



Hypsometric analysis and denudation rates in coastal catchments of the Cantabrian Mountains (northern Spain)

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A GIS based analysis including hipsometry and morphometry was performed in four small coastal catchments located in the northern coast of Spain (Porcía, Negro, Esva and Esqueiro). The catchment basins range in area from 56 to 466 km², and maximum elevations range from 900 to 1200 m. They erode similar substrates made of Paleozoic metamorphic slates, sandstones and quartzites. Digital Terrain Models show values of slope greater than 30° concentrated along the lowest hill slope sections. The catchments cut across a 1.5 M.a. old uplifted wave cut platform, in which the inner edge angle (assumed paleo coast line) is at 100 to 120 m elevations. The Hipsometric integrals show different stages of maturity of the rivers. The largest river (Esva) shows the largest uneroded volume (45%) in contrast to 25% in the other three.

In order to obtain an estimation of denudation rates we performed a GIS based analysis to determine the volume of eroded material. A reconstruction of non-eroded topography was made using the Inverse Distance Weighting interpolation method. This interpolation provides the surface that better adjusts the present elevation of the points belonging to the basin boundary. By subtracting the DEM from the reconstructed marker were estimated an eroded total volume and denuded volumes since marine platform uplift (1.5 M.a.). The denudation rates obtained from 1.5 M.a. are 3.3, 3.7, 5.2, and 3.8 cm Kyr⁻¹ for Porcía, Negro, Esva and Esqueiro, respectively.

Studies of denudation rates based on in situ cosmogenic nuclides were also performed. Quartz from alluvial bar sediments of the lower part in 3 of the 4 catchments yielded no measurable cosmogenic ²¹Ne. A lower limit of 3 cm Kyr⁻¹ for basin-average denudation rates could be proposed, assuming that cosmogenic ²¹Ne is present at the limit of detection (5 x 10⁵ atoms/g). These values are in agreement with the ones calculated in the GIS. In contrast, in the Esqueiro River provided a denudation rate of 5 mm Kyr⁻¹.