

Interpretations of Precambrian Basement Based on Recent Mackenzie Valley Aeromagnetic Data

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The relatively poorly exposed, inaccessible, and underexplored region of the Mackenzie Valley has been of long-standing interest for hydrocarbon and mineral resources. Between 1998 and 2001, the Geological Survey of Canada, together with industry partners, acquired new aeromagnetic data (259,605 line km; 800 m spacing) along the northern Mackenzie Valley; additional surveys are being planned. These data are helping to refine interpretations about the configuration of buried Precambrian basement, including the Slave Province (Archean) and elements of Wopmay orogen (Proterozoic). For example, north of Great Bear Lake, the north-trending Great Bear magmatic zone (1.88-1.84 Ga) bends 90° to the west, and appears to disappear beneath sedimentary cover. Preliminary analysis using a 40 km wavelength lowpass filter (wavelengths < 40 km removed) suggests that the westward extent of the Slave Province and Great Bear magmatic zone is limited by a northwest-trending fault parallel to, and east of, Cape Bathurst. In addition, the new data are helping to: identify buried Precambrian structures (generally thought to have influenced patterns of Phanerozoic sedimentation, deformation, and alteration that controlled distribution of hydrocarbon and mineral deposits); determine the extent of Proterozoic dyke swarms and location of Proterozoic plume centres; establish the geometry of thick Proterozoic sedimentary successions that lie between crystalline basement and Phanerozoic deposits; and define links between exposures of these Proterozoic successions in the Canadian Shield and in the Cordillera.