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# Heat Flow and Hydrothermal Circulation of the Lucky Strike Segment, Mid Atlantic Ridge

A. Bonneville [1], J. Escartín [1], F. Lucazeau [1], M. Cannat [1], P. Gouze [2], R. P. Von Herzen [3], C. Adam [1], M. Le Bars [1], E. Monoury [1], V. Vidal [1]

[1] Laboratoire de Géosciences Marines, CNRS-Institut de Physique du Globe, Paris, 75252, France
[2] CNRS-Université de Montpellier, place E.Bataillon, Montpellier, 34060, France
[3] Woods Hole Oceanographic Institution, Quissett Campus, Woods Hole, MA 02543, USA

In June 2003, expedition Luckyflux aboard the R/V Poseidon conducted a heat flow survey of a zone centred on the Lucky Strike segment of the Mid Atlantic ridge south of the Azores between ~35°N and 39°N. Using a 5 m-long lance with 7 outrigger thermal probes, about 150 successful thermal gradient measurements were obtained, 140 of these with in-situ thermal conductivity. Measurements were made at ~1 mile intervals along several profiles, where adequately sedimented sites were identified using 6-channel and 3.5 kHz seismic data from the previous Sudazores'98 cruise. We conducted heat flow measurements in two areas: a near axis region within the V-shaped ridge of overthickened crust that emanated from the Azores hotspot between ~14 and 4 Ma, and an off-axis region East of the V-shaped ridge. The off-axis region is characterized by an homogeneous sediment cover, 300-400 m thick, and crustal ages varying between ~6 and >10 Ma. Long wavelength (tens of km) low heat flow anomalies can be identified but the mean of 160 mWm-2 is comparable to the conductive heat flow expected for a crust of that age. Along two 80-km profiles perpendicular to the ridge, we observed coherent but different patterns. On the first profile, low heat flow values of 20-50 mWm-2 are observed at the base of the V-shaped ridge. These values are 100 mWm-2 below the profile average, showing that hydrothermal circulations can also affect oceanic crust beneath a thick and relatively impermeable sediment cover. On the other profile, heat flow generally decreases from west to east. On both profiles, higher than average values of heat flow are also present, associated on one of them with a nearly outcropping basement elevation. These contrasting overall heat flow patterns in similar geological context indicate that the likely pattern of hydrothermal circulations is mainly 3D, and not driven only by the presence of basement outcrops. In the near-axis region, where the tectonic structure is more complicated and the sediment cover heterogeneous, heat flow data show no clear spatial variation and their mean value, 60 to 90 mWm-2, is systematically lower than theoretical conductive values for young seafloor. These heat flow differences will be used to estimate the importance of advection in the heat budget. This characterization of the regional thermal state around a slow-spreading segment will provide the basis for future long-term studies on the structure, thermal evolution and the hydrothermal systems within the MOMAR (MOnitoring the Mid Atlantic Ridge) project.