The Pb cycle in 3D numerical geodynamic models

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The Pb isotope signature of oceanic basalts is characterised by positive linear correlation in $^{206}Pb/^{204}Pb$ - $^{207}Pb/^{204}Pb$ space. For a global set of oceanic basalts, the pseudo-isochron in $^{206}Pb/^{204}Pb$ - $^{207}Pb/^{204}Pb$ space gives a pseudo-isochron age (τ_{Pb}) of ~1.9 Gyr. Reconciling observed τ_{Pb} with τ_{Pb} in geodynamic models can help us to better understand the relationship between chemistry and mantle dynamics. Such models can be used to consider the Pb paradoxes. Previous 2D modelling attempts have reconciled τ_{Pb}, but this has only been achieved through assumptions which are not entirely satisfactory. Here we build upon previous work by modelling in 3D spherical geometry and introducing a new method of redistributing continental material back into the mantle. We use τ_{Pb} and the observed scatter in $^{206}Pb/^{204}Pb$ - $^{207}Pb/^{204}Pb$ space to assess a range of parameter combinations and discuss the implications these have for the evolution of the mantle.