

Sedimentary History of the Ryukyu Group on Okinawa Island, southwestern Japan

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Limestone consists mainly of skeleton and shells of marine calcifiers and their fragments. Therefore, the *in situ* composition of limestones is generally sensitive to sea level fluctuations and their lithofacies can be used as an important indicator of sedimentary environments. Okinawa Island is located at the boundary between coral-reef and non-coral-reef region in the present-day northwestern Pacific. Previously, Sagae et al. (2012) investigated many field outcrops and drill cores of the Pleistocene Ryukyu Group in southern Okinawa Island, and interpreted limestone lithofacies, environmental succession, and sequence stratigraphy. This study builds on these results and adds new field and drill core data to further consider the influence of regional sedimentary environment and tectonic movements to the limestone formation in southern Okinawa Island. We aim to integrate and reconstruct the sedimentary history of the Ryukyu Group, and to compare it with global paleoclimate change.

The Pleistocene Ryukyu Group can be divided into the Itoman, Naha, and Minatogawa formations in ascending order. The deposition of the Ryukyu Group began after the warm Kuroshio Current had flowed into the Okinawa Trough in the early Pleistocene. The initial period is characterized by the contemporaneous deposition of both the Itoman Formation and the lower part of the Naha Formation, but in different environments (reef and off-reef environment, respectively). The Itoman Formation mainly consists of coralline algae with low species diversity formed in a shallow setting (20-50 m water depth), which is an important character in the initial phase of the Ryukyu Group. Subsequently, the main part of the Naha Formation deposited at largely varied water depths (0–150 m). This formation is divided into four lithologic units and can be correlated with marine isotope stages (MIS). The widely distributed unconformity between Unit 3 and Unit 4 is likely caused during the sea-level lowstand at MIS 16. The Minatogawa Formation overlies the Naha Formation with a clear unconformity and deposited during the highstand at MIS 5, 7, or 9. The general sedimentary architecture described above is present throughout the Ryukyu Islands but with spatial and temporal variations, and may provide information toward reconstructing detailed tectonic evolution models for the Ryukyu Islands.

Keywords: Ryukyu Islands, Okinawa, Ryukyu Group, Itoman Formation, Naha Formation, sedimentary environment