



Relationship between sediment provenance of foreland basin and kinematics of orogenic belt in southwestern Taiwan

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The foreland basin in southwestern Taiwan offers an idealistic example for geologists to study the tectonostratigraphy in the foreland basin development from initial to latest stages. The subsidence analysis indicate that the initial stage of foreland basin development had started in the Mid Pliocene, and the basin went through two rapid subsidence events, along with forebulge moving back-and-forth in the E-W direction during the Late Pliocene to the Pleistocene. Thus, the tectonostratigraphic sequences deposited from the Late Pliocene to the later periods would provide crucial evidences for the relationship between foreland basin and its adjacent orogenic belt. Based on the tectonostratigraphic sequences in the late stage (Upper Pliocene to Pleistocene) of foreland basin development in SW Taiwan, this study aims to explore the mode of interaction between the evolution of foreland basin and kinematics of orogenic belt primarily based on petrofacies analysis. The results of petrofacies analysis were interpreted with the tectonostratigraphic and biostratigraphic frameworks of previous studies to infer the regional and local sediment provenances and transportation modes.

The the craton had been the sediment source to the west of the study area in the pre-orogenic period. The maturity of these sediments was high due to slow exhumation rates and long transportation distance. In the initial stage of foreland basin development, the forebulge slowly elevated and started to partially or totally obstruct sediment supplies from the craton. Before the period of NN19 when the forebulge steadily moved westward, the forebulge not only became the barrier of the most continental sediment supplies from the west but also shed a minor amount of detritus into the adjacent area. In addition, regional topographic relief, which was due to syn-orogenic normal faulting during the NN11-15, locally changed the composition and transportation modes of the sediments; the exposed basement of the footwall also became the source of the sediments shed into the adjacent depo-centers.

After the NN19, whole area was influenced predominantly by the orogenic belt from the east. Large amounts of slate fragments began to appear in the middle NN19 and percentage of the metamorphic lithics was increased upward and northward. As the orogen moved westward along with the foreland basin development, the studied area was changed from the distal to the proximal part of the foredeep and sediment sources were controlled mainly by river systems derived from the orogen. The metamorphic lithics decreased southward and concentrated in the central part of the study area, suggesting that the slate fragments which were transported parallel with the orientation of submarine canyons since NN13 to the south of the study area.

We propose that 1. From NN12 to NN18, the episodic subsidence in the foreland basin implies episodic movement of the orogenic belt; 2. Since the period of NN19, the orogenic belt and foreland basin has been developing in a continuous and steady state.