Investigation of the *Corbula* Bed of Central Texas as the Product of Catastrophic Tsunami Deposition

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ABSTRACT

Corbulids are tiny clams that live in low energy environments. They are elongate, up to about 7 mm in length, prefer fine grained sediments, and they burrow nearly vertical with their pointy posterior up. In Central Texas, the *Corbula* bed covers an area of 13,000 km² and is generally no more than 1 m thick. The geologic setting of a very wide backreef lagoon was the ideal setting for corbulids to prosper as their vast numbers and sizes testify. Their articulated nature within supercritical flow bedforms indicates that they were transported and deposited alive by high velocity currents. The *Corbula* bed can be divided into two layers. The lower half consists of a hard, dense iron-stained medium to very coarse packstone beds with load features and supercritical flow structures including antidunes, wavy plane beds, and a traction carpet above an erosive sharp undulating contact at the base. The upper half is a soft, friable crudely laminated to massive wackestone-packstone with increasing mud content. Storms and storm-generated tides were discounted because they rarely produce and preserve antidunes, and they are limited to much smaller geographical areas of inter-tidal beaches and storm washover fans. Outcrops confirm at least 4000 km² of antidunes in the lower half of the *Corbula* bed. Antidunes rarely preserve in nature unless there are diversions of the current and rapid burial by continuous sedimentation. The stacking pattern of antidunes in the lower part followed by crudely laminated muddy deposits in the upper part is characteristic of tsunamis. In the lower half, there are two or more antidune

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beds in quick succession with diverging currents. The flow in lower antidunes was initially towards the west, then south and is interpreted as tsunami drawdown. Antidune remnants at Canyon Lake Gorge indicate that the overriding northeastward flowing tsunami current was rotated towards the north by another strong current from the south. Based on outcrop evidence of the *Corbula* bed, the tsunami flood was at least 40 km wide and flowed at least 90 km in the northeasterly direction. The velocity of the tsunami above the sea floor is estimated between 5–8 m/s with sloshing and seiche as the tsunami waned. The debris that formed the overlying soft wackestone-packstone rapidly fell out of suspension to preserve the antidunes. There is a high probability that submarine earthquakes triggered the tsunami. Several major tectonic structures were located southwest of the study area. In Kendall County, a debris flow with load features and sand volcanoes formed by liquefaction on a low-angle slope of <0.05°. The overriding antidune bed, with wavelengths approaching 60 cm, superimposed above the debris flow bed indicate that high velocity currents were initiated in conjunction with the debris flow.

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