ABSTRACT

This thesis embodies the results of the study of regional trace element variation and relationship between the dispersal pattern of elements and the rock types from which they have been derived. The State Geology Branch of Tamil Nadu has given the data for nearly 1200 sample points around Idappady and Sankaridurg region. Inspection of the data set indicates that the sampling density is irregular. The missing data points have been interpolated using near neighbourhood relation. There is a large amount of sample-sample variance. In order to reduce the 'noise' content, linear moving average has been applied. This has truncated the data at the edges but has enhanced the 'signal' content of the data. Though assay values are available at every 250 metres, values at a kilometre apart are chosen for display of anomalies for polynomial calculations and other studies. The data base is split into 4 blocks. Each block has 60 to 80 data points. For these blocks, correlation tables have been constructed to define the correlation as zonal units. Blockwise correlation tables of the entire raw data base have also been constructed. An inspection of correlation tables of raw data base and smoothed nodal values indicates that smoothing and consequent selective picking of data points have not distorted the inherent

relationship existing between the pairs of elements much. Least squares summation technique is employed to study the trends, which disclose a low goodness of fit. It was not possible to fit higher than second degree trend surface. Though the sample-sample variance has been reduced, it is still large enough to characterize this set as noisy data. Orthogonal polynomial computation using Delury's integrals helped in defining the entire variance in terms of polynomial surfaces. The results obtained by clustering confirmed the inter-elemental patterns behaviour and the spatial arrangement of groups could be related to the soil types. Correspondence analysis method has been used to portray the total variation of the variables and samples. The results showed that five elements viz: Zinc, Manganese, Iron, Lead and Chromium form the background in the factor space. Copper, Cobalt and Nickel form the anomalous ones. Sample factor-2 maps are prepared for all the blocks. In order to perform spatial multiple correlation and spectral density analyses a large data base was needed. Hence, data have been generated between 2 profiles, which are a kilometre apart. This has given rise to a large data base on equispaced grid. Using this data base, local correlations are computed by a method, similar to moving average method. By this method it has been possible to delineate areas of positive, random and negative correlations between pairs of elements. Finally in order to investigate the polyharmonic nature of dispersion, the power spectrum is computed by a Fourier

transform of the auto-correlation function. In this study the intimate relationship between lithology and derived soil could be clearly established. As a part of processing the geochemical data, relevant software has been developed, which contains not only standard procedures but also an algorithm for the computation of rolling multiple correlation. The results are interpreted in the light of local geology of the region.

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