CHEMOSTRATIGRAPHIC CHARACTERIZATION OF LOWER CRETACEOUS TO PALEOCENE FORMATIONS OF THE BROOKIAN SEQUENCE, ALASKAN NORTH SLOPE FOOTHILLS

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A chemostratigraphic study has been carried out on Cretaceous- to Paleocene-age, east- and northeast- prograding, nonmarine to deepwater foreland basin sequences of the Torok, Seabee, Canning, middle Schrader Bluff, upper Schrader Bluff, Prince Creek and Sagavanirktok formations, located within the Brooks Range foothills of the Alaskan North Slope. The primary goals of this study are 1) to determine whether it is possible to use inorganic geochemical data to characterize and correlate formations in these depositional settings on a regional scale, and 2) to integrate the chemostratigraphic characterizations with the sequence stratigraphic framework of the Colville foreland basin. Such a tool could be of great value in this frontier area, where stratigraphic problems are commonly amplified by poor biostratigraphic resolution, few well penetrations, limited and discontinuous outcrops, local structural complexity, and non-unique clastic lithologies with few true marker horizons.

Chemostratigraphic analysis was carried out on a total of 145 cuttings samples from four widely spaced exploration wells (Echooka Unit 1, Susie Unit 1, Lupine Unit 1 and Aufeis Unit 1), and a suite of 147 outcrop samples. Rock chips from each cutting sample were carefully selected for analysis, using gamma ray data in order to determine the most representative lithology from each cutting interval. Whole-rock inorganic geochemical data were acquired for 50 elements by combining inductively coupled plasma - optical emission spectrometry (ICP-OES) and inductively coupled plasma - mass spectrometry (ICP-MS) analyses.

Results from this study show that it is possible to differentiate Torok, Seabee, upper Schrader Bluff, Prince Creek, and Sagavanirktok intervals geochemically, based on changing K/Al, K/Rb, Cr/Al and Zr/Cr ratios and U (ppm) concentrations. It is suggested that the elements used to characterize these formations are controlled by changes in sediment provenance, clay mineral species, and paleo-redox conditions through time. In addition, it has also been possible to integrate these data with previous work carried out on Cretaceous units from the Grizzly-1 and Heavenly-1 wells located outside the foothills province, tens of kilometers to the northwest.