8-5. - CRUSTAL HEAT PRODUCTION IN THE SOUTH EASTERN TAUERN, AUSTRIA

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It has been shown (1) that in some regions of batholithic intrusion the surface heat flow is proportional to the near-surface rate of radioactive heat production. This relationship has been interpreted as indicating that in such areas there is an exponential fall-off of crustal radioactivity with depth (2). In order to test this relationship further preliminary work has been carried out on the distribution of radioactive elements (U,Th and K) in the Pennine granitic basement of the Hohe Tauern, Austria. The area was chosen for its excellent exposure and because a detailed structural interpretation was already available (3), although there are difficulties in considering a region of multiple intrusion which has since undergone both a major phase of deformation and an almost complete post tectonic recrystallisation.

Measurements of U, Th and K were undertaken at Oslo Museum by kind permission of Prof. K. S. Heier, using x-ray spectroscopy, with a Thallium doped Nal crystal detector and a 400 channel analyser.

The combined effects of deep erosion and deformational tilting movements have made about 4 km of crustal section available for sampling. The measurements of heat production for each kilometer depth interval were considered together and the mean value for each fits closely to the curve

$$A = A_o e^{\frac{x}{D}}$$

A = heat production $\times 10^{-13}$ cals/cm^3 /sec

$A_o = 14.3 \times 10^{-13}$ cals/cm^3/sec x = depth in km $D = 3.53$ km

In two of the 1 km units the sampling is still poor, and since the standard deviation for the distribution of values about the mean in any unit is of the order of 25-35%, the fit of this line must be initially regarded as fortuitous. Nonetheless heat production is shown to conspicuously fall off with depth, and it is hoped that with more data a statistically valid relationship will be confirmed.

The one heat flow value at present available in the Eastern Alps (4) (1.8×10^{-6} cals/cm^{2}sec) comes from the vicinity of the Tauern tunnel. The syenogneis which is an important unit in this area (Exner 1956 (5)), and which outcrops near the thermal springs of Bad Gastein, has anomalously high U and Th (average U-28ppm and Th-62ppm). These are similar to values reported by Labhart and Rybach (6) from a syenite in the Aar Massif.

References

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