

## 3D digital models of stone monuments to hand down historical earthquakes in Tokushima Prefecture, Japan

\*Wataru Tanikawa<sup>1</sup>, Yasunobu Oohashi<sup>2</sup>, Shoichiro Uchiyama<sup>3</sup>, Go-Ichiro Uramoto<sup>4</sup>, Tadashi Yamashina<sup>4</sup>, Hinako Suzuki<sup>3</sup>

1. Japan Agency for Marine-Earth Science and Technology, Kochi Institute for Core Sample Research, 2. Tokushima Prefectural Board of Education, 3. National Research Institute for Earth Science and Disaster Prevention, 4. Kochi University

Stone monuments, which record major disasters of earthquakes and tsunamis by the great Nankai earthquakes, have been constructed along coastal areas in southwest Japan. In Tokushima Prefecture, Japan, earthquake and tsunami stone monuments were investigated by the Tokushima Prefectural Board of Education, and 39 monuments were confirmed (Tokushima Prefectural Board of Education, 2017). In 2017, 19 monuments of these were authorized as a first national registered stone monument of earthquake and tsunami in Japan. Earthquake and tsunami monuments have a strong potential for use of education of disaster prevention because they record the damages and teach the lessons about historical earthquakes (Iwaka et al., 2011). However, several stone monuments in Tokushima Prefecture are located deep inside shrines or away from a main street, and most of the message on the monuments are described by archaic words. Therefore, these problems have decreased the opportunity to teach the historical earthquakes from stone monuments (Iwaka et al., 2011). The problems will be solved by installing guide signboards or providing brochures. In contrast, growth of the Internet infrastructure gives us new insight into the use of digital archive, a website of 3D computer graphics to improve teaching function. In addition, the concept of digital archive is spreading to preserve the historical documents and monuments in a digital format (Noguchi, 2017).

This study constructed 3D digital models of the stone monuments for historical earthquakes in Tokushima Prefecture. Then we evaluated the application of the monument to earthquake and tsunami hazard and evacuation. To construct 3D model, we used the same method with that of the monument in Kochi Prefecture, reported by Tanikawa et al. (2017).

We constructed 3D models of nine stone monuments and two stone guideposts that record the maximum tsunami run-up height. Even though we did not discover any hidden/illegible messages on monument from the 3D models, we could make out the characters on monuments clearly. At present, we are constructing the database site that introduces the information and location of the monument in Kochi Prefecture through a map using “e-community platform (<http://ecom-plat.jp/>)” web system which was developed by National Research Institute for Earth Science and Disaster Prevention in Japan. In this database site, we plan to overlay the tsunami hazard map published by public institutes to confirm the relationship between the location of stone monument and tsunami inundation distribution. We also plan to combine the data of the monument in Tokushima Prefecture into the same database.

Keywords: Earthquake and Tsunami stone monument, Tokushima Prefecture, digital archive, Nankai Trough Earthquake, Photoscan