

## Rift inheritance, surface process, and décollement control on orogenic mountain belt structure explained by dynamic models

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Observations from the Pyrenean type example of an Alpine mountain belt reveal a doubly vergent orogenic wedge with ~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 by Triassic salt from underlying thick-skinned crustal deformation. Here we present self-consistent high-resolution numerical models that explain the formation of an orogenic antiformal stack, a wide foreland fold and thrust belt, and why such orogens may be characterised by a two phase evolution with early symmetric inversion followed by formation of a double vergent orogenic wedge. Features that are important to reproduce the observed behaviour include extensional inheritance, a weak décollement decoupling thin and thick-skinned deformation promoting a low taper foreland fold and thrust belt, and efficient orogen erosion and wedge top sedimentation in the adjacent foreland basins. The combined effects of these factors reduce taper and promote basal accretion of thick-skinned crustal thrust sheets and the formation of an orogenic antiformal stack.