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Late Quaternary stream incision rates due to tectonic uplift in North Peloponnese, Greece

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This study focuses on defining rates of fluvial incision for the last 350kyrs along valley systems of eight streams (those of Trikalitikos, Katharoneri, Seliandros, Elisson, Assopos, Zapantis, Raizanis and Xerias) that drain the eastern part of the tectonically uplifting area of north Peloponnese. The relationship between incision due to tectonic uplift and surface erosion along these streams is also investigated.

The studied rivers have a S.SW–N.NE flow direction and discharge into the Gulf of Corinth. They are developed on the uplifted block of the offshore extension of the Xylokastro normal fault which is one of the main south bounding faults of the elongated asymmetric graben of Gulf of Corinth. A series of ten uplifted marine terraces, ranging in elevation from 10 to 400m, lie on the hanging wall of the Xylokastro normal fault, which have been recognized, mapped in detail and correlated with Late Pleistocene oxygen-isotope stages of high sea-level stands and with global sea-level fluctuations by previous studies. The uplifted Late Pleistocene marine terraces of known age were used as reference surfaces in order to determine fluvial incision rates for the last 350kyrs. The lower reaches of the study streams cut down through these marine terraces

To evaluate the incision rates on the uplifted block of the Xylokastro fault 33 topographic cross sections were constructed perpendicular to the valleys at specific locations where streams cut down the marine terraces as close as possible to their inner edges because these points correspond precisely to the age of the palaeo-shoreline during the interglacial stage. The sections were drawn through fieldwork measurements as well as using a digital elevation model (DEM) produced by detailed topographic diagrams at the scale of 1:5,000.

These marine platforms allow the reconstruction of the geometry and age of the former (prior the formation of the valley) surface that represents the hypothesized topography in the absence of erosion so bedrock incision rates can be directly calculated. For each cross-section the high (Hv) and the width (Wv) of the valley were measured while the ratio of valley width and valley high (Vf) was also estimated. Valley side slope angles were also determined and their distribution along the study streams was discussed. The mean incision rate of each stream for the last 350kyrs was estimated and both spatial and temporal variations of incision rates along the reaches of the studied streams were reconstructed. Valley morphometric parameters were also studied utilizing Artificial Neural Networks.

The geomorphic evolution of the studied streams has been affected by the lithology of the bedrock, the tectonic uplift of the area, sea level fluctuations during the Late Quaternary and the head-ward erosion and incision of the channels. The high of the valleys for each marine terrace is gradually greater from east to west. This indicates that incision rates are comparable with the component of regional uplift and with the slip rate of the Xylokastro fault over the last 350 kyrs.