

Quantitative techniques for geological mapping using geophysical data

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A research project has been initiated to use geophysical data to delineate geological patterns as an aid to geological field mapping in Arctic regions in Canada. The Hall Lake area in Melville peninsula, Northwest Territories, has been chosen for this study, because the area has little vegetation, relatively large areas of unweathered rock outcrop and a geological map covering a part of the area has been recently published.

A subarea of 15 km x 15 km which consists of 512 x 512 (=262,144) pixels of the size of 30 m x 30 m, were selected as a test area. Among the 262,144 pixels, two sets of training samples, the first set consists of 144 pixels sys-

tematically selected; and the second set consists of 153 pixels where the field stations were located for the geological mapping, were chosen to test the technique.

Neural network algorithm and Logistic discriminant analysis were applied to each one of the two sets as a training, then the classification results were then used to predict the geological units in the remaining test area. In this test area, both neural network procedure and logistic discriminant models have adequately characterized the geological units from the geophysical data within each training area, and accurately (over 90%) predicted the geological units in the entire area.