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Petrographic study of the Miocene-Pleistocene sandstone in the Western Foothills, northern Taiwan: implication for the unroofing history of Taiwan orogenic belt

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The Taiwan orogeny belt developed due to the arc-continental collision since about 6 Ma. Plio-Pleistocene foreland basin deposits are eroded from adjacent orogenic belt that provides much information about orogenic tectonics. In this study, sandstone petrography is enabled to trace orogenic exhumation history of the northern Taiwan. It indicates that late Miocene-early Pliocene strata were composed dominantly of monocrystalline quartz and feldspar deriving from the Eurasia continent. Late Pliocene-early Pleistocene sandstone (3.6-2Ma) contains lithic fragments which consist dominantly of sandstone fragments. It suggests that the sediments were derived from sedimentary province (Miocene strata) of the orogenic belt. The middle Pleistocene sandstone (1.5Ma) consists of argillite and metasandstone fragments (Oligocene strata) deriving from low-grade metamorphic province (the Hsuehshan Range). The late Pleistocene sandstone consists of quartzite fragments (Eocene strata) which were derived from metamorphic province (the Hsuehshan Range). The exhumation history of orogenic belt is revealed significant changes from sedimentary to metamorphic provinces during the middle Pleistocene. It suggests that the Hsuehshan Range exposed since middle Pleistocene. Lithic fragments derived from the Taiwan orogenic belt that corresponded with the unroofing history of the northern Hsuehshan Range by apatite and zircon fission track dating (1.2-2.6Ma and 4.6-6.4Ma).