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玉里帶清水溪地區變質岩的岩石學與相平衡模擬
Petrology and equilibrium phase modeling of metamorphic rocks from the Chinshuichi area of the Yuli belt in eastern Taiwan

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Abstract

Tectonic blocks and sheets of mafic-ultramafic rocks are distributed discontinuously in the young Yuli metamorphic belt of Taiwan and are regarded as pieces of a dismembered ophiolite. The blocks include rare omphacite metagabbros and garnet-epidote-blueschists in the Wanjung and Juisui (Tamayen) areas, respectively. Such high-pressure (HP) mineral assemblages have been attributed to a mid Miocene subduction event. However, the surrounding psammitic, pelitic and chloritic schists are the dominant greenschist-facies lithologies of the Yuli belt. In the Chinshuichi area, tectonic blocks are enclosed in garnet-bearing metapelites, suggesting more elevated pressures. In this area, I recently discovered meta-plagiogranite containing the assemblage glaucophane + omphacite (X_{Jd} up to 0.39) + rutile + quartz, indicating conditions near 14 kbar/550 °C. New equilibrium-phase modeling of a garnet-paragonite-metapelite and compositional isopleths for peak assemblage minerals garnet and phengite (Si = 3.33-3.37 pfu) indicate metamorphic conditions of 15.5-17 kbar/535-550 °C. These P-T estimates are higher than previously reported in the Yuli belt and suggest that both tectonic blocks and host metapelites underwent HP metamorphism. The juxtaposition of tectonic blocks and metapelites apparently occurred during the formation of a subduction-accretionary complex, followed by exhumation facilitated by a collisional event. These findings imply that HP metamorphism was not limited to tectonic blocks as previously thought, and played a significant role attending orogenesis in eastern Taiwan.

Keywords: *equilibrium phase modeling, omphacite, glaucophane, meta-plagiogranite, high-pressure metamorphism, Yuli belt, Tananao Complex*

摘 要

鐵鎂-超鐵鎂質構造地塊不連續地分佈在台灣年輕的玉里帶內，其來源與地質意義據信可能代表被肢解的蛇綠岩系。萬榮及瑞穗(打馬燕)地區的構造地塊內包含有少量的綠輝石-變質輝長岩和石榴石-綠簾石-藍片岩等特殊岩類，如此高壓變質礦物組合形成於中新世的隱沒事件，然而構造地塊圍岩的砂質、泥質及綠泥石為主之片岩則為玉里帶綠片岩相的代表，過去無法解釋是否經歷相同的隱沒環境。玉里帶南端清水溪構造地塊周圍出露之含石榴子石的變質泥質岩可能隱示更高的變質壓力，該地新發現之變質斜長花崗岩其共生礦物組合為藍閃石+綠輝石(X jd=0.39) + 金紅石+石英，指示其變質環境接近 14kbar/550 °C，新發現的石榴子石-鈉雲母-變質泥質岩經相平衡模擬及石榴子石-多矽白雲母成分等值線交叉結果指示變質條件大約在15.5-17 kbar/535-550 °C，這些溫壓的估算較先前文獻所認知的玉里帶變質條件為高，進而可推測構造地塊及玉里帶主體的變質泥質岩可能曾經歷高壓變質過程。構造地塊及變質泥質岩二者的並列出露可能源自隱沒增積岩體的環境，因碰撞所衍生的剝蝕作用而露出地表。本研究結果隱示玉里帶的高壓變質作用並非如過去所認知僅侷限在構造地塊之內，且高壓變質作用在東台灣的造山運動過程中曾扮演重要的角色意義。

[關鍵字]相平衡模擬、綠輝石、藍閃石、變質斜長花崗岩、高壓變質作用、玉里帶、大南澳雜岩