# Allostratigraphy, Paleogeography and Subsidence in a Syntectonic Wedge: Harmon and Cadotte Alloformations (Middle Albian), Alberta and B.C.

**Olivia A. Henderson[1], Robin A. Buckley[2], A. Guy Plint[1], and Kristy F. Tiampo[1]**

[1]Department of Earth Sciences, The University of Western Ontario, London, ON, Canada
[2]Husky Energy Ltd., Calgary, AB, Canada

## Abstract

Detailed subsurface correlation, linked to outcrop sections, allows both the sedimentology and regional stratal geometry of the Middle Albian Harmon and Cadotte alloformations to be determined. The mudstone-dominated Harmon alloformation forms a pronounced wedge that thins from > 145m in the west to 5 m in the NE over ~ 300 km. The Harmon is interpreted to record a time of rapid flexural subsidence in the foredeep. In contrast, the overlying, sandstone-dominated Cadotte alloformation has a much less pronounced wedge shape, and thins from 85 to 18 m over ~ 300 km. The tabular geometry of the Cadotte is interpreted to record less pronounced asymmetrical flexural subsidence. In an attempt to quantify the physical controls on observed stratal geometry, the modeling program *tao* was employed. The *tao* program uses a finite-difference method to calculate the deflection of the lithosphere, and thereby allows tectonic, eustatic and sedimentary processes to be linked at varying spatial and temporal scales.

## References Cited

Beaumont, C., 1981. Foreland basins. Geophysical Journal of the Royal Astronomical Society, v. 65, p. 291-329.

Bloch, J., 1990. Stable isotopic composition of authigenic carbonates from the Albian Harmon Member (Peace River Formation): Evidence for early diagenetic processes. Bulletin of Canadian Petroleum Geology, v. 38, p. 39-52.

Buckley, R.A., 2011. Stratigraphy, sedimentology and paleogeography of the Middle to Upper Albian Peace River Formation, northwestern Alberta and northeastern British Columbia, Canada. Unpub. M.Sc. thesis, University of Western Ontario, Canada, 227 p.

Buckley, R.A. and Plint, A.G., 2013. Allostratigraphy of the Peace River Formation (Albian) in northwestern Alberta and adjacent British Columbia. Bulletin of Canadian Petroleum Geology, v. 61, p. 295-330.

Carrapa, B. and Garcia-Castellanos, D., 2005. Western Alpine back-thrusting as subsidence mechanism in the Tertiary Piedmont Basin (Western Po Plain, NW Italy). Tectonophysics, v. 406, p. 197-212.

Garcia-Castellanos, D. Fernandez, M. and Torne, M., 1998. Numerical modeling of foreland basin formation: A program relating thrusting, flexure, sediment geometry and lithosphere rheology. Computers and Geosciences, v. 23, p 993-1003.

Gaspar-Escribano, J.M., van Wees, J.D., ter Voorde, M., Cloetingh, S., Roca, E., Cabrera, L., Munoz, J.A., Ziegler, P.A. and Garcia-Castellanos, D., 2001. Three dimensional flexural modelling of the Ebro basin (NE Iberia). Geophysical Journal International, v. 145, p. 349-367.

Henderson, O.A. and Plint, A.G. Allostratigraphy and paleogeography of the Harmon and Cadotte members of the Peace River Formation (Middle Albian), west-central Alberta and adjacent British Columbia. Bulletin of Canadian Petroleum Geology, in review.

Johnson, D.D. and Beaumont, C., 1995. Preliminary results from a planform kinematic model of orogen evolution, surface processes and the development of clastic foreland basin stratigraphy. In: Stratigraphic evolution of foreland basins (ed. by S.L. Dorobek and G.M. Ross), SEPM Special Publication 52, p. 3-24.

Jordan, T.E. ,1981. Thrust loads and foreland basin evolution, Cretaceous, western United States. American Association of Petroleum Geologists Bulletin, 65, 2506-2520.

Jordan, T.E. and Flemings, P.F., 1991. Large-scale stratigraphic architecture, eustatic variation, and unsteady tectonism: A theoretical evaluation. Journal of Geophysical Research, 96B4, 6681-6699.

Koke, K. R., and Stelck, C. R., 1984. Foraminifera of the Stelckiceras Zone, basal Hasler Formation (Albian) northeastern British Columbia. In: The Mesozoic of middle North America (Ed. by D. F. Stott and D. V. Glass). Canadian Society of Petroleum Geologists, Memoir 9, pp. 271 -279.

Koke, K.R. and Stelck, C.R., 1985. Foraminifera of a Joli Fou Shale equivalent in the Lower Cretaceous (Albian) Hasler Formation, northeastern British Columbia. Canadian Journal of Earth Sciences, v. 22, p. 1299-1313.

Roca, X., Rylaarsdam, J.R., Zhang, H., Varban, B.L., Sisulak, C.F., Bastedo, K. and Plint, A.G., 2008. An allostratigraphic correlation of Lower Colorado Group (Albian) and equivalent strata in Alberta and British Columbia, and Cenomanian rocks of the Upper Colorado Group in southern Alberta. Bulletin of Canadian Petroleum Geology, v. 56, p. 259-299.

Sinclair, H.D., Coakley, B.J., Allen, P.A. and Watts, A.B., 1991. Simulation of foreland basin stratigraphy using a diffusion model of mountain belt uplift and erosion: An example from the central Alps, Switzerland. Tectonics, v. 10, p. 599-620.

Stelck, C.R. and Leckie, D.A. 1988. Foraminiferal inventory and lithologic description of the Lower Cretaceous (Albian) Hulcross Shale, Monkman area, northeastern British Columbia. Canadian Journal of Earth Sciences, v. 25, p. 793-798.

Stelck, C.R., Wall, J.H., Bahan, W.G. and Martin, L.J., 1956. Middle Albian Foraminifera from Athabasca and Peace River drainage areas of Western Canada. Research Council of Alberta, Report No. 75, 60 pp.