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Electron Spin Resonance (ESR) applied to optically bleached quartz grains extracted from sediment provides an age estimate for the last exposure of sediment to sunlight. This method has been increasingly used in archaeological, geological and geomorphological contexts for the last 30 years. However, its successful application is highly dependent on the geological context, the type and quality of the sampled material, but also its preparation.

In most of the ESR dating studies, Equivalent Dose calculation uses the multiple aliquot additive dose (MAAD) approach. Accuracy of the ED is the slightly correlated with the dose response of different aliquots of quartz grains to irradiation. In most of the measured quartz samples, a single saturating exponential dose response curve or a two components combining an exponential with a linear term are classically used in ESR dating to fit the experimental ESR data points derived from the aluminum (Al) or the titanium (Ti-Li, Ti-H) centers in quartz. However, large deviation and large associated errors may occasionally be observed. Heterogeneous bleaching (incomplete resetting) of the ESR dating signal can sometimes explain such deviations. Scattering of the dose response to irradiation may also be due to heterogeneous dose response of the different aliquots related to various nature and/or origin of the quartz grains constituting the dating sediment.

Quartz grains extracted from several sediments were measured by ESR and observed using cathodoluminescence (CL) technique. The CL colours of quartz are weak, compared with emission of other minerals such as carbonates or phosphates, but are highly variable and can be related to genetic conditions of quartz formation. Hence, luminescence microscopy can be used to reveal internal structures, growth zoning and lattice defects in quartz crystals not discernible by means of other analytical techniques, but also to reveal heterogeneity of the quartz grains within the sample, or even the presence of other minerals, not removed during the chemical process of quartz purification.

The cathodoluminescence gave evidence of several types of situation within our quartz samples. Some of them are made of monocrystalline quartz grains, emitting a uniform CL within the grain but with a light heterogeneity of the wavelength emission between the grains. Some are made of polycrystalline quartz grains, displaying a strong heterogeneity of the luminescence within and between the quartz grains. Finally we also observed some CL attributed to plagioclase and K-feldspar, which may contaminate, even strongly, the quartz samples.

The presentation will report this variability and discuss about its effect on the dose response curve when using the ESR dating of quartz grains.