

## Structure of orogenic belts controlled by lithosphere age.

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### *Abstract*

*Orogenic belts show variable tectonic styles and amounts of crustal shortening reflecting differential accommodation of lithospheric plate convergence. The extent to which these variations are pre-conditioned by the inherited thermo-mechanical conditions in the lithosphere is debated. The analysis of re-processed data on contractional deformation in 30 orogenic belts draws correlations with lithosphere strength and thermo-tectonic age. We show that the deformation and age of continental lithosphere at the time of collision are correlated. Deformation of Phanerozoic lithosphere, characterized by low strength, hot geotherms and weak mantle, involves mid-to-lower crustal detachment, and shows reduced crustal strain. Older continents, with higher strength and high-viscosity mantle, promote underthrusting, resulting in larger deformation. We show that inherited lithospheric strength, which controls the depths of crustal decoupling and is a function of plate age, is a major factor in determining the stability of continental subduction and the style and amount of contraction. Our results emphasize the link between deep Earth and surface processes and their impact on the development of structural styles of collisional orogens, by linking the distribution of crustal strain with the rheological properties of the continental mantle.*