



Orbital climate forcing of river floodplain sedimentation in the lower Eocene Willwood Formation of the Bighorn Basin, Wyoming (USA)

Hemmo Abels (1), Mary Kraus (2), Philip Gingerich (3), and Frederik Hilgen (1)

(1) Utrecht University, Utrecht, the Netherlands (abels@geo.uu.nl), (2) University of Colorado, Boulder, Colorado, USA, (3) University of Michigan, Ann Arbor, Michigan, USA

Astronomical climatic control of paleosol stacking patterns has been postulated recently for upper Paleocene to lower Eocene floodplain deposits in the Bighorn Basin, Wyoming (Abdul Aziz et al. 2008). Red paleosols, formed on fine mudstones were found to alternate rhythmically with heterolithic intervals showing weak pedogenesis in two sections of different age. The alternation was at a precession time scale. Here, we corroborate these findings with the longer lower Eocene Deer Creek Amphitheater section of the Willwood Formation in the McCullough Peaks area of the basin, which is intermediate in age.

In our new section, we find cyclicity with a dominant cycle thickness of 6.8 m, which is slightly shorter than in the two other sections (7.7 m and 8.7 m, respectively), though again well within the estimates of between 5 to 8 m for the thickness of a precession cycle. Furthermore, we find better-developed precession-scale cycles to occur in groups of three, separated by two or three less pronounced cycles. This pattern is typical for eccentricity-related modulation of precession amplitude. Bundles of precession cycles with mature paleosols are then related to short 100-kyr eccentricity maxima, and the whole succession is evidently tracking a long 400-kyr eccentricity maximum. This finding indicates that orbital forcing of climate was a determining factor in sedimentation on Willwood Formation floodplains. To further elucidate and document the role of orbital forcing, further research will focus on the construction of longer time series, preferably by extending the series through magnetochron C24n to achieve better age constraints. A three-dimensional image of the stratigraphy will be constructed to permit variability related to autogenic processes to be disentangled from variability related to allogenic mechanisms.

Abdul Aziz, H., F.J. Hilgen, G.M. van Luijk et al. 2008. Astronomical climate control on paleosol stacking patterns in the upper Paleocene-lower Eocene Willwood Formation, Bighorn Basin, Wyoming. *Geology* 36, p. 531–534; doi: 10.1130/G24734A.1.