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Kinematic evolution of the Altotiberina extensional fault system (Northern Apennines) constrained by paleothermal and thermochronological indicators.

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In the last 20 years, several thermocronological and paleothermal studies have been performed in the Northern Apennines of Italy to investigate the burial and exhumation history of the main tectonic units during chain building. In this contribution we test thermocronological (U-Th/He and apatite fission tracks) and paleothermal (vitrinite reflectance and illite content in mixed layers illite-smectite) analyses to reconstruct the burial and exhumation history related to the latest Neogene-Quaternary extensional tectonic phase. We apply these methods to the Altotiberina fault system (ATF), a low angle extensional detachment dipping to the East.

The Umbria-Marche succession (Upper Triassic-Tortonian) was sampled at three different structural levels of the extensional fault system. From west to east they are: block A) the ATF footwall (Massicci Perugini area); block B) the ATF hanging-wall to the East of the Tiber Valley and block C) the footwall of ATF mail antithetic fault (the SW-dipping Gubbio fault). Paleothermal data indicate a general increase from top (R_o%: 0.26-0.4% I% in I-S: 40-50%) to bottom (R_o%: 1.03-1.22, I% in I-S: 77-85%) of the succession.

Low-T thermochronology indicates in block A an complex pattern of apatite fission tracks data whereas U-Th/He dates are generally reset with ages ranging from 3.8 to 2.4 My. In the block B data are no reset or only partially reset; whereas data from block C show older U-Th/He ages, ranging from 4.2 to 4.6 My. Exhumation rates indicate values up to 1 mm/y in the block A (ATF footwall) and values up to 0.6 mm/y in block C, instead block B is only slightly exhumed.

The differences in the three blocks in exhumation ages and rates are discussed in relation to the activity of the ATF and to its possible footwall isostatic rebound. This interpretation is supported by the exhumation age younger than 3.8 My of the upper Triassic unit of the footwall block (block A) and compared to the burial history of the same rock unit preserved in the subsurface in blocks B-C.