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Salt décollement and rift inheritance controls on crustal deformation in orogens

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The Pyrenees, a type example of an Alpine mountain belt, exhibits a doubly vergent orogenic wedge with $\sim 20\%$ of shortening accommodated in the retro-wedge, an antiformal crustal stack in the orogenic core, and a wide low taper pro-wedge fold-and-thrust belt decoupled on Triassic salt from underlying thick-skinned deformation. We present self-consistent high-resolution numerical models that explain the formation of an antiformal stack, a wide foreland fold-and-thrust belt, and show that such orogens may be characterised by a two phase evolution with early symmetric inversion followed by formation of a doubly vergent orogenic wedge. Key factors for reproducing observed behaviour include (1) extensional inheritance, (2) a weak décollement decoupling thin and thick-skinned deformation, and (3) efficient orogen erosion and foreland sedimentation. The combined effects of (2) and (3) reduce taper and promote basal accretion of thick-skinned crustal thrust sheets to form an orogenic antiformal stack.