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Late Miocene extensional collapse of Northern Tunisia.

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Two orthogonal extensional systems produced the extensional collapse of the Tell and Atlas thrust belts in northern Tunisia during the Late Miocene in a context of NW-SE plate convergence between Africa and Eurasia. The older extensional system shows several detachments and associated high-angle faults with NE-directed transport that were active during the late Tortonian to Messinian. The Ghezale extensional detachment shows a gentle footwall and hangingwall ramp geometry that cuts down into the autochthonous Atlas unit, omitting most of the Palaeogene sequence at its footwall from West to East, from Bazina towards Ghezala. In this region, a large segment of the detachment shows a flat geometry with strongly stretched Triassic evaporites in between Cretaceous or Palaeogene marls. The direction of extension swinged towards the SE during the Messinian-Pliocene, cutting into and tilting the previous detachments and producing half-grabens and the Mateur hanging-wall syncline basin. The Nefza detachment exhumes authochthonous Triassic rocks in the footwall of the fault zone from under Numidian sandstones and Palaeogene sediments in the hanging-wall. This detachment is strongly folded, cropping out in the core of the Oued Belif Plio-Quaternary anticline. The Nefza detachment itself is defined by a thick sequence of mineralized tectonic breccia and locally by a marble mylonite where it exhumes syn-tectonic 8 Ma rhyodacites. Continued Plio-Quaternary NW-SE convergence produced reverse faults that cut and folded these extensional structures. We relate the NE-directed extension with the tearing of the Calabrian slab along the Northern Tunisia coast during opening of the Tyrrhenian basin. Meanwhile, the SE-directed extension that followed was probably related to SE-directed delamination of the African lithospheric mantle. This extension propagated eastwards from the late Tortonian until the Pliocene, and at present is probably still active, together with associated volcanism, further east in the Pantellaria rift. This new hypothesis for the tectonic evolution of Northern Tunisia shows for the first time the importance of crustal extension in the denudation of the Tunisian Atlas and Tell foreland thrust belts and its relation to deep mantle tectonic mechanisms.