Late Devonian and Carboniferous history of western Cape Breton Island

P.S. Giles[1], F.J. Hein[2] and T.L. Allen[1]
[1]*Geological Survey of Canada, Atlantic Geoscience Centre, P.O. Box 1006, Dartmouth, Nova Scotia B2Y 4A2, Canada*
[2]*Department of Geology, University of Calgary, Calgary, Alberta T2N 1N4, Canada*

Post-Acadian sedimentation in western Cape Breton Island records, in a single map-area, many tectono-stratigraphic features typical of the onshore Maritimes Basin. Bimodal volcanic rocks of the latest Devonian Fisset Brook Formation record initial deposition in a continental rift setting. Succeeding sedimentary rocks of the Horton Group (Tournaisian) were also

deposited in a rift environment but are more laterally extensive than the Fisset Brook volcanic rocks. The early Visean was a period of local uplift with consequent tilting of Horton strata, and has no sedimentary record in western Cape Breton. Marine invasion of the area during the middle and late Visean resulted in widespread deposition of cyclic marine and non-marine rocks of the Windsor Group which pass transitionally upwards into fine-grained lacustrine and fluviatile siliciclastics of the Mabou Group. The Mabou ranges in age from late Visean to Namurian C. Previous workers have suggested that the change in depositional and tectonic setting between late Devonian and late Visean time represents a fundamental change in Maritimes Basin architecture. Movement on the Margaree Shear Zone, an extensional detachment cutting the Fisset Brook Formation, may explain the more regional Visean and Namurian basin development following an initial (and independent ?) rifting event in the late Devonian and Tournaisian. Within the western Cape Breton map-area, the Port Hood Formation (basal Cumberland Group) lies unconformably on the Mabou Group, but may also overly latest Mabou strata without apparent stratigraphic omission. Strata of the Windsor and Mabou groups and Port Hood Formation were folded into upright and/or south-verging structures prior to deposition of the Inverness Formation. The latter (upper Cumberland Group) is unconformable on all older rock units, overstepping Carboniferous rocks to lie directly on the pre-Carboniferous of the Mabou Highlands. The Cumberland Group thus records two additional phases of basin subsidence, separated by an episode of significant fold deformation, uplift and erosion.

Down-to-the-basin movement on the Ainslie Detachment provides a plausible mechanism to accommodate the early Westphalian phase of Carboniferous subsidence in western Cape Breton. The detachment model fails, however, to rationalize the mid-Cumberland Group unconformity which clearly postdates the Ainslie Detachment. The latter unconformity, and that separating the Horton and Windsor groups can be recognized in widely separated areas such as the Horton-Windsor type-area and in the Sydney Basin. Local fault movements cannot explain these major tectono-stratigraphic features.