Subsurface imaging by the Ground Penetrating Radar

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1. Introduction

The imaging of subsurface structure of coastal plain by geophysical continuous profiling method gives well understanding of development of coastal plain. We applied GPR (Ground Penetrating Radar) profiling method to image the subsurface structure around the drilling site in the Kujukuri coastal plain facing the Pacific coast of Japan. In the Kujukuri coastal plain, the Holocene deposits are about 20 m thick and consists of an upward-shoaling beach-shoreface succession. The overall succession was formed by a prograding beach- shoreface system during the highstand in sea level of the last 6000 years (Tamura et al., 2003).

2. Method

GPR is a high-resolution geophysical profiling equipment based on propagation and reflection of electromagnetic waves (EM) in the frequency ranges 10-1000 MHz. The GPR method images sedimentary structures in the ground that are related to changes in dielectric properties. We used a SSI pulseEKKO 100 system, which consists of three unshielded antennae (50, 100 and 200 MHz), a console unit and a laptop PC, in the survey of the Kujukuri coastal plain. GPR reflection survey in the Kujukuri coastal plain were carried out along three track lines (totally 670 m in length). Common mid-point (CMP) gathers were measured in order to derive sediment velocities at each track line. Each profile was topographically corrected using elevation data measured by a total station system.

3. Results

GPR profile 1 is located at present foreshore to backshore. On the profile 1, the stratigraphy is divided into two units, Unit 1 and 2 from the top. Unit 1 and 2 can be interpreted as the present foreshore to backshore facies and foreshore-shoreface facies, respectively. GPR profiles 2 and 3 are located at the inter ridge swale. Two units (Unit 1 and 2 from the top) can be recognized on the profile3. Unit 1, in which parallel reflections to the surface are recognized, is correlated with soils and the depositional facies G (back marsh to lagoon) in Tamura et al. (2003). The reflections with a gentle slope (1 to 2 degree) to the seaward are recognized in Unit 2 which is correlated with depositional facies E and F (foreshore to backshore) in Tamura et al. (2003).

Reference

Tamura, T., Masuda, F. Sakai, T. and Fujiwara, O., 2003. Temporal development of prograding beach-shoreface deposits: the Holocene of Kujukuri coastal plain, eastern Japan. Mar. Geol. 198, 191-207.