Detailed fracture studies of detachment folds and thrust faults, Moose Mountain, Canadian Foothills

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A fracture study was undertaken during the 2000 field season in order to decipher the genetic relationship between folding, faulting and fracture development in the Moose Mountain anticlinorial structure. A deeper understanding of the mechanical significance of fractures and their development is required to make predictions as to their distribution. Two different geological structures were analyses separately: detachment folds and a thrust fault.

Many different fracture sets can be recognized in the area. Results indicate that two distinct regional fracture sets (N70° and N330°) developed before the detachment folding event. Within the detachment folds two fracture sets developed during folding, with fracture frequencies increasing in the hinge area. Low interconnection between these fracture sets and bedding planes combined with short lengths and small lateral extension provides for an ideal potential for anticlinorial traps.

For thrust faults, the two regional subvertical fracture sets, N70° and N330° were recognized as well as numerous small fractures planes that developed approximately subparallel to the thrust fault (N142°/32). Fracture densities increase dramatically in the hanging wall of the fault a few meters above the fault zone and decrease drastically in the footwall. The low-angle fractures are clearly related to the development of the thrust fault and increase the hydraulic conductivity within the fault zone.