Paleogene Topography, Drainage Patterns and Climate Change in Southwestern Montana

Lielke, Kevin [1] (1) Geosciences, University of Montana, Missoula, MT.

The purpose of this study is to reconstruct the paleogeography, drainage patterns and paleoclimate of the Paleogene Renova Formation in southwestern Montana and to establish regional and global chronologies of Paleogene geologic, climatic and biotic events. Measurement of stratigraphic sections, paleocurrent analysis, conglomerate clast counts and point counts of thin sections, were used to reconstruct drainage patterns and paleotopography. Field based techniques are supplemented by dating of detrital zircons to constrain the provenance of fluvial sandstone deposits. Paleoclimate parameters are estimated from fossil leaf physiognomy. Radiometric age dating of ash layers establishes the chronology of the Renova Formation and permits regional and global correlations of Paleogene events. In the Sage Creek area, middle Eocene fluvial sandstones indicate derivation from early Eocene volcanics. During the late middle to late Eocene, a large influx of exotic volcanic material overwhelmed the drainage network, forming a thick sequence of mudstones. Coarse facies are confined to discontinuous cut channels. East-directed (S82E) paleocurrents and clast compositions indicate sources in local topography developed on the Cretaceous Beaverhead Formation and the 47 Ma Hall Springs basalt. During Oligocene time, the influx of exotic volcanic ash waned, leading to an increase in fluvial channel size and coarse clastic material. Formation of calcic paleosols was promoted by early Oligocene climatic cooling and drying and the decline in sedimentation rates. In the upper Ruby Valley, late Eocene fluvial sandstones indicate paleoflow towards the east (S79E). Smaller S-SW directed fluvial channels are interpreted as tributary to the east flowing trunk stream. Cooling and drying of Oligocene climate is indicated by mudcracks, evaporites, and a decrease in both fossil leaf size and entire leaf margins. A playa lake fringed by deltas and fluvial/alluvial deposits was established by early Miocene time. Paleocurrent data indicates a radial drainage pattern consistent with a closed basin system. Paleogene southwestern Montana was neither a featureless volcanic plateau nor a tectonically active Basin and Range system. Topography and drainage patterns within the Renova basin were controlled by relict topography and contemporaneous volcanic activity. Eocene drainage was primarily towards the east, switching to locally closed basin conditions after Oligocene cooling and drying.