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ANTIENT MARTIAN TSUNAMIS: EARTH COUNTERPART OF PROJECTED MARTIAN SEDIMENT

Abstract

Bolide impacts on Mars, within the proposed ocean boundaries ("contacts 1 and 2") in the northern lowlands, would certainly have generated ultrahigh energy waves similar to tsunamis on Earth. Impacts into putative Noachian and Hesperian seas of variable areal extents and depths would have experienced high energy inundations (transgressions), which would have left an imprint in the stack of deposits adjacent to the proposed shorelines. On Earth, the principal influencing factors for tsunami-wave energy are the character of shoreline topography and coastal water depth, which control wave compression and shoreline friction. Shorelines with narrow embayment sand steep off shore gradients produce wave compression and increased collision of grains within the carried load contrasted with linear shorelines and shallow offshore gradients that dissipate energy. Steep offshore gradients produce concentrated major wave friction with the bed engendering high kinetic energy in the wave during emplacement of tsunami generated sediment, which differs from shallow offshore beds that produce lower frictional effects over a wider area and drawdown of wave energy. Thus, over printing of transported quartz grains on Earth is greatest where wave energy is highest, attenuated down to minor or nil overprinting where wave energy is less. Such grain overprinting in the form of energy-induced micro textures would also be observed in other grain types such as olivine and plagioclase, as such mineralogies are expected to dominate the Martian landscape based on orbital and local field (lander and rover) perspectives. Kinetic energy variation in tsunamis is controlled more by the square of velocity than mass, the resulting collisional effects of which produce swarms of v-shaped percussion micro features on quartz and other silicate mineral surfaces when velocity and compression are highest. This work indicates that a valid test for the ocean hypothesis is targeting "coastal' 'areas adjacent to narrow embayments where offshore depths are known to be highest, as possible tsunami-emplaced sediments, especially those that have been protected from atmospheric conditions through relatively rapid burial, may reveal a high frequency of percussion cracks, features of which appear to be unique to such terrestrial environments.