HEAT FLOW MEASUREMENTS ON THE MEDITERRANEAN RIDGE INDICATE TRANSIENT PROCESSES OF HEAT TRANSFER BETWEEN THE SEDIMENTS AND THE WATER COLUMN (MAST II - MEDRIFF PROJECT)

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We present the results of 120 conventional heat flow density (HFD) measurements with *in-situ* determination of the thermal conductivity, collected across the Mediterranean Ridge (MR), from the Jonian abyssal plain to the Matapan Trench, during the Urania, Discovery and Le Suroit cruises undertaken from September 1993 to June 1994. The investigations are part of the 3-year multidisciplinary MAST II-MEDRIFF (An Integrated Investigation of the Fluid Flow Regime of the Mediterranean Ridge) research project funded by the Commission of the European Communities.

The HFD measurements in the sediment were complemented by 7 CTD profiles which provided information on the thermal structure of the water column and were used to calibrate the absolute temperature readings of the heat flow probes. Temperature and pressure data of the heat flow probes were then used to integrate the CTD data in the water column and to provide reliable temperature profiles in the brines of the newly discovered Urania and l'Atalante brine lakes, located on the MR Inner Plateau, WSW of Crete.

Temperature data in the l'Atalante and Urania brine lakes indicate that both lakes are thermally stratified. Three layers with temperature slightly lower than in the sea bottom water were identified in the l'Atalante basin. Contrasting with these low temperatures of the l'Atalante basin, temperatures up to 29°C were measured in the bottom layer of the Urania lake, which suggest active or very recent inflow of warm brines into this lake. We discuss some of the implications of the thermal data in terms of the source and nature of the brine lakes.

A puzzeling observation made outside the brine lakes is that the temperature profiles in the sediment show strong negative curvatures, i.e. the shallow sediments are cooler than the sea bottom water. We relate the occurrence of the observed curvatures to the effects of bottom water temperature flactuations which propagate into the sediments by conductive heat transfer. The effects are spectacular in the corridor, about 150 km long, which extends from the Matapan trench to the MR crestal area, where temperature gradients remain conspicuously negative to depths of 3-5 meters in the sediments.

Fig. 1 shows the temperature distribution with depth in the sediments along HFD_1 profile (57 measurements), which is 70 km long and crosses the MR summit area and the adjacent part of the Inner Plateau. The temperature at the sea floor is generally increasing from the MR summit area towards the deeper Inner Plateau.

We discuss some implications of the thermal data in terms of source and nature of the thermal transient in the shallow sediments of the MR.

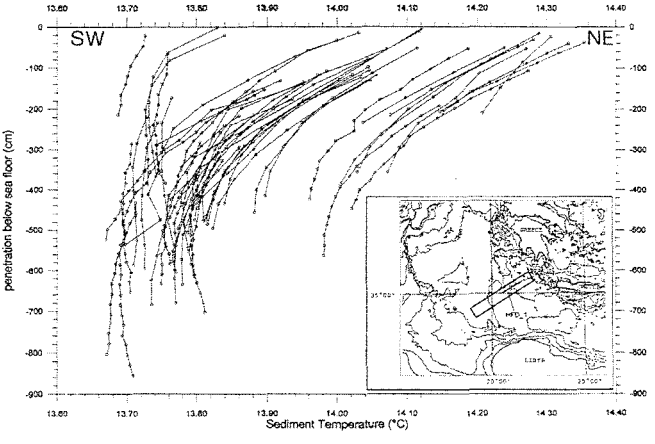

Fig. 1. Temperature distribution in the few upper meters of sediment along HFD_1 profile across the MR. Positioning of the MEDRIFF corridor and of the HFD_1 profile are indicated in the inset map.

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