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Dating intramontane alluvial deposits using luminescence techniques: problems and potential

J.Q.G. Spencer and R.A.J. Robinson

School of Geography and Geosciences, University of St Andrews, St Andrews, Fife, KY16 9AL, Scotland, UK (joel.spencer@st-andrews.ac.uk)

Intramontane basin sediments are an archive of the interaction between basin bounding faults, and alluvial fan and fluvial systems. The chronologies of intramontane basin sedimentation enable an understanding of the cycling of sediments within a basin through time, can be interrogated to identify periods of alluvial storage and erosion, provide rates of sediment accumulation and storage and date fault movement. If suitable dating methods (in terms of resolution and timescale) are applied to develop the chronologies of alluvial archives, it is then possible to discriminate between climate and tectonic forcing mechanisms on long-term basin behaviour.

Optically stimulated luminescence (OSL) dating of mineral grains from alluvial sediments is an ideal technique for establishing a chronological framework of basin sedimentation as the method directly dates sedimentation events. However, an OSL approach presents a number of challenges concerning the selection of appropriate facies to analyse. Wide, sometimes multi-modal, age distributions are quite common, samples may fail the fundamental protocol tests and mineral contaminants may be considerable resulting in anomalous luminescence signals. We will illustrate these challenges, and demonstrate the laboratory and statistical approaches we have used to overcome them, with our results from a detailed OSL study of quartz minerals extracted from Late Quaternary alluvial sequences in the quebradas of the Eastern Cordillera of NW Argentina.