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Structural characterization of the wedge - top Epiligurian Units in the framework of the Northern Apennines tectonic evolution (northern Italy)

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The Northern Apennines are an accretionary wedge formed in response to the Late Cretaceous-Eocene closure of the Ligurian-Piedmont ocean and the subsequent Oligocene-Miocene convergence and collision between Africa and Europe. The wedge is formed by a stack of different paleogeographic units which, from the innermost to the outermost and from top to bottom, are: (i) the Ligurian Domain (formed by Jurassic ophiolites and their Cretaceous-to-Paleocene sedimentary cover); (ii) the Sub-Ligurian Domain (Paleocene-to-lower Miocene deep marine sediments and turbidites); (iii) the Tuscan-Umbria-Marche Domain (mostly including Jurassic-to-Oligocene platform and basinal carbonate successions, overlain by Miocene-Pliocene turbidites). The wedge is shaped by WNW-ESE-striking and SW-dipping thrusts, accommodating a general northeastward tectonic transport. Atop of the deformed Ligurian Domain there occur the Epiligurian Units, which consist of middle Eocene-upper Miocene bathyal to shallow-water siliciclastic deposits infilling wedge-top basins. These Units presently fill in separate basins with poor lateral interconnectivity due to erosion and deformation. Since the Miocene, thrusting toward the (eastern) orogenic foreland occurred simultaneously with extension in the (western) hinterland domain, causing the formation of NW-SE-striking normal faults. Presently, focal mechanisms of the stronger earthquakes constrain dominant thrusting associated with NE-SW regional shortening, whereas the extensional regime controls the seismicity along the axial portion of the wedge. This recently launched study aims to better characterize the deformation structures affecting the Epiligurian Units in the internal and external sectors of the Northern Apennines (Emilia-Romagna Region) with the goal to provide a comprehensive syn-to-post accretion evolutionary scenario for these shallow basins. In particular, deformation structures affecting these wedge-top sequences of the inner (southwestern) side of the wedge are being studied by their systematic geometric and kinematic multiscalar and multitechnique characterization. Top-to-the NE, WNW-ESE-striking thrusts/reverse faults, dipping moderately to SSW are defined by planar slip surfaces associated with thin clastic damage zones. Top-to-the SE, ENE-WSW-striking thrusts/reverse faults, are instead generally devoid of well-developed damage zones. These contractional faults are systematically cut by NW-SE and NE-SW-striking normal and oblique faults systems, characterized by mutually intersecting fault planes accommodating centimetric to decimetric throws. Associated with the extensional structures occur widespread cataclastic and

disaggregation deformation bands. They are found as either single bands or clusters, cutting across upper Eocene coarse-grained sandstones. Our preliminary results show that the Epiligurian Units experienced a complex tectonic evolution, including NNE-SSW shortening followed by NE-SW extension. The structural record of these wedge top basins is useful to infer the kinematics and rate of wedge build up and tearing down during the progressive evolution of the continental collision. The Epiligurian Units can thus be considered as useful gages of the deformation history of the Northern Apennines wedge, with noteworthy implications on its current seismotectonic setting.