

RESURGE PROCESS OF THE CHICXULUB CRATER AND RELEVANCE FOR IMPACT CRATERS ON MARS. K. Goto¹, S. Yamamoto², and T. Matsui³, ¹Disaster Control Research Center, Tohoku University (6-6-11-1106 Aoba, Aramaki, Sendai 980-8579, Japan), ²Institute of Low Temperature Science, Hokkaido University (Kita-19, Nishi-8, Kita-ku, Sapporo 060-0819, Japan), ³Planetary Exploration Research Center, Chiba Institute of Technology (2-17-1 Tsudanuma, Narashino, Chiba 275-0016, Japan).

Introduction: Presence of ancient oceans, seas, and lakes on Mars have long been discussed [e.g., 1, 2]. Ormö et al. [3] and Horton et al. [4] suggested based on the analogy of the oceanic impact craters on Earth that some seafloor craters may have been formed during the Martian history, although such craters might be covered by thick sediments. Therefore, Ormö et al. [3] proposed that ground penetrating radar surveys are critically important to find the possible oceanic impact craters on Mars.

Morphology and internal sedimentary structures of the impactite in the oceanic impact craters, especially those of large craters (>100 km in diameter), are poorly understood even on Earth. Among the possible large oceanic impact craters, the Chicxulub crater at Mexico, which was formed at 65 million years ago and resulted the Cretaceous/Tertiary boundary mass extinction, is one of the important example. Resurge process of the Chicxulub crater have been studied based on the drilling cores in and around the crater. Goto et al. [5] reported possible resurge deposits in the top of the impactite layer of the YAX-1 core, which was obtained from approximately 60 km from the center of the crater (inside the crater).

In this study, we further investigated the early modification stage of the crater using UNAM 5 and 7 cores, 105 and 127 km from the center of the crater (outside the crater), based on the comparison to that of the YAX-1 core.

Results: Schönian et al. [6] subdivided the impactite in UNAM5 and 7 cores into 6 units, and correlated them to those of the YAX-1. On the other hand, based on the lithology of the impactite comparing to that in the YAX-1 core, we subdivided the impactite in UNAM5 into 5 units. Among them, the suevite in top two units in the UNAM 5 core have characteristics similar to resurge deposits in the YAX-1 core. For example, these units are composed of dark greenish, relatively well-sorted suevites, and has cross lamination at the top, suggesting the influence of current during the sedimentation of this interval. Moreover, at least 8 pulses of deposition are observed in the strata deposited in the upper part of the section in the UNAM 5.

On the other hand, impactite layer in the UNAM7 core is mainly composed of matrix-supported suevite with abundant altered melt fragments. No sediments,

which are similar to those of the resurge deposit in the YAX-1 core, were found in this core.

Discussion: Goto et al. [5] interpreted that top two units in the YAX-1 core were the resurge deposits that were formed by the ocean water invasion into the crater based on the presence of cross lamination, at least 10 pulses of upward fining/coarsening layers, presence of well preserved nannofossils in the matrix, and reverse chronology of nannofossils.

Similar resurge deposits can be found in UNAM 5 core, which was drilled outside of the crater rim. This suggests that the influence of currents was not local but prevailed both inside and outside the crater. The thickness of the resurge deposit in UNAM 5 core become thinner comparing with that in the YAX-1 core. Moreover, no resurge deposits can be found in UNAM 7 core. The crater-ward thickening trend of the resurge deposits probably suggests that the sediments once deposited outside of the crater were eroded and transported crater-ward by the high-energy resurge of ocean water into the crater.

The crater-ward thickening trend of the resurge deposits, cross lamination, and several pulses of sediment layers, which are characteristically observed in the resurge deposits in and out of the Chicxulub crater, are also reported from different scales of oceanic impact craters on Earth [e.g., 7, 8]. Therefore, these features can be considered as the characteristic features of oceanic impact craters. Such internal structures and sedimentary characteristics might be useful to identify the oceanic impact craters on Earth and Mars.

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