Global-Scale Tsunami-Driven Erosion, Transport, and Sedimentation during the Genesis Flood

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In today’s world, an oceanic plate is stuck and locked against the plate that overrides it at a subduction zone for the vast majority of the time, even though the subducting plate is moving in a continuous manner, as documented by GPS measurements. Relative motion occurs only in extremely brief episodes as the two plates release and slide rapidly past each other, producing an earthquake and in many cases also a tsunami. In the context of catastrophic plate tectonics, if the subducting plate is moving horizontally at 2 m/s and subducting at a 45° angle, the ocean bottom in the subduction zone is being pulled downward at a rate of 2 sin (45°) = 1.4 m/s. If the locking persists for even an hour (3,600 s), the sea bottom is depressed by more than 5 km. Sudden unlocking and slip between the subducting plate and the overriding plate will cause the sea bottom to rise by that height, unleashing a huge tsunami. Assuming that the cumulative length of subduction zones during the Flood was similar to today, some 50,000 km of subduction zones were active during the cataclysm. If the average length of a rupture segment were 1,000 km, and each segment unlocked once per hour, this would imply 50 mega-tsunamis were unleashed each hour in the world’s ocean basins. Previous numerical modeling of these waves as they impinge onto the continental margins and then move inland across the continent surface suggests that they indeed are able to account for the erosion, sediment transport, and sediment deposition implied by the sediment record during the Genesis Flood (Baumgardner 2016).

This talk will describe more recent work that includes topographical surface features such as mountains and plate motions involving continent breakup and reassembly. The primary conclusions reached in the earlier study still apply when the added realism is included. For example, due to the major influence of the Coriolis force, the sediment record tends to be characterized by large spatial scales. On the other hand, the recent studies reveal, as might be expected, that as topographical features erode they generate nearby regions of enhanced sediment deposition.

An astonishing feature in all these models is that early in the time history the emplacement of water onto the continental surface by the large tsunamis far exceeds the rate that water can drain by gravity influence back into the ocean basins (Baumgardner 2016). This results in rising water over the continental regions until the water height over the continents is sufficient for the runoff rate to match the emplacement rate. This mechanism provides a simple explanation for the inundation of the continental areas during the Flood, and it also accounts for in an obvious method of removal of the water at the Flood’s conclusion—it simply drained back into the ocean basins when rapid plate movement had ceased and the large tsunami had stopped. Numerical modeling suggests a possible strong linkage between the rapid, large-scale tectonics of the Flood and thick sequence of fossil-bearing sediment layers that today blanket the continents.


Influence of Greenland on Ice Sheet Growth in the Post-Flood World

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An investigation looking at the feasibility of a rapid ice age in a post-flood world has been ongoing since the 1980’s. Proposed in Morris and Whitcomb’s book The Genesis Flood and elaborated by Oard (1979), a post-flood ice age model consists of warm oceans, partially denuded land and enhanced volcanic activity. It is assumed that a combination of these factors result in enhanced precipitation at higher latitudes. The snowfall is intense enough that accumulation of ice occurs on successive years resulting in a 400+ m thick ice sheet that lasts 500 years. Vardiman (1998) reported on climate model studies of precipitation using perpetual January conditions and warm oceans. Gollmer (2013) reproduced these results using a more recent climate model that includes circulation of the warm ocean. At the previous Creation Biology Society/Creation Geology Society meeting Gollmer reported on an extension of the 2013 work using a higher resolution model. This work also started with a uniform ocean temperature of 24°C rather than 30°C.

As reported last year, there is an issue related to the amount of precipitation occurring over land at higher latitudes. One possible solution to the problem lies in the influence Greenland and Antarctica have on global circulation and precipitation patterns. Greenland’s ice sheet is over 3,000 m at its thickest point and has an average thickness greater than 2,000 m. Initialization files for the NASA GISS ModelE2 AR5 were modified to remove the Greenland and Antarctic ice sheets. Ice was removed to ground level or sea level. Isostatic rebound of the land masses was not taken into account since the goal of this study is to determine the
impact of topography. Although the topography was modified, the albedo of the surface was left unchanged. It is assumed that the surface would collect snow and, therefore, have similar reflective properties as the removed ice sheet.

There does appear to be some shift in precipitation; however, predominant wind currents are fundamentally unchanged. Precipitation rates are not suitable for rapid accumulation of ice during the winter and continental temperatures are above freezing during the summer. These results indicate that other factors must be explored to fully test out the post-flood ice age model.


Rapid Rounding of K-Feldspar Sand Grains from Beach to Dune Environments and its Significance for Ancient Sandstones
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Paired sand samples were collected from seven different locations along the California and Oregon coastlines where sandy beach sediments and eolian coastal dunes were in close proximity (< 0.5 km) of each other. Beach samples were collected from the swash zone. Dune samples were taken from either the crests or slip faces of coastal dunes of various sizes. It was assumed the dune sand was derived from the nearby beach environment.

The loose sand samples were embedded in epoxy and stained for K-feldspar in order to make thin sections for microscopic study. About 100 quartz and 100 K-feldspar sand grains were measured and scored for rounding from each of the fourteen locations. The slides were analyzed with a Nikon petrographic microscope and scored for rounding from each of the fourteen locations. About 100 quartz and 100 K-feldspar grains in any particular field of view were measured and scored for rounding so size bias could be limited. This process was repeated until an excess of about 100 grains for each type of mineral were measured and scored. Rounding for each grain was scored on a scale of 0 to 6 (to the nearest 0.5) using the rho rounding scale of Powers (1953) modified by Folk (1955). On this scale a score of 0.5 is very angular, 1.5 is angular, 2.5 is subangular, 3.5 is subrounded and so on. The author personally counted and scored all of the grains in this study during a two-week period of time in an attempt to minimize any bias in scoring the rounding. Means and standard deviations were calculated for size and rounding for both minerals in all of the samples.

In order to compare rounding of similar sized sand grains from the coupled beach-dune environments, a size sample of 1.0 standard deviations from each side of the mean was selected from the dune sample and compared with the same size population of grains from the beach sample (where there is a much wider range of sand grain sizes). T tests were performed to see if significant rounding occurred from the beach to the dune in quartz and K-Feldspar (2 tails, unequal variance assumed using Microsoft Excel). The statistical results showed quartz is only slightly rounded in most cases over this short transport distance. K-feldspar on the other hand, always showed a very statistically significant change (most p values were 0.000) in rounding even over this short transport distance. Changes in roundness ranged from 0.4 to 1.3 steps on the Powers rounding scale.

From these results one can cautiously conclude that the turbulent beach environment and probably other aqueous environments do not tend to favor rounding of most K-feldspar sand grains (the sand grains were delivered to the beach by rivers). On the other hand, even a small amount of eolian transport can result in the rounding of a population of K-feldspar sand grains. Similar trends have been noted experimentally with muscovite. Muscovite can last for long periods of time in aqueous “tumbling” experiments (more than one year) but disappears within days in simulated eolian trials (Anderson et al., 2017).

The results of this study can be helpful when interpreting depositional environments of ancient sandstones. A population of relatively angular K-feldspar sand grains probably indicates some type of aqueous deposit. Ancient eolian deposits should have relatively rounded K-feldspar grains unless the sandstone is derived from an extremely local source. Accessory minerals like K-feldspar and muscovite in predominately quartz sandstones are good minerals to evaluate when considering depositional environments because they are more sensitive to abrasive eolian

| Rounding changes in quartz and K-feldspar sand grains from beach to sand dunes, Oregon and California |
|-------------------------------------------------|----------------------------------|----------------------------------|
| Rounding in quartz | Rounding in K-feldspar |
| Beach | Dune | p value | Beach | Dune | p value |
| Florence, OR | 2.8 | 3.1 | 0.007 | 2.4 | 3.7 | 0.000 |
| Winchester Bay, OR | 3.1 | 3.7 | 0.000 | 3.2 | 3.9 | 0.000 |
| Coos Bay, OR | 2.9 | 3.2 | 0.002 | 3.1 | 3.7 | 0.000 |
| Hunter’s Cove, OR | 2.7 | 3.0 | 0.178 | 2.9 | 3.7 | 0.000 |
| Tolowa Dunes, CA | 2.9 | 2.8 | 0.518 | 3.2 | 3.6 | 0.038 |
| Morro Beach, CA | 3.0 | 3.0 | 0.359 | 3.1 | 3.5 | 0.001 |
| Pismo Beach, CA | 2.8 | 2.9 | 0.033 | 2.7 | 3.1 | 0.000 |

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conditions compared to quartz. At least two factors might be significant: the physical properties of the minerals involved and the medium (air or water) in which the deposit is made. Quartz has conchoidal fracture and a hardness of 7.0 on Mohs scale. Both K-feldspar and muscovite exhibit cleavage (allowing them to break easier) and have hardnesses of 6.0 and 2.0-2.5 respectively which probably allows them to deteriorate more quickly in violent grain-to-grain collisions that occur in eolian environments compared to an aqueous one where water can “cushion” collisions.