Integration of surface, seismic, high resolution aeromagnetic, airborne radar and RADARSAT data in the southern Mackenzie and Franklin Mountains, N.W.T., Y.T. and B.C.

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The Liard study area was chosen in order to examine the northeast deflection of the Rocky Mountain fold and thrust belt at 60° N latitude. With renewed interest in hydrocarbon exploration in this area, a greater number of new data sets are now available to complement the existing surface geology maps of the Geological Survey of Canada and seismic data stored at the National Energy Board (NEB) of Canada. New data used in this study include recent seismic data, high resolution aeromagnetic (HRAM) surveys, airborne radar and RADARSAT data sets. These have been used in conjunction with existing data sets to examine the initial basement geometry and its effects on the localization and development of subsequent Laramide structures.

Geological Survey of Canada 1:250,000 scale geology maps show the presence of numerous structures oblique to the regional trend that point to a transpressional setting and include the Pointed Mountain Thrust and the Liard Syncline. Inherited features affect the 3-D geometries of structures developed during compression. They include the Bovie Lake Fault system, the Proterozoic unconformity and a zone of erosional and depositional pinchout of the Lower Paleozoic strata whereby thick strata of the Liard Basin (Depression) are absent to the southeast on the Liard High. Older NEB seismic data suggest that the inherited features have an effect on the localization and development of later structures; however, the age of the data (mostly 1970's vintage) and poor resolution over anticlines and below middle Devonian reflectors make a full interpretation difficult. HRAM data and more recently acquired seismic data reveal the interplay of deep and shallow structures. Seismic data show that sub-Nahanni (middle Devonian) growth faults and changes in elevation of the Proterozoic unconformity commonly become the sites for localization of shallower Laramide compressional structures. This is further substantiated by the interpretation of HRAM data, in which "basement" trends coincide with both growth faulting and elevation changes of the Proterozoic unconformity interpreted in the seismic data. In addition, the asymmetric nature of the basin is evident based on the westward thickening between the seismic reflectors. East-directed thrusting of the westward thickening strata has resulted in the development of asymmetric folds where a thicker portion of a given unit is thrust over a thinner platformal portion. A full integration of all available data sets is being used to achieve a better understanding of the effect of the original basement geometry (resulting from growth faulting and the topography of the Proterozoic unconformity) has on the development of Laramide compressional structures within the study area.

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