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A preliminary study on the high-resolution X-ray CT analysis of the invertebrate burrows from the Jinju and Haman formations in Cretaceous Gyeongsang Basin, Korea

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High-resolution X-ray computed tomography (HRXCT) is a recently developed technology ideally applicable to a wide range of geological investigations. It is a non-destructive method to produce the 3D internal images of samples. In earth science, this technique has been frequently used for 3D pore characterization, 3D grain analysis, fracture analysis, multi-scale imaging, ore analysis, monitoring structural dynamic processes, fluid flow analysis, and morphological characterization of fossils (Cnudde and Boone, 2013). In this study, HRXCT analyses were conducted to more clearly reconstruct the 3D internal structures of invertebrate burrows. Burrow-bearing samples were collected in the Sacheon City, southern part of Korean peninsula: one (Jb-1: greenish gray sandstone) from the Jinju Formation and two (Hb-1: purple sandstone and Hb-2: white layer consisting mainly of wairakite minerals) from the Haman Formation in the Gyeongsang Basin, the largest Cretaceous terrestrial basin in Korea. After collecting the samples, they were drilled into cylindrical cores (ca. 54 mm in diameter) using NX bits for comparison under the same condition. The 3D reconstruction of internal structures was performed using the X-EYE system in the Korea Institute of Civil Engineering and Building Technology (KICT). The numbers of slices from the Jb-1, Hb-1, and Hb-2 are 1562, 1222, and 1024 with 59.37 μm in resolution, respectively. In general, the HRXCT images are known to be visualized by the difference in brightness depending on the atomic number and density of materials. Therefore, it is important to recognize the difference in the mineralogy and particle size between burrow-fill and surrounding matrix. In this study, 3D images of the invertebrate burrows in sandstone samples were successfully obtained by HRXCT analyses, and they were also identified by thin-section observation under the polarizing microscope. The results of this study are expected to provide the basis for HRXCT analysis of not only the burrow structure, but also other small-sized fossils (μm to dm-scale).