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Regarding an Oceanic Crust/Upper Mantle Geochemical Signature at the KT Boundary: If not from Chicxulub Crater, then Where Did it Come from?

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1 Abstract

Evidence for a mantle and/or basaltic component in KT boundary distal ejecta is apparently inconsistent with ejection from Chicxulub Crater since it is located on ~35 km thick continental crust (DePaolo et al., 1983; Montanari et al., 1983; Hildebrand and Boynton, 1988, 1990). This evidence, along with ejected terrestrial chromites (Olds et al., 2016) suggest the impact sampled terrestrial mafic and/or ultramafic target rocks which are not known to exist in the Chicxulub target area.

Possible resolutions to the paradox are: 1) the existence of an unmapped/unknown suture in Yucatan Platform basement, 2) an additional small unmapped/unknown impact site on oceanic lithosphere, or 3) an additional large impact on oceanic lithosphere or continental margin transitional to oceanic lithosphere.

The third hypothesis is elaborated here since: 1) Ophiolites nearest to Chicxulub crater are found in Cuba and apparently were obducted in latest Cretaceous/earliest Danian times (García-Casco, 2008), inconsistent with the documented Eocene collision of Cuba with the Bahamas platform; and 2) Cuba hosts the world's thickest known KT boundary deposits (Iturralde-Vinent, 1992; Kiyokawa et al., 2002; Tada et al., 2003). These and geometric considerations suggest oceanic crust and upper mantle rock, exposed as ophiolite in the Greater Antilles island chain, marks the rim of a roughly 700 km diameter impact basin deformed and dismembered from an originally circular form by at least 50 million years of left-lateral shear displacement along the North American-Caribbean

transform plate boundary.

References

- DePaolo, D., et al., 1983. Rb-Sr, Sm-Nd, K-Ca, O, and H isotopic study of Cretaceous-Tertiary boundary sediments, Caravaca, Spain: Evidence for an oceanic impact site. *Earth and Planetary Science Letters*, 64(3): 356–373.
- Hildebrand, A., and Boynton, W., 1988. Provenance of the K/T boundary layers. *LPI Contributions*, 673: 78.
- Hildebrand, A.R., and Boynton, W.V., 1990. Proximal Cretaceous-Tertiary boundary impact deposits in the Caribbean. *Science (New York, NY)*, 248(4957): 843.
- Montanari, A., et al., 1983. Spheroids at the Cretaceous-Tertiary boundary are altered impact droplets of basaltic composition. *Geology*, 11(11): 668.
- Olds, E.P., et al., 2016. KT boundary chromites determined to be terrestrial: Cr isotopic evidence for excavation and ejection of mafic/ultramafic rocks by the KT boundary impact. Submitted to *Lithosphere* Dec.
- García-Casco, A., 2008. Iturralde-Vinent, and J. Pindell, Latest Cretaceous collision/accretion between the Caribbean Plate and Caribbeana: origin of metamorphic terranes in the Greater Antilles. *International Geology Review*, 50(9): 781–809.
- Tada, R., et al., 2003. K/T boundary deposits in the paleo-western Caribbean basin.
- Kiyokawa, S., et al., 2002. Cretaceous-Tertiary boundary sequence in the Cacarajicara Formation, western Cuba: An impact-related, high-energy, gravity-flow deposit. *Catastrophic Events and Mass Extinctions: Impacts and Beyond*.
- Iturralde-Vinent, M., 1992. A short note on the Cuban late Maastrichtian megaturbidite (an impact-derived deposit?). *Earth and Planetary Science Letters*, 109(1-2): 225–228.

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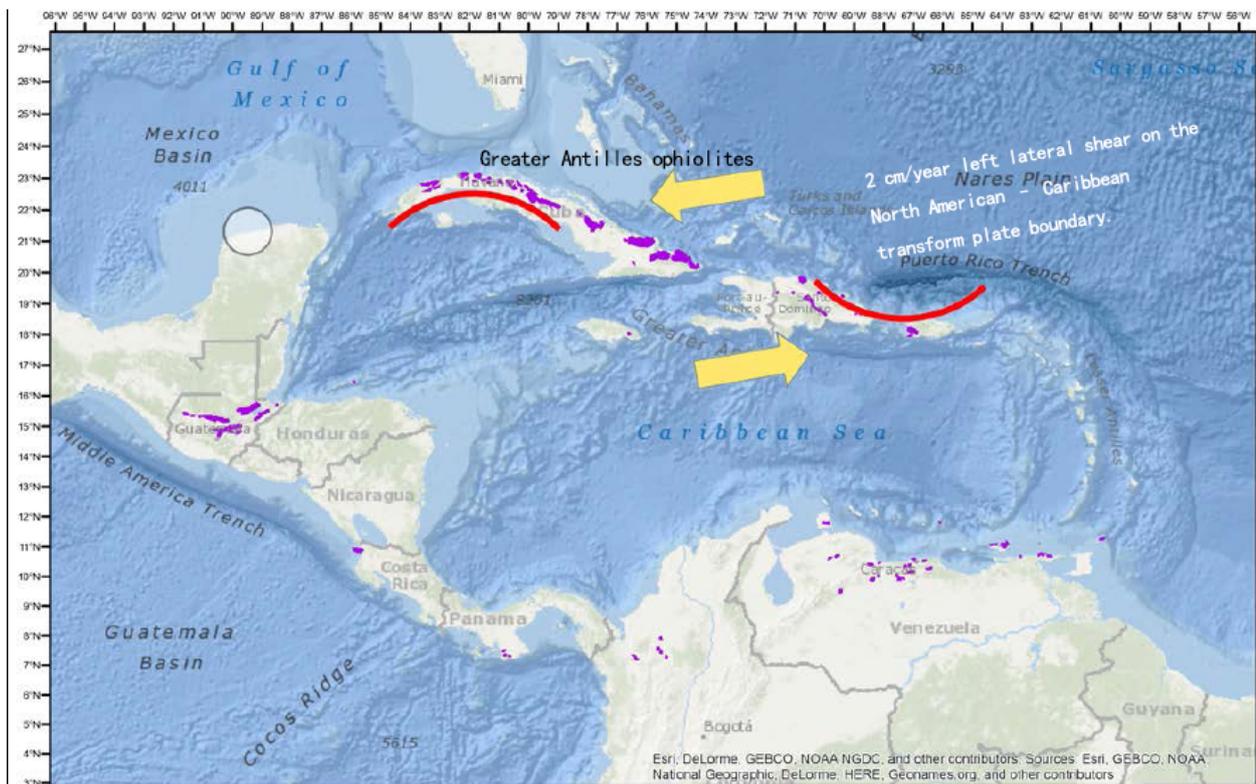


Fig. 1. Map of the Greater Antilles island chain ophiolites straddling the North American Caribbean plate boundary. Ophiolites are coded purple and exaggerated (in area) for visibility. Cayman Trough extent corresponds to about 1000 km minimum left-lateral offset between the northwest and southeast Greater Antilles island ophiolite belt segments (and corresponding North American and Caribbean plates). The Puerto Rico Trench has nearly identical strike (and relative strike-slip plate velocity) as the transform faults (Oriente and Swan fracture zones) bounding the Cayman Trough. Large arrows indicate sense of present day relative plate velocity of ~ 2 cm/y.