

8 Deep Seismic Structure (Mauritania and Central Morocco)

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ABSTRACT

This paper presents two crustal sections through the Moroccan and Mauritanian continental margin in the vicinity of the Canary and Cape Verde Islands. The sections are based mainly on joint refraction surveys of the Institut für Geophysik (Hamburg) and the Federal Institute for Geosciences and Natural Resources (BGR, Hannover) and additional information from published refraction work in the survey areas.

On both sections rift basins were crossed, in which evaporites had formed diapirs. A 7.1 - 7.3 km/s layer could be followed from the rise to the shelf in both areas, while Moho arrivals could only be observed over the continental rise of Mauritania. Here the typical oceanic layer 2 seems to be thin or missing in a more than 100 km wide zone of transitional crust, in which the 7.1 km/s layer probably forms the top of the crystalline basement. From this structural relationship a model is postulated, which interprets that prominent 7.1 km/s refraction horizon as the cooled and solidified top of the original elongated mantle plume that lead to the splitting up and contributed to the drifting of the continents. A thick layer with a velocity of 5.8 km/s overlying the postulated plume surface off Morocco could then either constitute > 100 km of thinned continental crust or massive carbonate sediments. From the refraction results clear indications for an oceanic crust exist only more than 100 km west of the present continental slope.

The lithological interpretation of the seismic velocities is complicated by the presence of high velocity ($v_p > 5$ km/s) carbonate platform rocks under the continental slope and of volcanic rocks (intrusions on the shelf, sea-mounts and islands on the rise and slope).

1. Introduction

The evolution of passive continental margins with its relation to sea-floor spreading and plate tectonics has been studied geologically and geophysically for more than ten years. Especially the continental margin of North West Africa was the object of several expeditions, some of which partly served as DSDP/IPOD pre-site surveys, of the German vessels "METEOR" and "VALDIVIA" in the period 1967-1980 (Closs et al., 1969; Seibold and Hinz, 1976). On four cruises (Fig. 1) the deep crustal structure off Mauritania ("VALDIVIA"-cruise 10) and off Morocco ("METEOR"-cruises 39, 46 and 53) has been studied by explosion refraction seismics (Weigel et al., 1977; Weigel et al., 1978; Thiessen, 1979; Hansen, 1979; Goldflam et al., 1980; Gebhardt and Weigel, 1981; Wissmann, 1979; Hinz et al., this Vol.), partly combined with refraction seismic investigations in Morocco (Makris, 1981) and on Lanzarote (Pavia, 1977).

The history of the continental margin surely can be linked to the geological events on the bordering continental regions. From the results presented in this paper it is obvious, that in the important transition zone between ocean and continent, informations from the deeper crust are sparse. Nevertheless, an evolutionary model has been derived.

The main geological structures of Northwest Africa are

1. offshore volcanic features, such as the Canary Islands (Bosshard and Macfarlane,

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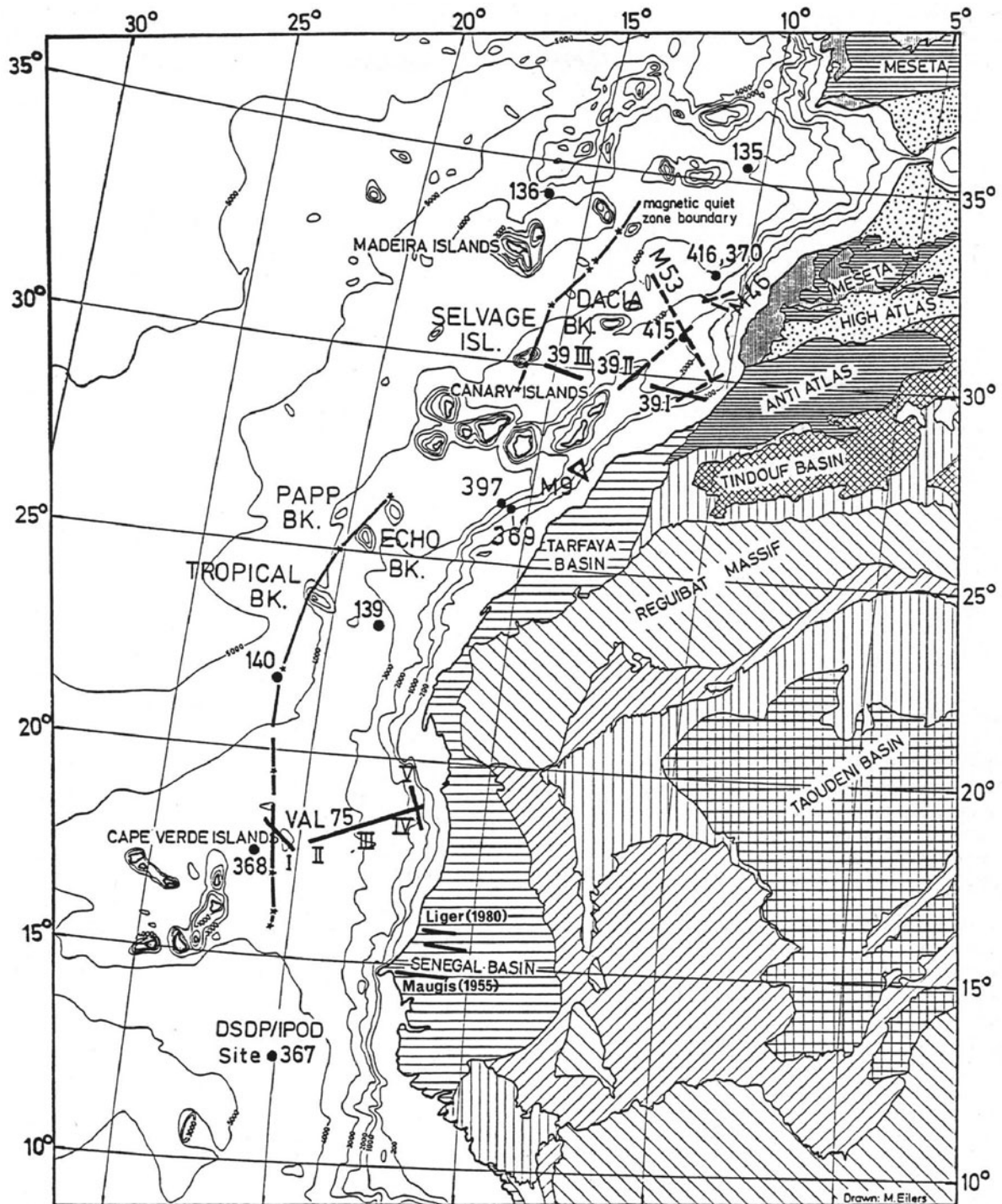


Fig. 1. Deep seismic sounding on the continental margin of NW-Africa by IfG Hamburg and BGR Hannover.

Solid lines: refraction seismic profiles (I, II...).

VAL 75 : VALDIVIA cruise 10/1975, I : Cape Verde Rise

M 39 : METEOR cruise 39/1975, 39 I : Continental margin off Mauritania

39 II : Conception Bank (in strike profile)

39 III: Conception Bank - Selvagem Grande

M 9 : METEOR cruise 9/1967

dashed lines: M 46/1977, M 53/1980 (Thiessen, 1979; Gebhardt and Weigel, 1981)