segregation length $\delta_c = 6$ km, $V_d = 30$ cm·y^{-1}, $t_s = 0.2$ My, $L_s = 8$ km, $\gamma_c = 1.7$. As soon as melt segregates, new partially molten zone grows, and the sequence of the events repeats until the whole diapir passes by the melting level. A diapir size, D, can be estimated based upon diameters $D = 20$ to 80 km of low-amplitude uplifts known to correlate with kimberlite fields [Kaminsky et al., 1995]. Therefore, the decreasing dependence of the segregation time on a mushy layer thickness implies formation of clusters of $D/L_s = 3$ to 10 low volume eruptions of almost the same age and composition. An attractive feature of the model is that it relates the kimberlite origin to a localized incipient melting.

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Interactive visualization of large-scale numerical simulations with GPU-CPU systems

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We present a method for pipelining results from large-scale fluid dynamical simulations in such as way as to exploit the exponentially increasing computational capacity of the latest generation of multicore CPUs, many-cores and GP-GPUs. Exploiting this technique, together with an integration with several data post-processing and visualization utilities has enabled numerical experiments in computational fluid dynamics to be performed interactively on a new, dedicated system in our lab at the University of Minnesota. This method provides an immediate, user controlled visualization of the resulting flows on the LCSE PowerWall display as well as through a globally accessible html and java web interface. The code restructuring required to achieve the necessary computational performance boost, as well as the interactive visualization are described. Requirements for these techniques to be applied to other codes are discussed, and our plans for tools that will assist programmers elsewhere to exploit these techniques are briefly described. Examples showing the capability of the new system and software are given for various applications in turbulent hydrodynamics, stellar flows, and mantle convection.