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Tracing sediment movement using Infra-Red Stimulated Luminescence

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Understanding sediment transport dynamics is key to understanding landscape evolution, and has important implications for engineering projects, aquatic ecosystem dynamics, and transmission of water-borne diseases. Multiple elevated temperature infra-red stimulated luminescence (MET-IRSL) has great potential to provide detailed information on the transport of sediments using infra-red light to stimulate the luminescence signal of feldspars. MET-IRSL uses a series of elevated temperature stimulations to access multiple signals with different characteristic rates of signal reduction by light exposure (bleaching), for example, during grain transport. During deposition and storage, trapped charge accumulates, leading to growth of the different IRSL signals, until the grain is again subject to transport. Applied in this manner, MET-IRSL measurements can constrain past sediment burial and exposure histories.

MET-IRSL measurements of different grain and clast sizes (e.g. silt, sand, pebbles and cobbles) can provide a range of sediment transport information, providing further constraint to sediment dynamics and system behaviour. Different clast size groups are associated with varied ways to structure the MET-IRSL measurements, e.g. depth bleaching profiles observed within pebbles and cobbles. In this presentation we demonstrate the potential of combining these approaches, and of constructing time-space equivalence models for real world situations, including the site of Allt Dubhaig, Perthshire, Scotland.