Polymineral fine grains as the alternative to date sedimentary material from New Zealand

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Establishing robust chronologies to understand landscape evolution and tectonic activity in New Zealand have been the focus of a number of studies over the past years. The use of optically stimulated luminescence has often been hampered by the change in the sensitivity of the quartz grains during the measuring process. A set of ten samples from a sedimentary sequence which shows deformation caused by the activity of the Te Puninga fault, in New Zealand, have been the target of this study. Analysis of the tephra and peat layers within the sequence suggest that the latter should cover, at least, 25 ka of activity.

Coarse quartz grains extracted from the sediment shows a severe sensitity change between the natural OSL and the test dose derived-OSL used for normalization. Attempts to monitor and correct this change in sensitivity did not lead to plausible equivalent doses, which do not increase at increasing depth, as expected, but instead, they show a saturation around 4 Gy, equivalent to 1.5 ka. These poor luminescence properties of quartz from New Zealand was also observed by other authors [1] who related it to the young sedimentary history of the quartz grains and concluded that this material was unsuitable for use as a natural dosimeter for luminescence dating.

Coarse K-feldspar grains have a dim and unstable IR50 signal and no postIR-IR signal was detected at any temperature. limiting the use of coarse feldspar for dating also.

In contrast, the polymineral fine grain fraction showed a reproducible response. A very different response between the coarse and fine grain quartz fractions from New Zealand was reported by other authors [2]. Artificially given doses have been recovered succesfully using the postIR-IRSL225 signal. Estimated equivalent doses for the studied samples are within the plausible dose range. Residual doses around 2 Gy, not significant compared to the natural doses, were measured after 24h of artificial exposure to light in a solar simulator. The quality control of the postIR-IR225 response indicates that reliable ages could be estimated using this signal from the polymineral fine grain fraction.

Keywords (max. 5): quartz, sensitivity change, low dose OSL saturation, polymineral fine grains

References

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