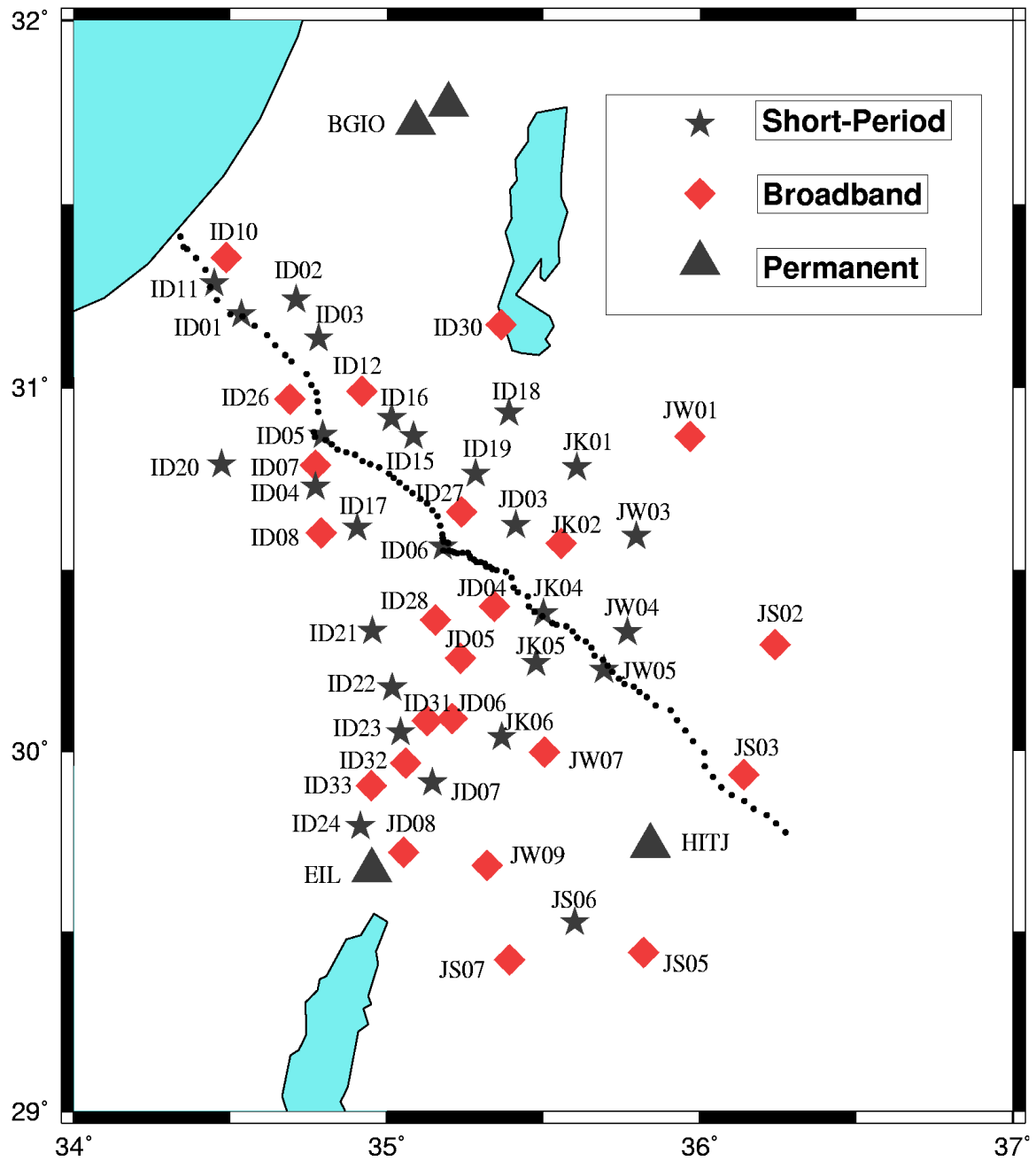


Figure 4.1: Location map showing the distribution of all seismic stations of the DESERT temporary network.

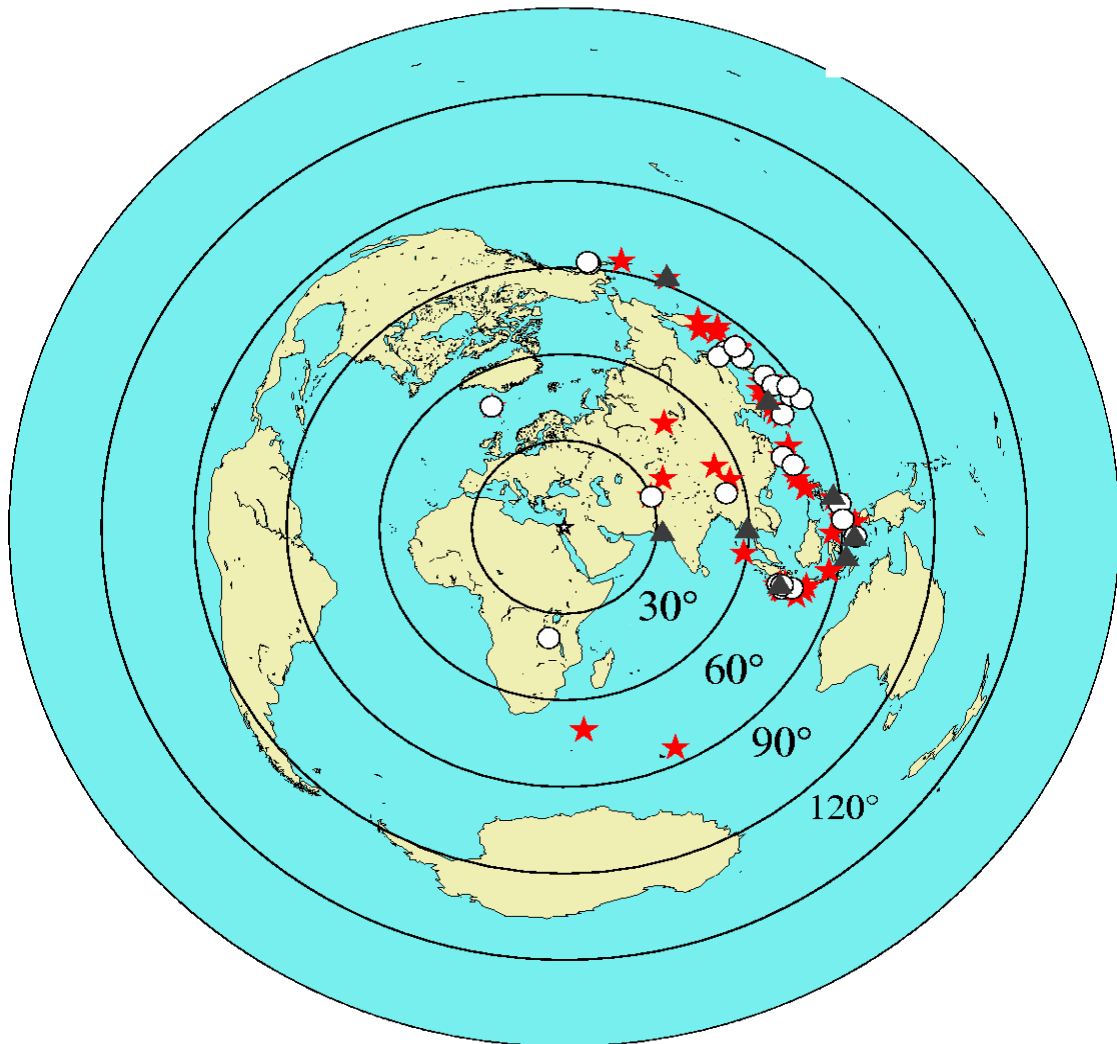


Figure 4.2: Distribution of 92 teleseismic earthquakes (Table 1.1, Appendix A) as recorded by DESERT temporary network during its operation time from April 2000 to May/June 2001. Stars and circles represent earthquake magnitudes from 5.6-5.9 and 5.9-6.3, respectively, while triangles represent earthquake magnitudes greater than 6.3.

4.4 Characteristics of the Dataset

Some characteristics of the selected dataset are displayed in Fig. 4.3 (a-d). Fig. 4.3a shows the distribution of the events versus their epicentral distances from the network. This indicates that number of records at larger epicentral distances (70° - 93°) are larger compared to the smaller epicentral distances.

Figs. 4.3b and c, show the distribution of the teleseismic events in terms of depth and magnitude, respectively, indicating that most of the teleseismic earthquakes occurred at shallow depths less than 50 km and magnitudes less than 6.0. Fig. 4.3d represents the distribution of the events according to their back azimuth.

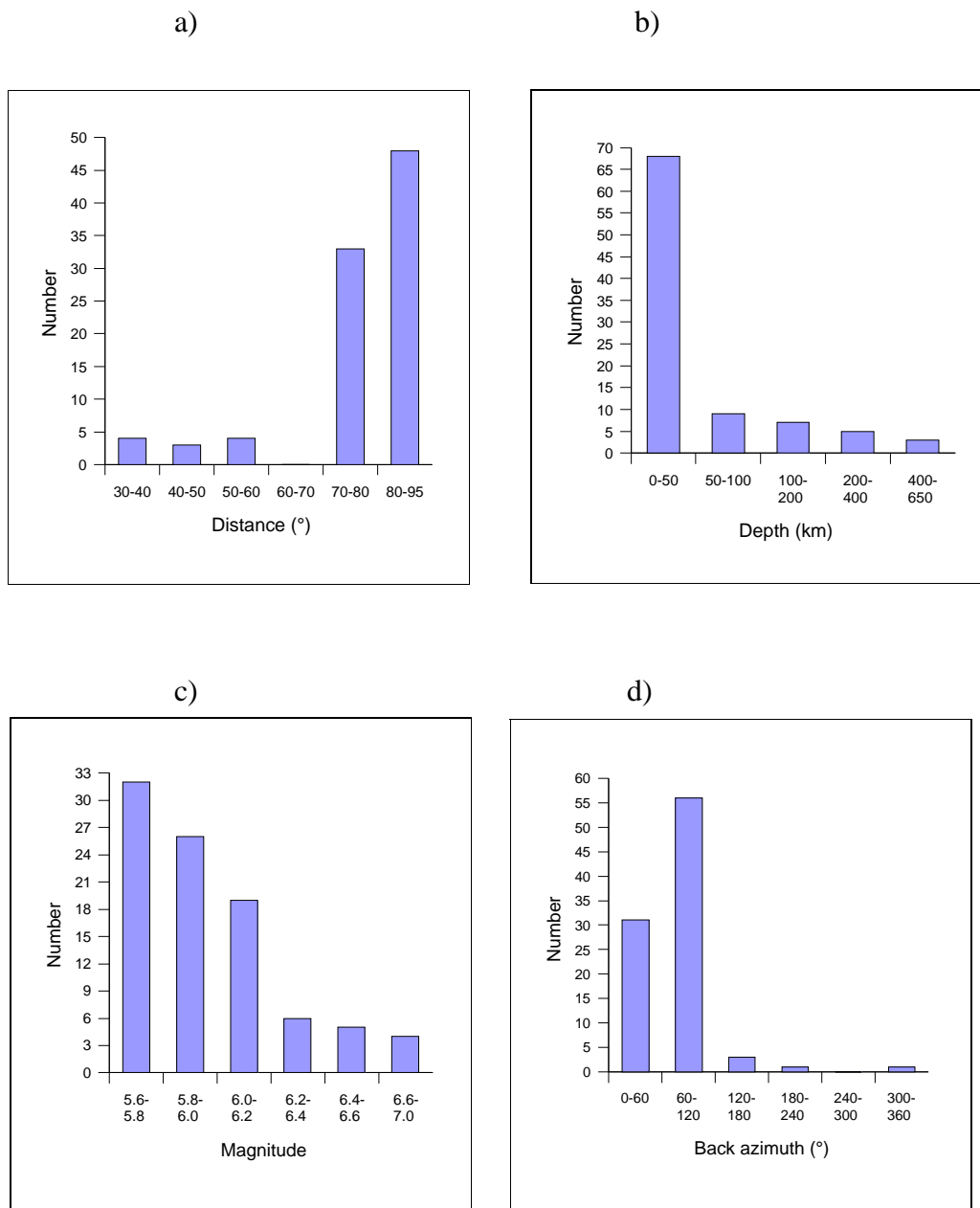


Figure 4.3: Characteristics of all earthquakes used in this study. a) represents the distributions of epicentral distances. b) distribution of focal depths. c) distribution of magnitudes and d) distribution of back azimuths.