

## Age and Character of Basement Rocks in SW Borneo: New Insights from Ar-Ar Dating of Pinoh Metamorphic Group Rocks.

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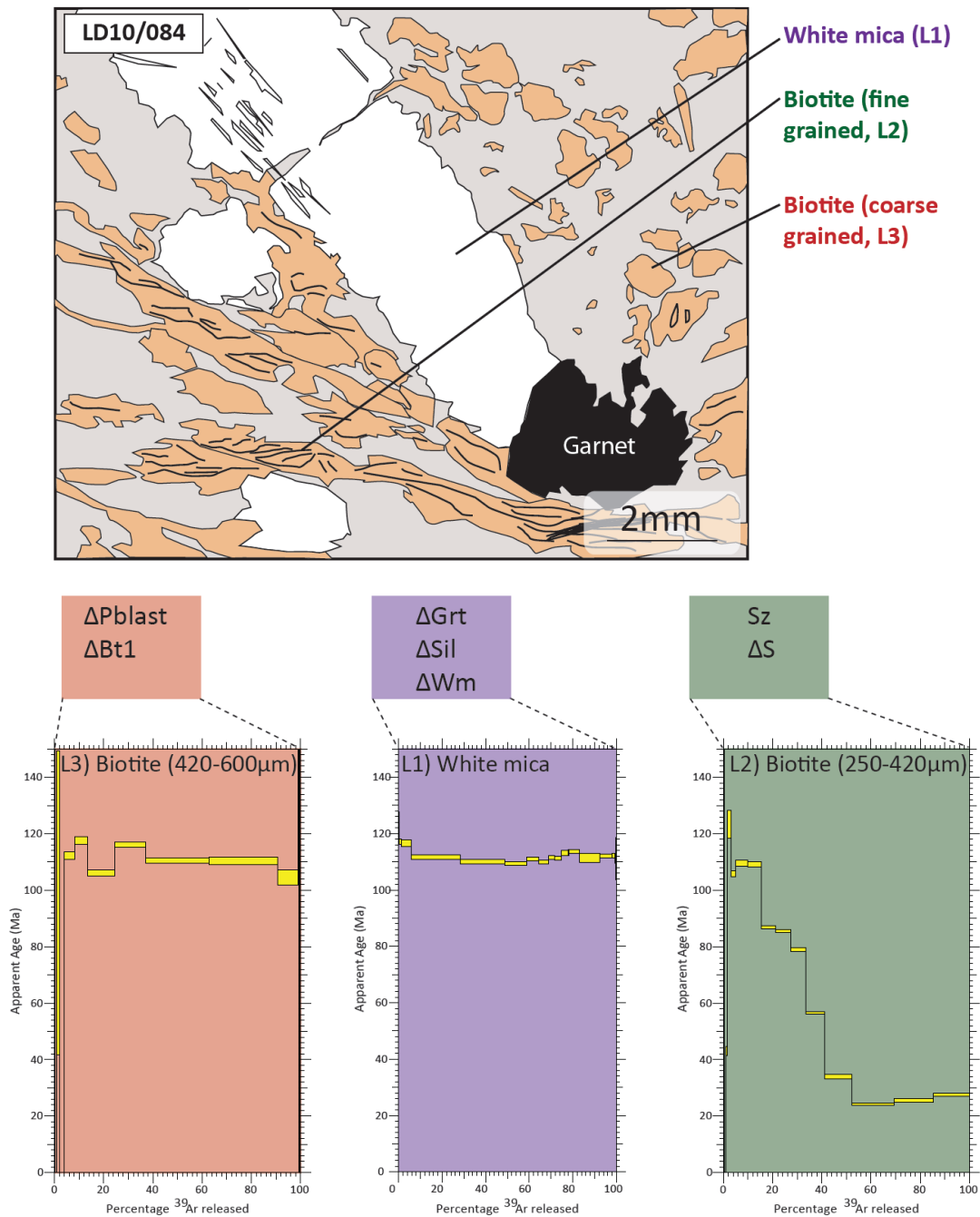
The Schwaner Mountains are the topographic expression of basement rocks in SW Borneo. The basement is composed of a suite of metamorphic rocks, the Pinoh Metamorphic Group (PMG), which are intruded by Cretaceous granitoids. This uplifted area is considered to be an important sediment source to depositional systems across Borneo throughout the Tertiary, yet until now very little information has been recorded about the history of this area after initial emplacement. Until recently it had been widely accepted that PMG rocks were Permo-Carboniferous in age. However, the only age constraint was that given by the intrusive relationship with granitoid rocks of known Cretaceous age. Recent work by the authors indicated that PMG rocks were in fact likely deposited much younger than previously supposed and were intruded by granitoids which recorded ages from ca. 120-90 Ma.

We present petrographic analyses and Ar-Ar ages for metamorphic rocks that build upon previously reported U-Pb ages which indicate that the PMG were deposited as volcanogenic sediments during the Lower Cretaceous (ca. 130 Ma). Ar-Ar ages record onset of low-pressure metamorphism (ca. 116 Ma), as well as peak thermal metamorphism (ca. 110), and a later shearing event (ca. 25 Ma) which may indicate the approximate age of exhumation in the Schwaner Mountains.

Petrography of metamorphic rocks indicate that the PMG were subjected to at least 3 phases of deformation. A fabric forming phase of metamorphism is discernible from the weak foliation seen in some samples; 'strong' biotite grains which retain this early fabric indicate early low-grade burial metamorphism. Low-P, high-T metamorphism is recorded by andalusite- and cordierite-bearing mineral assemblages in conjunction with white mica. Finally, a shear fabric cuts the rock which is associated with biotite and fibrolite intergrowths. Biotite and white mica from PMG rocks were subjected to careful step heating Ar-Ar experiments. The results record the history of deformation in the Schwaner Mountains: Initial low pressure fabric-forming metamorphism took place at approximately 116 Ma. Peak thermal metamorphism associated with andalusite and cordierite mineral assemblages took place at various stages during pulsed emplacement of granitoids. At least one such period of thermal metamorphism is recorded at ca. 110 Ma. Biotite grains associated with shear fabric growth record an age of 25 Ma.

Ar-Ar data from metamorphic rocks corroborates the authors' previous interpretation that PMG rocks were deposited as volcanogenic sediments, progressively buried and metamorphosed by the emplacement of granitoid rocks. Furthermore, the newly reported 25 Ma shear-fabric sheds further light on a key time in the tectonic evolution of Borneo. The Oligocene-Miocene boundary is recorded in the Barito basin to the southeast by drowning of carbonate platforms and rapid influx of clastic material. In the Kutei basin this period is similarly marked by increased sediment influx. These observations are broadly contemporaneous with shearing recorded in this paper and it is interpreted that 25 Ma may mark the approximate age of exhumation in the Schwaner Mountains;

and that the subsequent denudation resulted in significant changes to the sediment budget in the surrounding basins.



**Figure 1:** Textural relationships of grains dated by Ar-Ar geochronology, and summary age plots. Coarse grained biotite grains (L3) are found throughout the rock. These ‘strong’ grains are interpreted to be the first phase grown during metamorphism. White micas (L1) are present as pseudomorphs after the original porphyroblast. ‘Weak’ biotite grains (L2) are commonly a mix of broken strong grains (mixed during crushing), and finely laminated biotite which is present along shear planes (intergrown with fibrolite).