Aptian–Albian Terrestrial Paleoclimatology of the North American Western Interior Basin

***Ludvigson, G.*[1,*], Gonzalez, L.[1], Suarez, M.[2], Joeckel, R.M.[3], Moeller, A.[1], Ross, J.[1]**

*1) University of Kansas, Lawrence, Kansas, USA, *E-mail: gludvigson@kgs.ku.edu*
2) University of Texas at San Antonio, San Antonio, Texas, USA
3) University of Nebraska-Lincoln, Lincoln, Nebraska, USA

The north-south trending Western Interior Basin (WIB) of North America extended from Boreal to Tethyan realms, and encompassed zonal climatic belts including the subtropical Hadley Cell (northern boundary near 30°N palolatitude), the mid-latitude Ferrel Cell (northern boundary near 60°N paleolatitude), and the high-latitude Polar Cell. These zonal belts exerted strong influence on climatically-sensitive terrestrial deposits, which included calcic mudstone paleosols in the Hadley Cell, with coals and sideritic mudstone paleosols predominating in the Ferrel and Polar cells. A north–south transect of the $\delta^{18}O$ values of pedogenic carbonates (calcic and sideritic) in the WIB has been used to constrain oxygen isotope mass balance models of Aptian–Albian hydrologic cycles, and suggest substantial increases in both global and zonal precipitation rates over that of the modern climate system. The age of the oldest Cretaceous terrestrial deposits filling the WIB are still subject to question, although evidence for the presence of Neocomian units is starting to emerge, with Maximum Depositional Ages (MDAs) of up to 139 Ma observed in the Yellow Cat Member of the Cedar Mountain Formation of Utah, USA. Published terrestrial records of Aptian-Albian Carbon Isotope Excursions (CIEs) show that these global-scale carbon cycle perturbations can be traced into continental deposits. Sedimentologic characters of terrestrial units spanning these CIEs clearly show evidence for major paleoclimatic impacts on land. Pedogenic carbonate pCO_2 time series constructed from Aptian–Albian paleosols in the WIB (LUDVIGSON et al., 2015) and in China (LI et al., 2014) both show an overall long-term fall through the Aptian-Albian interval punctuated by abrupt changes, with peak values in the C10 C-isotope feature in the late Aptian. The C10 feature also coincided with a pronounced aridification event in the WIB, a result seemingly at odds with many other indications for a late Aptian cold snap. We advocate wider use of chronstratigraphically-useful MDAs from large detrital zircon populations (n=300) from mudstone paleosols as a means for calibrating terrestrial records of Aptian–Albian CIEs.

LI et al., 2014. Geological Magazine, **151**, 830–849.
LUDVIGSON et al., 2015. Cretaceous Research, **56**, 1–24.