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Facies trends in the western foreland basin of Taiwan: depositional framework and paleogeographic implications from Miocene to present

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The Neogene foreland basin system of Western Taiwan recorded infill from both the Chinese Mainland in the west as well as from the emerging Taiwan Island to the east. Therefore the exact timing of filling and subsequent change from a passive margin sedimentation to the development of the active foreland basin is difficult to determine. The system developed by the oblique collision between the volcanic Luzon arc (Philippine Sea Plate) and the Eurasian Continental Plate and lead to a different distribution of sedimentary facies from North (with shallow marine to nonmarine environments) to South (with deep marine environments). Beyond the initial geometrical models of oblique collision, there are no clear data supporting a southward propagation. Interpretation of the sedimentary infill of the foreland basin in terms of depositional environment and paleobathymetries is the key to reconstruct the paleogeography at the time of deposition and have insight into the evolution of collision.

We present here a synthesis of the different facies that we have described over several key sections through the foreland basin deposits and which takes into account the numerous previous descriptions available in the literature. We concentrate in particular on estimating the paleobathymetries in order to produce quantitative paleogeographic maps of the foreland basin. Paleobathymetries of the encountered facies have been determined by estimating the depth of wave influence (e.g. wave base) using the linear airy wave theory and wave data from the Taiwan Strait collected over the last 20 years (e.g.wave height, wave period).

We build a new chronostratigraphical framework of the foreland fill based on nannofossil zones rather than the classical lithostratigraphical subdivisions.

Our results are a set of maps for the times of 12.5 Ma, 5.5 Ma, 3.0 Ma, 2.0 Ma and 0.50 Ma which allow discussion of the propagation of the collision and estimation of the volumes of sediments trapped in the foreland. We find that the emerged southern tip of the collision has propagated at a rate of 31 mm/a. Integration of these maps within a multidiffusive forward stratigraphic model will help to resolve the sediment budget within a coupled orogen-basin system.

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