



A Crack in the Kimberlite Model for the Upper Crust

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The general model for kimberlite emplacement is based upon a volcanic model. An alternative model is based upon a mantle derived gas explosion, produced by expansive phase transitions that occur during the rapid ascent of carbonated volatile-rich ultramafic magma from the mantle. The shock-waves (in excess of 50 Gpa) produce modified Weertman cracks on a macroscopic scale, that propagate vertically at supersonic speeds forming channels for kimberlite magma with entrained diamond xenocrysts and xenoliths of mantle and crustal origin. The supersonic crack model with a high strain rate ($\sim 10^2$ s), is a powerful and potential mechanism for both the migration of the kimberlitic melt from the Earth's mantle to the surface and for the preservation of diamonds.