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Thesis Abstract

Thesis title: Alluvial response to environmental change: Luminescence dating of the Quaternary sediment systems.

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Abstract

Geomorphological investigations of Quaternary fluvial deposits in the Guadalope basin, northeastern Spain, have revealed an extended record of riverr and drainage basin response to long tem environmental change. Investigatiommns have focused on a 13 km long reach centred on the town of Castelserás, a 4 km long reach at Mas de Las Matas, a 2.5 km long reach at Forcall and a cross section of the valley at Aguaviva. A study was also made of a 1 km long reach in the neighbouring Rio Regallo catchment.

Luminescence dating, utilising a partial bleach methodology with infra-red stimulated luminescence (IRSL), was tested on alluvium collected from the River Danube. The IRSL age of 7 ± 1 ka agreed with archaeological evidence indicating a Mesolithic age. Modelling of the adopted procedure suggests accurate IRSL ages can be determined where residual luminescence signal is 10% or less. The presence of a residual signal necessitates the use of the partial bleach methodology to avoid overestimation of IRSL age.

Luminescence dating of 39 sediment samples from alluvial units in the Guadalope and Regallo basins provides a geochronology indicating that deposits span the Middle Pleistocene through to the historic period. The period c.227-130 ka was characterised by large-scale (locally up to 40m) aggradation and incision cycles associated with tributary stream and slope input of sediment. More gradual alluviation between c.122-30 ka was followed by renewed dissection and aggradation at c.24 ka, immediately preceding the Last Glacial Maximum. At least 4 river terraces were formed during this period, with heights above present river level of between 10 and 15 metres. River instability continued after the glacial maximum and into the Holocence, when the most recent major alluvial unit was formed 3 to 4,000 years ago.

The sedimentology of the alluvial fills indicates that coarse gravel, braided rivers dominated the fluvial system during the Pleistocene. Single thread, meandering rivers (gravel bedded were more common during the Holocene. Sediment geochemistry of the samples analysed using ICP-MS indicates that sediment sources within the catchment have not changed significantly during the Late Quatermary. LOI analyses highlight the importance of local sediment delivery to the trunk river by tributary streams.

Progressive entrenchment of the Guadalope valley floor during the Pleistocene would appear to reflet fong term regional uplift, with channel aggradation and dissection episodes linked to the climate changes shown by vegetation and oxygen isotope records. Rates of downcutting increadsed during oxygen isotope stages 2 and 3. This change probably occurred in response to a reduction of coarse sediment delivery to the main channel from tributary catchments, an increase in trunk stream competence and / or catchment uplift.

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