OSL-thermochronometry for rapidly exhumed rocks

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We present a new thermochronometric method for the assessment of rapidly cooled samples using Optically Stimulated Luminescence (OSL) dating of quartz. OSL makes use of electron traps within crystals, which have a relatively low thermal stability. This effect follows a simple Arhenius-type relationship and can in turn be used to estimate the late stages of thermal histories of rocks. We will present evaluation of the diffusion parameters from pulse-annealing experiments and derive a closure temperature. We estimate the closure temperature to be approximately 40°C. Note that this method can only be applied to places where rocks are rapidly exhumed to the surface, since OSL dating is limited to ages from 10 to 1000 ka. However, this technique has a great potential in regions affected by intense erosion and only requires the presence of quartz in field specimen.

We will present how we have applied this new thermochronometric system to samples from the Southern Alps of New Zealand, a young tectonically active mountain belt that is known for its extremely high exhumation rates (~8 km/Myr). The samples were previously analyzed using FT track dating as well as (U-Th)/He dating techniques on zircon and apatite [1, 2], which provide us with good constrain on the thermal histories. The OSL ages vary from 30 to 80 ka. These results allow us to reconstruct the evolution of the landscape at a high resolution (100 meters) over the last glacial cycle (i.e.; during the past 10-100 kyrs). We will propose how we interpret the data using a 3D thermo-kinematic model (Pecube, [3]).

[1] Herman *et al.* (2007a). [2] Herman *et al.* (2007b). [3] Braun (2003).

Determination of differential vital effects for some Neogene calcareous nannoplankton taxa

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Microseparation of Calcareous Nannofossils

Culture studies have provided information on the fractionation of oxygen and carbon isotopes into coccolith calcite, summarized in [1]. However, when examining extinct taxa, data obtained from modern species cannot necessarily be applied. A differential approach can be utilised, but it requires separating taxonomic groups from each other in order to compare their geochemical signatures. We applied an innovative microseparation technique [2] suitable for micron-sized particles and enabling the recovery of monospecific assemblages of calcareous nannofossils.

Biogeochemical Insights

We have measured the species-specific geochemistry of *Pseudoemiliania*, *Calcidiscus* and *Reticulofenestra* coccoliths for which isotopic fractionations have previously been measured [1] with other taxonomic groups and for the first time *Discoaster* and other extinct coccolithophores. Combining a number of differential calculations from different samples, it becomes possible to infer absolute vital effects for these taxa. This approach opens the door to the construction of a 'vital effect scale' for the main phytoplanktonic groups during the Neogene helped by modern coccolithophore datasets.

[1] Stoll & Ziveri (2004) *Coccolithophores* (Thierstein & Young, eds) pp.529-562. [2] Minoleti *et al.* (accepted) *Nature Protocols.*