Origin of craton mantle layering according to PT reconstruction

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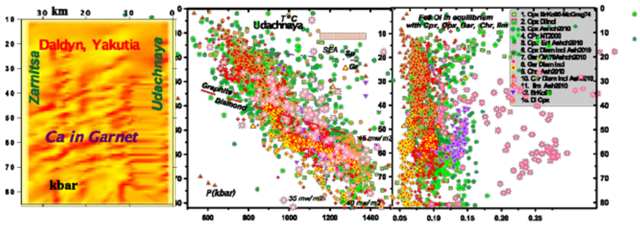
Reconstruction of PTXF conditions of SCLM for Ykutian [1,2] and ~70 worldwide kimbelites show high heating of Proterozoic mantle, lower heating stage to the mantle of the northern continentswith sicker SCLM in comparison with post Gondwana ones. The layering -7-12 horizons correlates with superplume events. The transects for Siberia, Baltica, marginal N America and S Africa show motley inclined SCLM, in central parts prevail horizontal. Three traps for the melts: oxidized in- the 75-65, carbonatite- 45-40, and water-bearing basaltic- 20-30 kbar [3] are marked by pyroxenites [4]. Melt and diapiric upvelling from these levels in off-craton and rifting settings were basificated, reduced and rifted in superplume periods. Models of SCLM formation: the nucleation of restite from mantle diapirs; joining of exhousted or island-arc type blocks; the low angle subduction of submelted plates under superplumes; broken, folded high angle plates joined to the continental margins. Fluid/melt flows in the continent margins metasomitized SCLM [5]. Protokimbelites refertillized low part of mantle section in two steps–carbonatite/kimberlite and with H_2O bearing melts as evidenced by geochemical features of pyroxenes and garnets RBRF 11-05-00060a;11-05-91060-PICSa.



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The melting curve of MgO from shock temperature experiments

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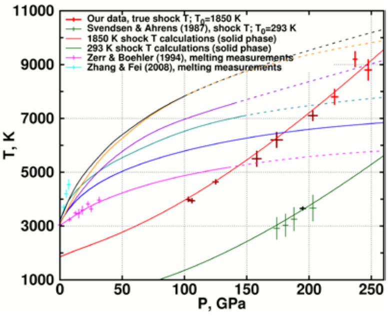
MgO is a major constituent of the lower mantle and its melting curve is an essential anchor point for understanding crystallization of magma oceans or melting at the core-mantle boundary. Despite the apparent simplicity of this material, its melting curve remains highly uncertain. The laser-heated DAC-based melting curve of [1], extrapolated to 135 GPa, is 1000 K below any of the published theoretical curves [2-6], which themselves range over nearly 2500 K. A recent study of the MgO-FeO binary loop supports a very steep liquidus [7]. To resolve this issue we determined shock temperature on single-crystal MgO pre-heated to 1850 K before impact. Our data are calibrated against a standard irradiance lamp and the known shock temperatures of NaCl and MgO shocked from 300 K and are corrected for shock-front reflectivity. Melting should manifest as a drop in shock *T* with increasing pressure and shock *T* lower than expected for solid periclase in the shock state. Our experiments reach 9000 K at 250 GPa and remain solid in the shock state. This rules out the melting curve of [1] and probably [2], but we have only a lower bound on the melting curve at this time. Experiments with initial temperature up to 2350 K are in progress.



A very high melting temperature of MgO implies minimum melts of the lower mantle that are silicate- and FeO-rich and a significant ferropericlase liquidus field.

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