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Conditions and Features of Paleoproterozoic Continental Subduction from Supercomputer Modelling Results

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A number of issues concerning Precambrian geodynamics still remain unsolved because of uncertainity of many physical (thermal regime, lithosphere thickness, crust thickness, etc.) and chemical (mantle composition, crust composition) parameters, which differed considerably comparing to the present day values.
The presence of ultra-high pressure metamorphic (UHPM) rocks in collisional orogens is considered reliable indicator of continental subduction. Low spread of Precambrian UHPM terranes gives reason to believe that subduction of continental crust was not common.
In this work, we show results of numerical supercomputations based on petrological and thermomechanical 2D model, which simulates the process of collision between two continental plates, each 140-250 km thick, with convergence rate - 5 cm/year. In the model, the upper mantle temperature is 130-150^{0}C higher than the modern value, while the continental crust radiogenic heat production is higher than the present value by the factor of 1.5.
The results have shown that even in the Paleoproterozoic conditions continental subduction is widespread process. The primary parameter, which has the most significant influence on continental subduction style is composition of the continental crust. The 2 following archetypal settings of continental crust composition are examined: 1) completely felsic continental crust; 2) basic lower crust and felsic upper crust. Continental subduction with the felsic crust is short-termed and lasts less than 5 Myr. Rocks exhume very fast (< 1 Myr). In the case of basic lower crust, a continental subduction is more stable and last over 15 Myr.
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