

Ground-penetrating radar profile of the Tottori coastal dune system, Japan Sea coast of central Japan

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The ground-penetrating radar profile of the Tottori coastal dune system is reported. Coastal dune systems developed along the Japanese Archipelago have experienced alternations of an active phase and inactive phase due to vegetation during the Holocene period. The vegetation is revealed by interventions of organic rich sand layers in aeolian dune deposits, of which dates are believed nearly consistent inter-regionally. Coastal dune activity is related to fluctuations of wind, precipitation, sediment supply and sea level, and thus is expected as a proxy for the past environmental changes. A ground-penetrating radar survey was performed in the Tottori coastal dune system facing the Japan Sea coast of central Japan. The dune system, 6 km long and 1 km width, consists of three rows of transverse dunes. These transverse dunes are almost perpendicular to the dominant N or NW wind direction in winter, and their ages become younger seaward. We employed a radar system of PulseEKKO 100 with 100 MHz antennas, and obtained a good vertical penetration up to 25 m. Three transects were studied. Two transects are perpendicular to the crest of the dune, and cross older inland dune row (Dune III), and intermediate dune (Dune II), then reaching the present shoreline. Another transect traces the crest of the Dune II. In the subsurface of the Dune III, dome-shaped continuous reflection is present, and below which the signal was attenuated. The reflection is thought to outline a soil layer capping the last interglacial dune that cores the Dune III and is covered by relatively thin Holocene aeolian sand. The seaward part of the Dune III and majority of the Dune II is characterized by tabular cross bedding 10 m thick that dips less than 25 degrees and is partitioned by reactivation surfaces at an interval c. 100 m. The Dune II partly shows cross bedding that dips seaward and is concordant with the present dune surface. These features suggest the deposits in the Tottori dune system was mostly formed and preserved by landward migration of dunes due to NW wind. Several sharp reflections gently dipping are recognized between the Dune II and its landward trough, at which the sand changes in color from yellowish white to white, which are characteristic of the Pleistocene and Holocene dune, respectively. These reflections thus are possibly equivalent to the boundary across which the depocenter shifted seaward from the Dune III cored by the Pleistocene dune to Dune II, and related to the organic rich layer formed from the middle Jomon to Yayoi periods. Along the transect tracing the Dune II crest, trough cross bedding was recognized, characteristic of a profile normal to the dune migration. Based on the radar profiles, sand samples for OSL dating will be drilled using a hand auger to clarify the detailed story of the dune system evolution during the Holocene.