Update to HPE abundances in the continental crust

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The continental crust is a major chemical reservoir for some elements, despite its small relative mass. Abundance estimates of the heat producing elements (HPE) U, Th, and K in the continents dictate model estimates for the energy budget of the mantle relative to the bulk silicate Earth (BSE). Most crustal compositional models combine geochemial inputs, usually based on sampling surveys, with physical reference models that defined crust thickness, density, and seismic properties.

Huang et al. (2013) modeled HPE abundances of the middle and lower crust by combining laboratory seismic velocity measurements from representative lithologies with velocities provided by CRUST2.0, a global geophysical model. This method requires correcting laboratory velocity measurements to the temperature (from an assumed geotherm) and lithostatic pressure conditions of the geophysical model. Upper crustal abundances were adopted from previous studies. Their model is the most up-to-date estimate of bulk crustal heat production.

We applied the Huang et al. (2013) method to LITHO1.0, an update to CRUST2.0, to acquire crustal HPE abundances and their contributing heat production. We performed sensitivity tests of model output to various input parameters, including: 1) crustal geotherm, 2) seismic temperature and pressure corrections to laboratory data, 3) upper crustal abundance, and 4) lower crustal density in poorly defined regions. These sensitivity tests are necessary for proper uncertainty estimation.

An updated model for U, Th, and K abundances and their distribution in the continents will be presented. We report fits and residual mean square (RMS) for iterative geotherm calculations, P&T dependent velocity corrections, and upper crustal HPE abundances and distributions.

[1] Huang *et al.* (2013) *Geochem. Geophys. Geosyst.* 14(6), 2003-2029.