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DEPARTMENT OF ENERGY, MINES AND RESOURCES
MINISTÈRE DE L'ÉNERGIE, DES MINES ET DES RESSOURCES

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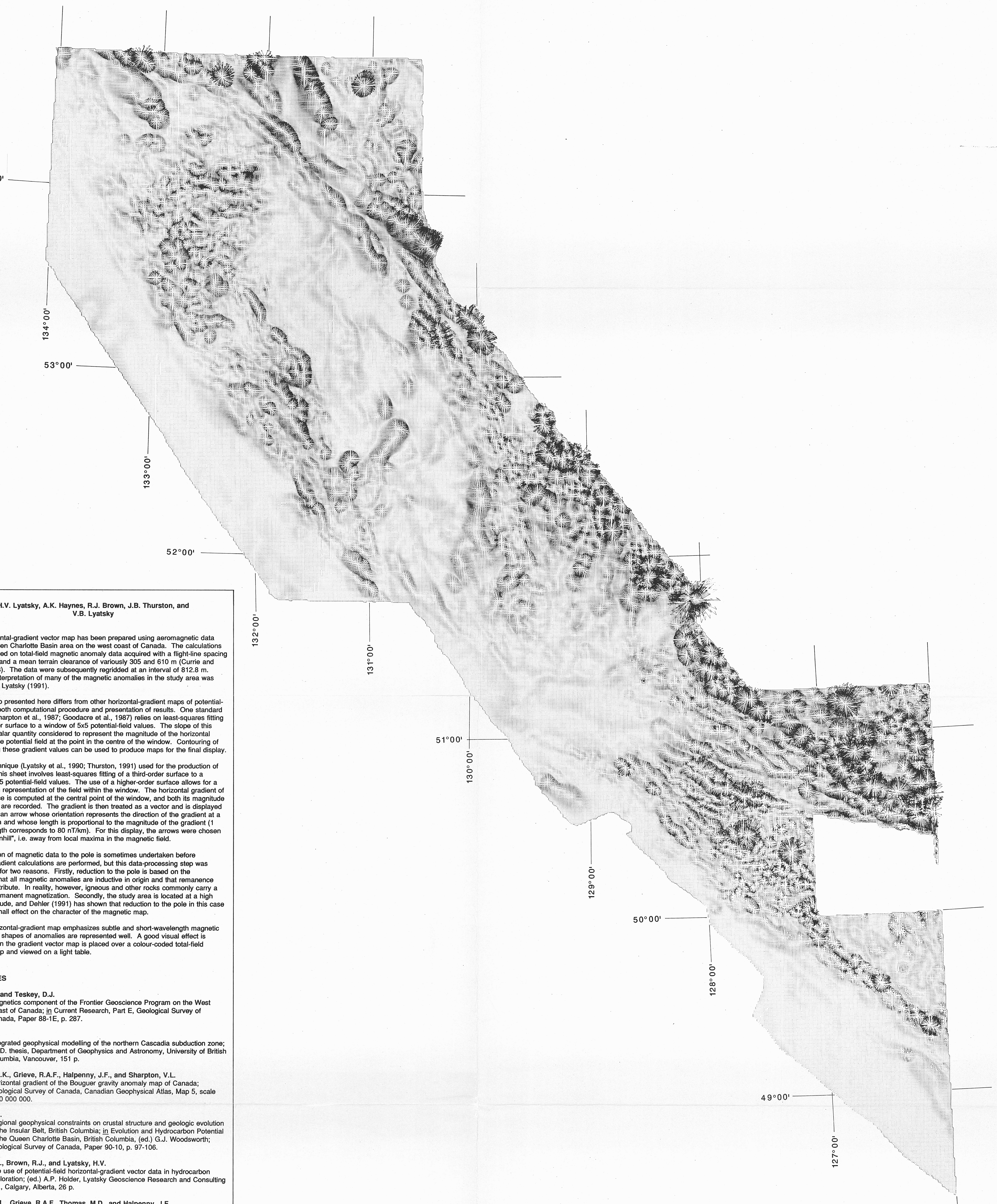

H.V. Lyatsky, A.K. Haynes, R.J. Brown, J.B. Thurston, and V.B. Lyatsky

A horizontal-gradient vector map has been prepared using aeromagnetic data from the Queen Charlotte Basin area on the west coast of Canada. The calculations were performed on total-field magnetic anomaly data acquired with a flight-line spacing of 1 to 2 km and a mean terrain clearance of variously 305 and 610 m (Currie and Teskey, 1988). The data were subsequently regridded at an interval of 812.8 m. Geological interpretation of many of the magnetic anomalies in the study area was discussed by Lyatsky (1991).

The map presented here differs from other horizontal-gradient maps of potential-field data in both computational procedure and presentation of results. One standard technique (Sharpton et al., 1987; Goodacre et al., 1987) relies on least-squares fitting of a first-order surface to a window of 5x5 potential-field values. The slope of this plane is a scalar quantity considered to represent the magnitude of the horizontal gradient of the potential field at the point in the centre of the window. Contouring of colour coding these gradient values can be used to produce maps for the final display.

The technique (Lyatsky et al., 1990; Thurston, 1991) used for the production of the map on this sheet involves least-squares fitting of a third-order surface to a window of 5x5 potential-field values. The use of a higher-order surface allows for a more realistic representation of the field within the window. The horizontal gradient of such a surface is computed at the central point of the window, and both its magnitude and direction are recorded. The gradient is then treated as a vector and is displayed on a map as an arrow whose orientation represents the direction of the gradient at a given location and whose length is proportional to the magnitude of the gradient (1 mm map length corresponds to 80 nT/km). For this display, the arrows were chosen to point "downhill", i.e. away from local maxima in the magnetic field.

Reduction of magnetic data to the pole is sometimes undertaken before horizontal-gradient calculations are performed, but this data-processing step was omitted here for two reasons. Firstly, reduction to the pole is based on the assumption that all magnetic anomalies are inductive in origin and that remanence does not contribute. In reality, however, igneous and other rocks commonly carry a substantial remanent magnetization. Secondly, the study area is located at a high magnetic latitude, and Dehler (1991) has shown that reduction to the pole in this case has only a small effect on the character of the magnetic map.

The horizontal-gradient map emphasizes subtle and short-wavelength magnetic features, and shapes of anomalies are represented well. A good visual effect is obtained when the gradient vector map is placed over a colour-coded total-field amplitude map and viewed on a light table.

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AEROMAGNETIC HORIZONTAL–GRADIENT VECTOR MAP OF THE
QUEEN CHARLOTTE BASIN AREA,
BRITISH COLUMBIA

O.F. 2436

Scale 1:1 000 000
25 0 25 50 75
Kilometres

$10.00