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Numerical modelling of salt diapirism and the surrounding temperature field during thin-skinned extension

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The occurrence of salt diapirs is strongly associated with potential geothermal and hydrocarbon energy sources. Many numerical modelling studies of diapirism have been done in the past, though very few of these in fact use geologically realistic settings and materials. Besides, only analogue and structural studies have been done on full scale diapirism during thin-skinned extension. Two-dimensional numerical modelling of this problem using a Finite Element code aims at addressing the following questions: which geometrical or material parameters affect the growth rate and shape of the diapir and how? what is the effect of this diapirism on the temperature field and surface heat flux? How does the inclusion of simple surface processes influence these observations to first order ?

Our results show that, in compliance with both analogue modelling and structural geological studies, a diapir formed during thin-skinned extension undergoes three phases: reactional piercement, active piercement and passive piercement. Extension rates directly influence the total time required for the diapir to reach the surface, as well as how long the system remains in a state of reactional diapirism, which both affect the shape of the resulting diapir. Erosion efficiency is found to affect the growth rate of the diapir during its active stage and the total rising time, which affects in turn its the shape. The density contrast between the salt and the sediments also influences the growth rate during active and passive piercement. Finally, the temperature surrounding a rising diapir (especially in the region above it) is found to be heightened by a few dozens of degrees.