# Plume-lithosphere interaction through time

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In this this study we use numerical modelling to investigate plume-lithosphere interaction through time (decreasing mantle temperatures) for a variety of lithospheric architectures. The objective was to identify parameters controling melt development (mantle/crust) and mechanical errosion of the lithosphere.

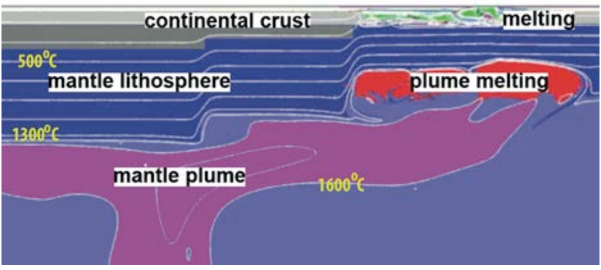


**Figure 1.** Cross-section through lithosphere/mantle showing interaction between plume head and 'stepped' lithospheric architecture at a potential mantle temperature of 1450°C.

We tested plume-lithosphere interactions under variable mantle potential temperatures ($T_p$) and observed that:

1. Maximum melt production occurs beneath the craton margin, controlled by the flow of plume material into shallower mantle;.

For higher $T_p$ (~1600°C) the depth of decompression melting is greater, suggesting melt development beneath deep cratons >250km, e.g. Barberton-type komatiites, is plausible;

2. For $T_p$ (>1550°C) the amount, as well as the duration, of plume-triggered crustal melting is greater than for lower temperatures;.

For higher $T_p$ (>1550°C), the base of the lithosphere is more prone to mechancal erosion; and

At high $T_p$ (>1500°C), non-plume related mantle decompression melting occurs when the lithospheric is <150 km, suggesting ambient mantle melting was possible under continental crust in the early Earth.