



Drainage reorganization explains the large-scale fan-shape morphology of the northern Pyrenean landscape: no megafan in the northern Pyrenean foreland

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On the Northern side of the Pyrenees, the morphology of the foreland corresponds to a piedmont which is currently eroded by rivers belonging to the Garonne and Adour drainage basins. A particularity of this network of rivers is to show a regional divergent pattern at the scale of the piedmont, from a source area located at the mountain-piedmont transition, at mid-distance between the Mediterranean and the Atlantic Ocean. The radial drainage network is closely associated with a large-scale fan-shape topography of the whole piedmont (radius > 100 km, height ~500 m). Some recent studies proposed that this regional-scale fan-shape is the consequence of a recent localized differential uplift of the piedmont, or that it resulted primarily from recent deposition in a unique huge alluvial fan, the megafan of Lannemezan. Here, we show that none interpretation is satisfying and we use numerical simulations of surface processes (numerical code CIDRE) to propose an alternative model for explaining this particular landscape of the northern Pyrenean piedmont. We show that it likely results from successive steps of drainage reorganization, primarily linked to the geometry of boundary conditions for erosion. Our simulations successively reproduce most morphological observations and characteristics of the northern Pyrenean landscape. Then, we show that no recent deformation of the piedmont needs to be invoked to explain its morphology and that there is not any megafan on the northern flank of the Pyrenees.