

Sea Levels and coastal evolutions during the Medieval Climate Anomaly related to the construction and the abandonment of the ancient harbor “Tangseong” , western coast of Korea Peninsula, presumed by diatom analysis

*Kaoru Kashima¹, Dong-Yoon Yang², MIn Han²

1. Department of Earth and Planetary Sciences, Kyushu University, 2. Korea Institute of Geoscience & Mineral Resources (KIGAM)

The trading by sailing ships was one of the most important methods in East Asia since the ancient period for commercial and culture exchanges. It was often called as the “Marine Silk Road” , the sailing connection routs between China, Korea, Japan and Southeast Asian countries. Tangseong was one of the biggest ancient fortresses along the western coast of Korean Peninsula. The archeological excavation since 1998 revealed several stages of buildings of the United Silla period (AD668-935) including the observatory tower, called “Manghaeru” for overlooking coasts and Yellow Sea. It was “Dang Hang Seong” written in the historic document by Wonhyo (617-686 AD), and prospered as the military and commercial center of marine trading between Korean and China crossing Yellow Sea. According to sedimentation of delta, Tangseong was remained, and it was about 2.5 km far from the present sea coast.

The alluvial lowland, north of Tangseong was presumed to be the ancient bay used as a harbor for the trading ships. KIGAM (Korea Institute of Geoscience and Mineral Resources) has started the geologic surveys with 22 undisturbed drilling cores at the lowland since 2017, and obtain 24 C-14 dating and 18 OSL dating from the cores at the lowland and surroundings. We selected the following six cores for the analysis of diatom and Chrysiophyceae assemblages. All cores presumed to insert marine clay within the core by their lithological observation.

The previous data of the relative sea level during the Medieval Climate Anomaly at Korea Peninsula were limited. Although a lot of coastal drillings surrounding western coasts of Korea Peninsula but the evidences to presume the past sea level could hardly be found in the sediments. In Tangseong area, at DS17-09 core, the front of the castle hill slope, we found the thin marine deposit at the United Silla period (AD668-935) and Goryo period (AD935-1392) by diatom analysis. The marine deposit overlaid by freshwater marsh sediment, and successive brackish layers from marine to freshwater were kept well as the sediments. The marine top level was 4.6 m amsl. It was the high tide level at the United Silla period (AD668-935) and Goryo period (AD935-1392) during the Medieval Climate Anomaly. Although the ancient tidal range under the ancient bay topography of Tangseong was not calculated yet, the sea level at there might be a little higher (about 20 cm) than the present level.

At the United Silla period (AD668-935), the trading ships sailed using tidal current from the Yellow Sea, going through the narrow entrance of the bay, into the bay. The small castle was set at the entrance gate. The TS18-06, located at the west of the entrance, was erosional stage during the United Silla period (AD668-935). The erosional level of the site was leveled about -4.5m amsl. Because the high tide level of there was presumed 4.6m amsl (DS17-09 site), at least 9m water depth was kept at the high tide. It would be enough water depth for sailing trading ships. The bay entrance was narrow, and the bay was kept stable water space for suitable environment for anchoring ships. The marine deposit at DS17-09 was only 1.5m thickness, presumable water depth at the high tide was 1-1.5 m. The trading materials were

transshipped to small bottom flat boats from the sailing ships to the Fortress.

The harbor deposits (Zone A) at DS17-09 was buried soon and became a shallow intertidal flat (Zone B, C) and freshwater marsh (Zone D, E) corresponded to the abandonment of the fortress during the Goryeo period (AD935-1392). Finally, it was covered by freshwater flooding deposits from the hill slope during Joseon Period (1392–1897). At the same period, DS18-06, located at east of the entrance gate of the bay, restarted the sedimentation of delta deposits (deposition of Zone II, DS18-06). The lowland north of the fortress was buried and was used as reclamation farm lands.

Keywords: Archaeology, Diatom, Coastal evolution, Korea, Sea level change, the Medieval Climate Anomaly