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Insights into a high-latitude terrestrial greenhouse ecosystem, Cretaceous Nanushuk Formation, DeLong Mountains foothills, western North Slope, Alaska

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Summary

The Nanushuk Formation (Albian-Cenomanian) crops out over much of the central and western North Slope of Alaska, and records an inter-tonguing succession of marine and nonmarine conglomerate, sandstone, mudstone and coal. These rock units comprise the marine Kukpowruk and nonmarine Corwin formations of the former Nanushuk Group, respectively. This study presents results from the foothills of the DeLong Mountains along the Kukpowruk River, from west of Igloo Mountain to the Barabara Syncline. Outcrops along the Kukpowruk River contain a previously studied, well-preserved fossil flora (Spicer and Herman, 2001). Our own work focuses on detailed measured sections of terrestrial rocks, interpretation of sedimentary facies and facies associations (Fig. 1), and documentation of fossil vertebrates. Eight facies associations are identified in the study area that together are interpreted to represent meandering fluvial and upper delta plain environments. Plant fossils are common and include standing tree trunks up to 58 cm in diameter in places. Over 75 tracksites have been discovered that evidence the presence of a rich fossil vertebrate ichnofauna. The ichnofaunal assemblage includes evidence of small and large theropod dinosaurs (including birds) and bipedal and quadrupedal onithischian dinosaurs. Preserved wood fragments were analyzed for their carbon isotopic composition and used to estimate a mean annual precipitation of ~ 1770 mm/year. This precipitation record provides new data from the Cretaceous western North Slope that supports global precipitation patterns associated with the Cretaceous Thermal Maximum. Our work provides another new data point in the still emerging paleoecology and paleoclimate of the Cretaceous Arctic under greenhouse conditions.

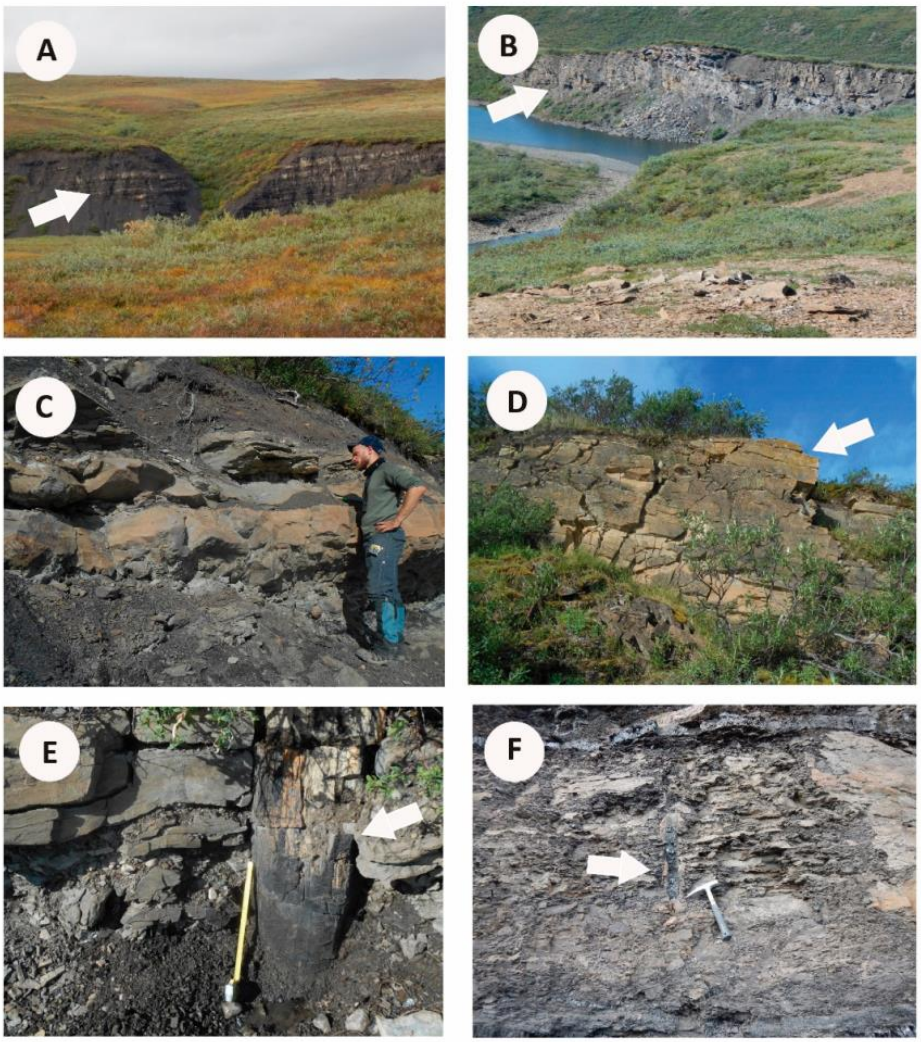

Figure 1: (A) Interbedded sandstone, siltstone, shale and coal typical of floodplain facies; (B) Multi-story, meandering channel-fill sandstone; (C) Floodplain mudstone and sandstone with standing trees at base (not shown); (D) Trough cross-bedded channel sandstone; (E) Standing tree trunk (max. 58 cm diameter) rooted in floodplain mudstone and sandstone; (F) Floodplain mudstone with standing tree (adjacent to hammer, length = 33 cm).

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References

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