

Constructing a sequence of palaeoDEM^s to obtain erosion rates in a drainage basin.N

F. Xavier Castelltort (1), J. Carles Balasch (1), Jordi Cirés (2), and Ferran Colombo (3)

(1) Universitat de Lleida, ETSEA, Environment and Soil Sciences, Lleida, Spain (xavier.castelltort@gmail.com), (2) Institut Cartogràfic i Geològic de Catalunya, Barcelona, Spain (jordi.cires@icgc.cat), (3) Department of Earth and Oceans Dynamics, University of Barcelona, Barcelona, Spain (colombo@ub.edu)

DEM^s made in a present-day drainage basin, considering it as a geomorphic unit, represent the end result of a landscape evolution. This process has had to follow a model of erosion. Trying to establish a conceptual erosion model in landscape evolution represents the first difficulty in constructing a sequence of palaeoDEM^s. But if one is able to do it, the result will be easier and believable.

The next step to do is to make a catalogue of base level types present in the drainage basin. The list has to include elements with determinate position and elevation (x, y, z) from the centre of the basin until hillslopes. A list of base level types may contain fluvial terrace remnants, erosive surfaces, palaeosols, alluvial covers of glaci, alluvial fans, rockfalls, landslides and scree zones. It is very important to know the spatial and temporal relations between the elements of the list, even if they are disconnected by erosion processes.

Relative chronologies have to be set for all elements of the catalogue, and as far as possible absolute chronologies. To do it, it is essential to have established first the spatial relations between them, including those elements that are gone. Moreover, it is also essential to have adapted all the elements to the conceptual erosion model proposed. In this step, it has to be kept in mind that erosion rates can be very different in determinate areas within the same geomorphic unit. Erosion processes are focused in specific zones while other areas are maintained in stability.

A good technique to construct a palaeoDEM is to start making, by hand, a map of contour lines. At this point, it is valuable to use the elements' catalogue. The use of those elements belonging to the same palaeosurface will result in a map. Several maps can be obtained from a catalogue. Contour maps can be gridded into a 3D surface by means of a specific application and a set of surfaces will be obtained.

Algebraic operations can be done with palaeoDEM^s obtaining positive or negative volumes corresponding to processes of erosion or aggradation.

A case study of the application of palaeoDEM^s is presented in the process of homoclinal shifting that is the origin of the strike valley of La Plana de Vic in the NE of Iberian Peninsula.