**CRATER-FILLING AS A PROBABLE CAUSE OF GIANT TSUNAMIS AT THE CRETACEOUS/ TERTIARY BOUNDARY.** K. Goto [1], R. Tada[1], T. J. Bralower[2], E. Tajika[1], T. Matsui[3], [1]Department of Earth and Planetary Sciences, The University of Tokyo (goto@sys.eps.s.u-tokyo.ac.jp), [2]Department of Geosciences, The Pennsylvania State University, [3] Graduate School of Frontier Sciences, The University of Tokyo.

**Introduction:** A great number of Cretaceous/Tertiary (K/T) boundary proximal deposits were reported from the shallow and deep-sea environments around the Gulf of Mexico [e. g., 1]. Because large tsunamis are one of the major consequences of the impact into the ocean, influence of the tsunamis is expected to have been recorded in these deposits [e.g., 1 to 7]. However, tsunami origin of these deposits is still criticized [e. g., 8]. Moreover, the ultimate cause of large tsunamis is controversial and their magnitude and extent are unknown.

Two different generation mechanisms are proposed for the giant tsunamis caused by the K/T boundary impact [9]. One is a landslide triggered by the impact seismic wave (landslide-generated tsunamis) and the other is a crater-filling of the ocean water (crater-generated tsunamis) [9]. There are thick (>250 m) landslide and gravity flow deposits of probable K/T boundary age reported around the Yucatan peninsula [10, 11 and 12], which might have caused large tsunamis. On the other hand, if the ocean water invaded into the crater immediately after the impact, the crater-generated tsunamis would have been formed by the movement of water that fills and then flows out of the crater cavity [9]. Although the latter mechanism has a potential to generate the largest tsunamis [9], no evidence of ocean invasion into the crater has been presented. So the examination of the sediments in the Chicxulub crater is critical to test the possibility of marine invasion and consequent generation of the large tsunamis. In this study, lithology, grain composition, chemical composition, grain size and nannofossil assemblage of the samples from YAX-1 core, drilled by the Chicxulub Scientific Drilling Program (CSDP), were analyzed to investigate the possibility of the marine invasion into the Chicxulub crater immediately after the impact.

**Lithology of the YAX-1 core and probability of marine invasion:** The YAX-1 core was taken from the site approximately 70 km to the south of the center of the Chicxulub crater on the southern slope of the rim at the time of the impact. The impactite occurred within the interval between 794.60 (?) m and 894.94 m depth, and is divided into two lithological units: the impact melt rock unit (822.86 m to 894.94 m) and the suevite unit (794.60 (?) m to 822.86 m). The impact melt rock unit is mainly composed of infinite form of green, black and brown melt fragments with small amount of basement rock fragments such as granite, gabbro and gneiss with glassy matrix. Small amount of limestone, dolostone and anhydrite lithics of probable Yucatan Platform origin are also observed.

The suevite unit overlies the impact melt rock unit with irregular contact. The suevite unit is roughly subdivided into lower and upper subunits based on the grain size. The lower subunit is composed of two slight normally graded beds, which are composed of pebble- to cobble-sized, subangular to rounded, green, black, dark red and brown melt fragments with small amount of limestone, dolostone and basement rock fragments together with melt in a clastic matrix of similar but finer-grained materials. The lower subunit is poorly-sorted and shows grain-supported fabric. A large melt fragment of up to 20 cm in diameter shows intraclast-like appearance and occurs only in the base of this subunit. Poor sorting, grain-supported fabric, and intraclast-like nature suggest that this subunit is a debris flow from the crater rim.

The upper subunit is composed of three slightly normal graded beds that are composed of pebble- to coarse sand- sized, subangular to rounded, green, black, dark red and brown melt fragments with small amount of relatively well-sorted limestone, dolostone and basement rock fragments. Nannofossil assemblage in this subunit is a mixture of various species with various diagnostic ages ranging from Maastrichtian to middle Campanian (797.24 m to 803.98 m). This age range and mixed nature of nannofossil assemblage are similar to the “K/T boundary cocktail deposits” in the Gulf of Mexico [13]. Normal grading, relatively well-sorting and boundary cocktail nature of nannofossil assemblage suggest the upper subunit was deposited from a dense sediment suspended cloud. Approximately several tens centimeter interval of the upper subunit is composed of medium to coarse, greenish sandstone with parallel lamination, suggesting the influence of strong current. Although the top of the impactite is still not confirmed, this lamination may reflect the marine invasion just after the impact. Above the suevite unit, there are approximately 50 cm thick light gray limestone unit (794.11 m to 794.60 (?) m) with repetition of cross and parallel lamination in which there are at least 6 intercalations of thin redeposited suevite layers.

According to our preliminary non-destructive analysis of bulk chemical composition using XRF scanner, > 5 times compositional oscillations are recognized in the upper subunit of the suevite unit. Compositional oscillations are also observed in the K/T boundary deep-sea tsunami deposits in northwestern Cuba [7], which are interpreted as reflecting the formation of the sediment suspended cloud caused by the initial largest tsunami followed by repeated injection of the sediments derived from the Cuban volcanic arc as a result of backwashes by the following tsunamis [7]. This similarity suggests that compositional oscillations in the upper subunit of the suevite unit are tsunami origin, although more study is necessary to clarify the mechanism of compositional oscillations.

**Conclusion:** Presence of laminations, boundary cocktail nature of nannofossil assemblage and compositional oscillations of the suevite unit in the YAX-1 suggests the marine invasion into the crater cavity and potential generation of tsunamis. However, further research is needed to confirm whether the marine invasion occurred immediately after the impact event.

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