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DISSERTATION TITLE:	*Numerical modelling of continental collision with an application to the Zagros fold-and-thrust belt*

The relatively rigid outer layer of the Earth, called the lithosphere is divided into tectonic plates, which are in constant motion relative to each other. These plates may be oceanic in character, or continental, or a combination of both. Continental collision occurs when an intervening ocean has been closed by subduction of the oceanic lithosphere. Geological and geophysical observations show that deformation at continental collision zones can be accommodated in different styles: subduction of the continent, thickening of continental lithosphere, lithospheric-scale folding, Rayleigh-Taylor instabilities, and slab break-off. In this PhD two continent-continent collision systems is reviewed; the Norwegian Caledonides and the fold-and-thrust belt as found in the Zagros mountains in Asia. The two mountains formations give us examples of parameters that may affect the style of deformation. Using 2D upper mantle-scale thermo-mechanical models, it was found that these styles are achieved through variations in driving velocity, lithospheric temperature, continental rheology, and the interaction with adjacent plates. Then a simple force balance of slab pull, slab push, slab bending, viscous resistance and buoyancy was used to explain the different collision styles caused by these variations.

As an application of these results, the role of salt in the Zagros fold-and-thrust belt was investigated. Upper mantle-scale models, as far as possible constrained by available geological and geophysical data, indicate that the presence of Hormuz salt has played a crucial role in decoupling overlying sediments from the basement, and localising deformation in the sediments by foreland-verging shear bands. Although these models predict a topography and top basement dip that agrees reasonably well with the present-day observations, they are not able to reproduce the fold-dominated deformation in the simply folded Zagros. Instead the kinematic boundary conditions, thermal structure, and top basement dip of the upper-mantle-scale model was used as initial conditions of a series of upper-crustal-scale models to investigate the effects of basal and intervening weak layers, salt strength, basal dip, and lateral distribution of salt on the deformation style of the simply folded Zagros.