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The Palo Duro Flow, a Reinterpretation of the Palo Duro Paleosol

F. Bauhof, D. Stansbury
Independent Scholars

The Texas Panhandle has exposures of the unconformity between the upper Permian Quartermaster Formation and the base of the Triassic Dockum Group. At this boundary, the lower unit is informally named the "Palo Duro Geosol" by Kanhalangsy (1997). The Geosol has been studied from the eastern boundary of the Llano Estacado canyon system in Texas, north to the Canadian River and east along the Pecos River. There are no exposures to the south as the bed is underground.

Current interpretation of the boundary unit of the upper Permian as a paleosol in the Texas Panhandle correlates with the mottled beds in eastern New Mexico and the Shinarump Member of the Chinle Formation further west in New Mexico and Arizona. The depositional environment of the Dockum Group has been interpreted as fluvial and subaerial. The initial study location is a 5.54 m flow exposure, which is the type location of Kanhalangsy, in Caprock Canyon State Park, Texas. To the north-west, north of Amarillo, Texas, at the Rosita Flats OHV Area on the Canadian River, the flow expands to 11 m (Lehman et al. 1992) The flow comprises a unit at the boundary between the Permian Quartermaster and Triassic Dockum Group. Based on research from Austin (2003) and Stansbury (2010), as a flow progresses from proximal to terminal end, flow thickness increases as the flow inflates.

Field work provides evidence for the reinterpretation of the paleosol as a hyperconcentrated gravity flow, flowing from south-east to north-west based on flow thickness changes as previously described. Reinterpreting the Geosol as a hyperconcentrated flow is based on physical characteristics of sediment gravity flows as described by Mulder and Alexander (2001). Flow characteristics of the Palo Duro deposit include suspended clasts in the lower section, inverse grading up section, and the top exhibiting characteristics of dewaterization.

At the Tule Canyon Location, two Palo Duro Flow samples were collected and thin section and XRD analysis was performed. A thin section of the sandstone has an average grain size of 0.20mm. The sample is bedded with crude argillaceous laminations comprised of compacted ductile grains with sparsely scattered calcareous bioclasts and patchy poikilotopic calcite cement with a porosity of 32%. XRD analysis indicates 90% quartz, 5% K-feldspar, <2% mica/illite?, <2% hematite, <1% calcite, with <5% unidentified. This sub-angular to angular, well sorted, clean sandstone is consistent with a laminar flow. A soil normally contains higher concentrations of clay minerals.

Primary evidence of the hyperconcentrated flow at the Canadian River site includes multiple layers of suspended clasts. These layers show size consistency with upper layers having clast sizes of 1-2 cm while lower clast layers have sizes of 10 cm or more (Figure 1 – Canadian River suspended clasts). The combination of suspended clasts, inverse grading, and dewaterization features indicate that the Palo Duro Geosol should be reinterpreted as the Palo Duro Flow, a hyperconcentrated sediment gravity flow.

Figure 1. Canadian River suspended clasts.

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Another Major Consequence of Catastrophic Plate Tectonics: Mega-Tsunamis That Generated the Continental Flood Sediment Record

J. Baumgardner
Logos Research Associates

Previous numerical modeling of the tsunamis generated by the rapid plate motions during the Genesis Flood suggested that such tsunamis indeed are capable of accounting for most of the erosion, sediment transport, and sediment deposition the fossil-bearing portion of the continental sediment record (Baumgardner 2016). This talk will describe more recent work that includes more realistic topography and tectonic motions involving continent breakup and reassembly. Details of this more recent modeling show that, just as there are ebb and flow phases of the tide on a beach, the tsunamis display similar back and forth flow. In a tide the *ebb* is the outgoing phase, when the tide drains away from the shore; the *flow* is the incoming phase when water rises again. In the case of the tsunamis, the incoming phase has much higher speed, is highly turbulent, keeps the sediment in suspension, and there is little or no deposition. By contrast, in the outgoing phase, the water speed is lower, the flow is less turbulent, and deposition typically is appreciable. In terms of the flow direction recorded in the deposited sediment implied by this model, the flow direction recorded in the deposited sediment is generally in the direction toward the coastline. For example, in the case of the Laurentia, which today corresponds to North America and Greenland, tsunamis in the model invade the western coast from the west southwest. The current direction of the retreating water from these tsunamis, when most of the sediment deposition occurs, in the model is therefore from the east northeast. It is noteworthy that the paleocurrent directions observed in the Paleozoic portion of the sediment record in the southwestern United States are also predominately from the east northeast (Brand et al. 2015). Moreover, the general pattern of Paleozoic sedimentation over Laurentia is also in reasonable agreement with recent estimates (Clarey and Werner 2017). This modeling builds a plausible case that the rapid, large-scale tectonics of the Flood also played a dominant role in the generation the continental fossil-bearing sediment record.

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Orbital Tuning: Exploiting a Huge Weakness in Uniformitarian Geochronology

J. Hebert
Institute for Creation Research

Because radioisotope dating methods (with some exceptions) cannot be used to date deep seafloor sediments, uniformitarian scientists often use the Milankovitch (or astronomical) ice age theory to assign ages to deep-sea sediment cores via a technique called orbital tuning. Foraminiferal oxygen isotope ($\delta^{18}O$) values at a given depth within the sediments are thought to represent global ice volume at the time those particular sediments were deposited. Maximum and minimum $\delta^{18}O$ values are thought to represent times of maximum and minimum global ice cover, respectively. However, the timing of these supposed past ice ages, which orbital tuning assigns to the sediment cores, are obtained from the assumption that Earth's astronomical cycles are pacing the ice ages.

However, the astronomical theory (hypothesis, really) has numerous well-known theoretical problems. Likewise, the main argument for the theory, the famous 1976 "Pacemaker of the Ice Ages" paper, is problematic by secular scientists' own reckoning: the confirmation of Milankovitch climate forcing in that paper depended upon an assumed age of 700 ka for the most recent geomagnetic field reversal. Yet uniformitarian scientists now claim that this reversal has an age of 780-790 ka. Recent creation research has replicated the frequency-domain results in the original Pacemaker paper and has shown that the new results, obtained using the revised age assignment, no longer align with Milankovitch expectations. Moreover, uniformitarian scientists also made other changes to the seafloor sediment data, changes which cause an even larger disagreement with Milankovitch expectations (paper in press)! There are good reasons to suspect that uniformitarian scientists do not have a good "replacement" argument for the Pacemaker paper. Hence, there is likely no real evidence for Milankovitch climate forcing, even within a uniformitarian framework.

Nevertheless, orbital tuning has become an essential part of the uniformitarian geochronology "toolkit". It is used to calibrate argon-argon dating standards, assign ages to both marine and terrestrial sediment cores, calibrate ages for the deep ice cores of Greenland and Antarctica, as well as to assign ages to tephra layers and chalks. A Milankovitch interpretation of paleoclimate data is also contributing to fears of future "climate change" and rapid sea level rise. Hence, it is no exaggeration to say that the above results are potentially devastating to hundreds, if not thousands, of geochronology papers, even by uniformitarian reckoning.

Creationist scientists now have a "golden opportunity" to expose this embarrassing (and far-reaching) error on the part of uniformitarian scientists, as well as to demonstrate that the dating methods, despite popular perception, are not truly independent. This talk presents evidence that some secular scientists are aware that the Pacemaker paper used an invalid age assignment, why uniformitarian scientists may (incorrectly) think that this age revision is not really a problem, a method by which even laypeople can quickly confirm that these new results are approximately correct, and a demonstration of how age assignments in cores are routinely tied back to the Milankovitch ice age theory.

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Defining "creationist" research: implications for project design and publication

S.A. Maithel
Loma Linda University

In recent decades, researchers have made significant progress toward developing a young earth model for the rock record. Technical journals, such as the *Creation Research Society Quarterly*, *Journal of Creation*, *Answers Research Journal*, *Origins*, and others, were established to publish so-called "creationist" research projects, attracting papers on a wide variety of subjects from philosophy of science, to literature reviews, to original research. The range of publications in these journals, therefore, raises an important question: what is it that makes a project *creationist*?

To some, a "creationist" project is one that critiques a widely-accepted interpretation and/or invokes catastrophic processes. These definitions, however, could encompass numerous projects that are controversial – or at least were at their time of publication – but are not related to creationism (e. g. Bretz, 1925; Schweitzer et al., 2005). If a creationist individual conducts similarly controversial research, that project becomes branded as a "creationist" endeavor: not because of the scientist's personal beliefs, but because the research is perceived to be more relevant to young earth models than other, less-controversial studies.

While individuals with creationist views can do any kind of research, I suggest that the only truly "creationist" projects are those that directly relate to Scriptural events or provide a novel interpretation/approach that applies exclusively to a young earth model (presumably based on Scripture). By this definition, prime examples of "creationist" research fields include baraminology (e. g. Wood, 2006) and Flood boundaries (e. g. Whitmore and Garner, 2008). Catastrophic Plate Tectonics (Austin et al., 1994) arguably fits the definition as well, since the model is directly linked to the Biblical Flood and is otherwise unique to a short chronology.

Accordingly, it follows that many projects apply to creationist models, but are not intrinsically "creationist" by themselves. Examples include studies of sedimentary processes, taphonomy, and paleoenvironments, among various others. Defining these as "creationist" projects – even if they are controversial or invoke catastrophe – implies that the *research itself* is based on something more than the sedimentary processes, taphonomy, paleoenvironments, etc. which it claims to be about: that some fundamental aspect of the methods or approach is different, when in reality, the application may be different, but the *scientific methods* should be the same.

These definitions will impact creationist approaches to project design and publication. Research should aim to make positive interpretations instead of only critiquing standard models, and should not be limited to issues that are "controversial." Furthermore, the best projects suited to publication in creationist journals may be those that are truly "creationist" by design; that is, they connect to Scripture in some way. Clarifying the definition of creationist research will enable scientists to design and publish projects more effectively as they seek to develop a short-age paradigm of earth history.

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Persistence and Significance of K-Feldspar and Muscovite in the Cambrian Tonto Group and Devonian Temple Butte Limestone, Grand Canyon, AZ

A.A. Snelling
Answers in Genesis

The Tapeats Sandstone, Bright Angel Shale and Muav Limestone of the Tonto Group represent the fining upwards Sauk Megasequence exposed in the Grand Canyon (Beus & Morales 2003, Timmons & Karlstrom 2012). Conventional facies analysis postulates deposition of these formations in a variety of fluvial, nearshore and shallow shelf environments involving a number of transgressions and regressions that resulted in intertonguing of the formations and vertical juxtaposition of facies belts that probably were not laterally adjacent.

The Devonian Temple Butte Limestone unconformably overlies the Muav Limestone. It is estimated that the time gap at this unconformable boundary represents 135-140 million years. The dolomitization of the original limestone and rarity of recognizable fossils have made refining a conventional environmental interpretation difficult.

Below the Tapeats Sandstone is the Great Unconformity, which represents the continent-wide erosion surface on which the Tapeats Sandstone was then deposited. The Precambrian rocks beneath the Great Unconformity consist primarily of the crystalline basement complex of schists of the Granite Gorge

Metamorphic Suite intruded by two generations of various granite plutons and pegmatite complexes. In several downfaulted blocks, this crystalline basement complex is overlain unconformably by the Grand Canyon Supergroup. Many of the Precambrian granite plutons and especially the pegmatites are K-feldspar-rich, so that when they were eroded, coarse K-feldspar grains were included in the base of the Tapeats Sandstone, where they are macroscopically evident.

During the investigation of four soft-sediment folds in the Grand Canyon, samples of these Cambrian and Devonian rock units were collected from the folds, and from locations distant to the folds for compositional and textural comparisons – 26 samples of the Tapeats Sandstone (including 4 regional samples), 12 samples of the Bright Angel Shale (including 2 regional samples), 9 samples of the Muav Limestone (including 3 regional samples), and 6 samples of the Temple Butte Limestone. All samples were subjected to XRD analyses at the Calgary Rock and Materials Service laboratory to determine their mineral contents. Follow-up thin section study of each sample is in progress.

All but three samples of the Tapeats Sandstone contain measurable K-feldspar, the 23 samples ranging in K-feldspar content from 1.8% to 33.1% and averaging 14.7%. In thin section these K-feldspar grains are very evident and are generally small to medium sand-sized grains. Occasional muscovite flakes can be seen end on in the plane of the thin sections. This is understandable, since the thin sections were cut as cross-sections through the samples, so the planes of the thin sections are perpendicular to the bedding, thus cutting through the muscovite flakes which would be expected to lie flat – parallel to the bedding.

What was surprising was to find that K-feldspar persists in the contents of the other units, even in the Cambrian and Devonian limestones. The K-feldspar content of the 12 Bright Angel Shale samples ranges from 11.0% to 46.9% and averages 37.3%, of the 9 Muav Limestone samples ranges from 0.9% to 26.3% and averages 16.3%, and of the 6 Temple Butte samples ranges from 4.5% to 18.5% and averages 11.5%. Even more surprising was the persistence of the occasional small muscovite flakes in all of these lithological units.

K-feldspar (Mohs 6) is softer than quartz (7). It is readily subject to chemical weathering, and its grains are also rounded rapidly (Whitmore 2017). Muscovite at Mohs 2-2½ is relatively soft, and its flakey habit makes it very susceptible to destruction by abrasion by other harder mineral grains during sediment transport and deposition, especially in aeolian environments (Anderson et al. 2017).

The sources of the K-feldspar and muscovite in these Grand Canyon sedimentary units are presumably the granites and schists respectively in the eroded underlying crystalline basement complex. So, the persistence of K-feldspar and muscovite throughout the Tapeats, Bright Angel and Muav is consistent with both a short transport time and distance, that is, deposition was very rapid and very soon after erosion locally during the Flood year, rather than over millions of years claimed by uniformitarians. It is also consistent with the Tonto Group formations being deposited simultaneously and laterally during the initial erosive transgression of the Flood waters. Highly significant though is the persistence of K-feldspar and muscovite in the Temple Butte Limestone, which must thus have been deposited rapidly very soon after the Tonto Group during the Flood year.

More distant sources cannot be ruled out because in the global water environment of the Flood such grains could have survived global transport (Anderson et al. 2017). More work thus needs to be done to determine if the origin of the K-feldspar and muscovite grains can be demonstrated, perhaps by electron microprobe analyses of them, including trace element patterns which may be characteristic of their source.

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