

## **MEANING OF U-PB AGES IN METAMORPHIC TERRAINS: LIMITATIONS OF THE CLOSURE TEMPERATURE CONCEPT**

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Closure temperature of an isotopic system is defined as the temperature at which the system ceases exchanging isotopes with its surroundings. Thus, metamorphic ages are the time span between the moment of closure and the present. This interpretation has been in common use for the last 30 years and implies that metamorphic temperature is the only, or at least the most important physical parameter controlling the start of the isotopic clock. Although this interpretation works well in some situations, it fails to explain some common observations such as the diachronism between zircon (and/or monazite/titanite) ages of regional metamorphism and those, usually younger of in situ leucosomes and diachronism between leucosomes a few hundred meters apart. These cases are best explained by calling on the presence of fluids in the rock mass whose heterogeneous distribution is controlled by the predominant stress field at that particular time. Typical examples are the leucosomes formed in pressure shadows of mafic boudin necks yielding younger zircon ages than the adjacent gneiss. Therefore, zircon formation is the result of the interplay between temperature, fluid flow/accumulation and deformation and metamorphic ages do not necessarily represent peak metamorphic conditions as is often assumed.

Zircon and monazite formation/recrystallisation during metamorphism depend on these environmental parameters and on intrinsic ones such as rock composition and porosity. Therefore, the meaning of metamorphic ages has to be evaluated case by case.