Upper-crustal fault processes in southern New Brunswick

Paul Wilson
Department of Geology, University of New Brunswick, Fredericton, NB E3B 5A3

Upper-crustal faulting has played an important role in the structural evolution of the Carboniferous of southern New Brunswick. This study looks at two important faults in southern New Brunswick with the aim of establishing the deformation processes, fluid flow properties and permeability/porosity evolution of these faults.

Two splays of the Harvey-Hopewell fault system (HHFS) cross the Fundy coast between Alma and Waterside; the Dennis Beach fault at Dennis Beach and the Harvey-Hopewell fault at Owl Head. The Dennis Beach fault represents the main splay of the HHFS. Hopewell conglomerate is intensely deformed immediately to the north-west of this fault. Microstructural examination of these deformed conglomerates reveals that intracrystalline plasticity and recrystallization processes have been important in both calcite and quartz, despite the upper-crustal conditions of deformation. Samples from near the fault trace contain large quantities of calcite, indicating that fluid flow has been important. At Owl Head, Hopewell conglomerate has been thrust over overturned strata of the Enrage and Boss Point formations. The thrust plane is occupied by a thin gouge zone. Bedding-parallel gouge zones to the west of the thrust fault show evidence for extensional

Atlantic Geology, March 2001, Volume 37, Number 1

movement and contain large amounts of vein calcite. These observations show that different splays of the same fault system can have very different characteristics.

The Quaco Head fault is a dip-slip fault which outcrops at two localities in the area of Quaco Head, immediately west of St. Martins. At the coastal exposure 600 m north of Quaco Head, the fault consists of an outer zone of calcite-cemented fault breccia and an inner zone of red-grey fault gouge. The presence of large quantities of vein calcite in the gouge and calcite cement in the fault breccia indicate that fluids have been important at this locality. At the exposure 2 km southwest of Quaco Head, the fault zone consists of a 2 m thick sliver of sheared Hopewell conglomerate which underlies a thin gouge zone. Microstructural examination shows that deformation in the conglomerate is weak and has largely been accommodated by cataclastic flow and pressure-solution processes. Gouge at this locality contains folded and offset veins. The fault zone is much narrower and fluids have been less important at this locality than at the more northerly exposure of the Quaco Head fault. This has important implications for fault sealing properties and active deformation mechanisms; these may differ along strike, even over short distances.