

Sandbox analogue experiments to examine how syntectonic sedimentation influence on forearc basin stratigraphy and accretionary wedge growth

*Atsushi Noda¹, Hiroaki Koge¹, Yasuhiro Yamada^{2,3,4}, Ayumu Miyakawa¹, Juichiro Ashi⁵

1. National Institute of Advanced Industrial Science and Technology, 2. Japan Agency for Marine-Earth Science and Technology, 3. Faculty of Science and Technology, Kochi University, 4. Department of Earth Sciences, Royal Holloway University of London, 5. Atmosphere and Ocean Research Institute, The University of Tokyo

Forearc basin stratigraphy is expected to record a detailed history of the deformation and growth pattern of an accretionary wedge. However, the relationship between syntectonic basin sedimentation and growth of a wedge remains poorly understood, including (1) how deformation of the wedge modifies the basin stratigraphy and (2) how syntectonic sedimentation influences deformation of the wedge. In this study, we conducted scaled analogue sandbox experiments to reproduce accretionary wedges with and without syntectonic sedimentation. The results show that basin stratigraphy varied with the growth pattern of the accretionary wedge. In the case that wedge growth was dominated by trenchward accretion, the depositional area migrated trenchward. In contrast, prolonged underthrusting caused the sediment layers to be tilted landward and the depocenter to migrate landward. A phase dominated by underthrusting can result in the combining a retro-wedge basin with a wedge-top basin, and yield a wide area of accommodation space in the forearc basin. The occurrence of two types of basin stratigraphy (i.e., trenchward and landward migration of the depocenter) reflects the two different types of deformation style of accretionary wedge (frontal accretion phase and underthrusting phase), and these differences possibly depend on a contrast in strength of the basal shear resistance between the inner and outer parts of the wedge due to sedimentation on the wedge. A change in the magnitude of normal stress acting on the wedge base likely influenced the mode of deformation of the wedge. These results suggest that forearc basin stratigraphy is influenced by the growth pattern of an accretionary wedge that is affected by syntectonic sedimentation.

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