

## **Is the Pre-Cenozoic basement of Taiwan strait an exotic terrane? : Constraints from detrital zircon and monazite U-Pb ages of Well TL-1 in Penghu Island**

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The Pre-Cenozoic basement beneath the Taiwan Strait (TS) and East China Sea (ECS), considered an extension of the East Cathaysia Block (ECB), remains poorly understood with limited investigation into its crustal compositions. This study focuses on Well TL-1, a 900-meter-deep core on Penghu Island, employing coupled detrital zircon and monazite U-Pb ages of littoral-to-neritic facies sediments. The aim is to elucidate the crustal characteristics of the TS basement and its relationship with ECB. Below an unconformity at depth of 503 meters, five Early Cretaceous sand-siltstones exhibit a distinctive zircon age cluster of approximately 120 Ma with minor inherited grains (~190 Ma). These ages align with major magmatic episodes observed in the ECS basement. Positive  $\epsilon_{\text{Hf}}(t)$  features of these Jurassic-Cretaceous zircons suggest mantle-origin magmatism, contrasting with the Mesozoic crustal assimilation magmatic system in ECB. On the other hand, zircon age spectra from two Early Miocene sediments at depths of 403 and 500 meters reveal four groups, including ~1.8 Ga, 800-700 Ma, 450-430 Ma, and 300-200 Ma, consistent with common deposits in ECS and the drainage systems of ECB. Notably, the presence of ~1.8 Ga monazites (30-45%) in these samples, absent from neighboring continents, indicates an exotic provenance. The large grain sizes (>100 microns) and euhedral to subhedral morphology of these monazites further suggest a proximal source-sink relationship for the Miocene sediments. In summary, the features observed in Well TL-1 deposits suggest a potential disconnection between TS and ECB crusts, implying the concept of an allochthonous terrane. Additionally, the application of dual-mineral geochronology to sediments proves valuable in providing comprehensive information on source areas.

**Keywords:** Detrital zircon and monazite, U-Pb ages, Pre-Cenozoic basement, Exotic terrane, Taiwan Strait