Reconstruction of syn-depositional cross-valley faulting through numerical modelling: the Plio-Pleistocene Ambra paleovalley (Northern Apennines, Italy).

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Geomorphological and sedimentological processes at basin scale can be simulate and estimate through numerical modelling. This technology allows geologists to validate conceptual sedimentological and stratigraphical model in clastic systems, playing with control factors involved on sedimentation (Leeder, 1987; Paola, 2000; Hickson et al., 2005).

LECODE (Landscape Evolution Climate Ocean and Dynamic Earth) is an innovative geomorphic and stratigraphic forward modelling code able to simulate surface evolution and clastic sedimentary processes in 3D through geological times (Duclaux and Salles, 2013). This numerical tool can test geological scenarios and compare existing geological data with simulated one, such as high-resolution stratigraphic record, sediment dispersion and clastic sedimentary system evolution.

Here, we propose to simulate a conceptual evolution model of a well-constrained fluvial paleovalley study case in the Chianti region (Northern Apennines, Italy). The Ambra incised-valley aggraded under control of a syn-depositional tectonic forcing, which caused downstream changes in fluvial architecture and variations in sediment grain size distribution.

The Plio-Pleistocene Ambra paleovalley drained the northern flanks of the Chianti Ridge. Valley fill entirely consists of fluvial deposits, which are grouped in two main sedimentary units (Aldinucci et al., 2007; Bianchi et al., in press). The lower unit is mostly gravelly, whereas the top one exhibits a dramatic change from mud- to gravelly-dominated deposits moving downstream. This variation, which coincides also with a lateral shift of the valley axis, occurs where a normal, upstream-dipping fault cross the valley.

Imposing some constraints to the numerical experiment, as hydraulic, geologic and sedimentologic field data, we successfully reproduce the sedimentological pattern for the upper and lower units. The experiment allows (1) to monitor the progressive steps of valley-fill aggradation in the framework of a syn-depositional

tectonics, (2) to control avulsion and fluvial architectural changes and grain-size variations and (3) to quantify the fault activity required to obtain both sedimentary thickness and composition observed in the outcrops.

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