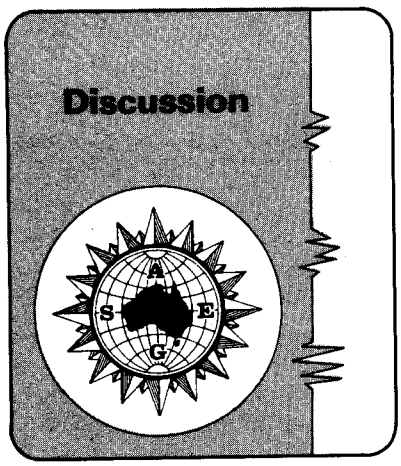

A Gravity Survey of Woy Woy District, New South Wales, and its Interpretation

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I. R. Qureshi

Comments by F. P. Fritz

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The use of regression surfaces (trend surfaces) to define regional gravity features is a useful tool with many applications. However correlation coefficients are usually not a sufficient measure of goodness of fit of a calculated surface to a particular data set, especially when they are so close to 1.0 (Qureshi 1981). A better measure of such surfaces is the F-ratio.

The F-ratio is defined as the ratio of the mean squares of the calculated surface divided by the mean squares of the residual. Mean squares are the sum of the values squared divided by the degrees of freedom. For a plane surface there are two degrees of freedom. For a particular data set the degrees of freedom are calculated as follows:

Degrees of freedom = number of data points – degrees of freedom for surface – 1.

Once an F-ratio is calculated it can be compared to a tabulated value for a normal distribution. If the value is above the tabulated value the surface is significant. If below it is not significant and probably is fitting random variations in the data set.

This type of analysis can be extended to individual terms of a particular surface or the added terms of higher order surfaces. Typically for increasing orders of surfaces the correlation coefficient will increase rapidly to an asymptote approaching 1.0 while the F-ratio will increase to a peak and then decrease rapidly. The best surface is that with the highest F-ratio.

For further detailed discussion of the F-ratio trend surfaces etc. with FORTRAN programmes see Davis (1973).

Reply by I.R. Qureshi

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I appreciate the interest of Mr F. P. Fritz in my paper (Qureshi 1981) and thank him for his comment concerning the test for goodness of fit.

I consider two possible surfaces to represent regional gravity trend in the area, a first degree surface and a second degree surface. These surfaces were fitted by the method of least squares and their equations were given on p. 104 (op. cit.). I provide further statistics concerning these surfaces in Table 1.

It is clear that on all bases – correlation coefficient, F-ratio and adjusted co-efficient of multiple determination which takes degrees of freedom into account (see p. 930 in Yamane 1973) – the two surfaces represent highly significant trends and that the second degree surface does make a statistically significant contribution to the trend. It is on geophysical grounds that I chose the first degree surface.

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References

Davis, J. C. (1973), *Statistics and Data Analysis in Geology,* John Wiley, Sydney.

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Yamane, T. (1973), *Statistics. An Introductory Analysis,* 3rd edn, Harper and Row, New York.

TABLE 1
Statistics for regression surfaces used in defining regional gravity trends

Source of variation	Sum of squares	Degrees of freedom	Mean squares	F-ratio	Correlation coefficient	Adjusted coefficient of multiple determination
First degree regression	292794	2	146397			
				4469	0.9734	0.9472
Deviation from above	16247	496	32.76			
Second degree regression	299060	5	59812			
				2954	0.9837	0.9674
Deviation from above	9981	493	20.24			
Addition from second degree	6266	3	2089	103.2		
Total variation	309041	498				