

Paleovalleys in the Cenomanian Dunvegan Formation, Western Canada: Local and regional tectonic controls on drainage pattern

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ABSTRACT

The Cenomanian Dunvegan Formation is a delta complex that prograded about 400 km from NW to SE. Isopach maps show that deltaic allomembers have two distinct geometries. Allomembers J-F are 'sigmoidal-prismatic', thinning updip and downdip, but not thickening towards the orogen, suggesting minimal flexural subsidence. Allomembers E-A thicken toward the orogen, suggesting the onset of a new phase of flexural subsidence.

Valleys in allomembers H-F trend broadly NW-SE towards the delta-front, and show a pronounced NW-SE and NE-SW rectilinear pattern over the Peace River Arch that mimicks the regional fault pattern. We infer that subtle syn-depositional offsets on faults influenced the location of coastal plain rivers prior to valley incision. Valleys in allomember E show a distinctly different, dendritic pattern. In the west, valleys trend towards the NE, E and SE, but towards the east, they all bend abruptly and flow to the south, parallel to the paleoshoreline, joining to form a single valley.

In the modern New Guinea foreland basin, the Fly and Digul rivers flow perpendicular to the orogen in the north, but in the south, they turn abruptly to the east and west respectively to flow parallel to the coast. A drainage divide about 300 km south of the overthrust zone extends along the southern coast of New Guinea and is probably a forebulge; it appears to have caused the 90⁰ deflection of the Fly and Digul rivers. The coast-parallel deflection of valleys in Dunvegan allomember E might also reflect a response to a forebulge resulting from renewed flexural subsidence.