COMMENTS AND REPLIES

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Comment

Impacts, mega-tsunami, and other extraordinary claims

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Pinter and Ishman (2008) not only question several aspects of our work but also some well-established scientific concepts. The first is our inference that splashes of Fe > Cr > Ni metal onto conchoidally fractured grains, marine microfossils, and impact glasses are probably derived from a vaporized impactor. There are two well-known cases of impact condensates with a high content of Ni but with Fe > Cr > Ni. The first is the Ries impact crater, where veinlets of Fe > Cr > Ni metal a few microns in diameter were interpreted as vaporized impactor (El Goresy and Chao, 1976). The second is from the Barberton greenstone belt, where 3.24 Ga impact spherules have Fe > Cr > Ni (Krull-Davatzes et al., 2006). Cr isotopic values from the impact spherules indicate that the Cr came from an impactor (Kyte et al., 2003). Modeling suggests that the Cr contents of impact condensates increase under conditions equivalent to “impactor dominated vapor and/or a basaltic ocean-crust target” (Ebel and Grossman, 2005). Thus, impacts can produce Ni-rich ejecta in which Cr is enriched relative to Ni.

Pinter and Ishman also believe that our observation of fused metals on marine microfossils is wrong because $CaCO_3$ decomposes at ~500 °C, while the melting points of iron, nickel, and chrome are >1400 °C. However, Ozinski et al. (2005) found that $CaCO_3$ melts in the Haughton impact crater coexist with silicate melt. In addition, intact, well-preserved carbonate microfossils are found encased in silicate melt from Chicxulub (Salge, 2007). Recent experiments have replicated grasses found intact within silicate impact melts in South America (Harris and Schultz, 2007). If the grasses are exposed to silicate melt ~1200 °C, the grasses burn. If they are exposed to silicate melt at ~1600 °C, they are preserved. As no Holocene igneous rocks have liquidus temperatures >1600 °C, only impacts can produce either grass or marine microfossils encased in silicate melt.

Pinter and Ishman also claim that chevron dunes in Madagascar and on Long Island are aeolian in origin. We visited both locations and found many features that seem incompatible with an aeolian origin. First, parts of the chevrons in both locations contain fist-sized rocks. These rocks are too large to be transported by the wind. Second, the orientations of the chevrons do not match the current prevailing wind direction. In both areas, some of the thicker sand deposits are being reworked into classic windblown dunes. The direction of movement of these dunes differs 8° to 22° from the long-axis of the chevrons. Third, the degree of roundness of the grains in the chevrons is not characteristic of wind transport over long distances. In both locations, sand grains on the distal ends of the chevrons are not well sorted or well rounded. Sand moved by the wind obtains an aeolian size and sorting distribution after only 10–12 km of saltation transport (Sharp, 1966); however, at Ampalaza in Madagascar, the chevron is >40 km long and rises to 63 m above sea level. At its distal end, the chevron is 7.2 km in a direct line from the coast and contains unbroken, unabraded marine microfossils and conchoidally fractured sand grains. It is impossible to transport unabraded marine microfossils to this location via wind-generated saltation. The site is too far above sea level for storm waves, and there is no local agricultural activity. The chevron was deposited by a tsunami.

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