Climate of southern Laramidia: A multi-proxy paleobotanical reconstruction for the upper Campanian Jose Creek Member, McRae Formation, south-central New Mexico, USA.

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Leaf physiognomy of dicots is a long-standing source of data on Late Cretaceous terrestrial climate. Wood anatomy of dicots has similar potential, but calibration errors lead wood anatomists to urge caution. Leaf and wood macrofossils rarely occur in sufficiently close stratigraphic/geographic proximity to permit cross checking, and Cretaceous angiosperm wood floras often have insufficient diversity to use published physiognomic transfer functions.

The upper Campanian (74–76 mya) Jose Creek Member (JCM) of the McRae Formation, south-central New Mexico, USA, provides a unique opportunity to reconstruct climate through a combined analysis of leaf physiognomy, wood anatomy, and life form. The JCM preserves an abundant and diverse leaf macroflora of >175 species, and an exceptionally preserved wood flora of >50 species that comprises dicots, conifers, and palms. Dicot leaf margins estimate Mean Annual Temperature (MAT) of 21–22° C, based on an early collection of 42 species and an expanded collection of 161 species from the same volcanic ash bed. A preliminary analysis of dicot wood anatomy estimates MAT of 24–25° C, based on 30 morphotypes from the entire Jose Creek Member. These same dicot woods estimate a Cold Month Mean Temperature (CMMT) of 15° C. Leaf and wood estimates of MAT and CMMT are congruent with the absence of annual rings in most dicot and conifer wood types, and the presence of diverse fossils of rosette plants, including palm leaves, multiple types of palm wood, leaves and cones of thermophilic cycads (cf. *Ceratozamia*), and a palm stem base indicative of tree habit. These constrain MAT to >13°C and CMMT >10–11° C. Estimates of Mean Annual Precipitation (MAP) are in general less certain, but year-round precipitation is indicated by abundant palms and gingers and published evidence for non-calccic paleosols; dicot wood physiognomy sets an upper limit for MAP of 3 m. The more southerly Olmos flora of Mexico provides similar climatic estimates from dicot leaf margins and wood anatomy. This indicates the common occurrence in southern Laramidia, during the late Campanian to early Maastrichtian, of climate and vegetation most analogous to modern paratropical rainforest and tropical premontane moist to wet forest.