

Reconstruction Of Depositional And Burial History Of Cretaceous - Paleocene Strata Where None Exists, Lac De Gras, Northwest Territories, Canada

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ABSTRACT

Reconstruction of Mesozoic sedimentary 'cover' on the Precambrian shield in the Lac de Gras diamond field, Northwest Territories, has been achieved using sedimentary xenoliths preserved in volcanoclastic sediments associated with kimberlite pipe intrusions, and *in situ*, Tertiary crater lake strata. This work has relevance for anyone conducting burial history – hydrocarbon generation modeling in the northern NWT. Palynology dates constrain depositional ages for Albian (Cretaceous) to Paleocene (Tertiary) shale xenoliths and for early to early middle Eocene strata deposited in crater bog and lacustrine facies. Per cent reflectance in oil (%Ro) of vitrinite within shale xenoliths for: (i) Albian to mid-Cenomanian to Turonian ranges from > 0.27 to 0.42 %Ro (mean = 0.38 %Ro), (ii) Maastrichtian to early Paleocene from 0.24 to < 0.30 %; (iii) latest Paleocene to early middle Eocene 0.15 to < 0.23 %Ro (mean = 0.18 %Ro). Porosity of unaltered Cretaceous shale xenoliths averages 26 % whereas the younger xenoliths and *in situ* shales have porosity of up to 40 %. Burial history modeling constrained by vitrinite reflectance and porosity data predicts that the maximum burial temperatures for Mid to Late Albian (~ 115 Ma) was on the order of 60 °C with ~ 1.2 to 1.4 km of Cretaceous strata present in the Lac de Gras kimberlite field region prior to major uplift and erosion likely beginning at about 90 Ma. The late Paleocene to middle Eocene strata were only buried to maximum depths of ~ 200 to 400 m.