

Focused heating in continental collision zones caused by the burial of highly radioactive sedimentary rocks

FORREST HORTON¹

¹ California Institute of Technology
Division of Geological and Planetary Sciences
1200 E. California Blvd., MC 100-23
Pasadena, CA 91125
horton@caltech.edu

The abundance and spatial distribution of heat producing elements (U, Th, and K) in the middle and lower crust can influence the tectonic evolution of orogens. Intense localized radiogenic heating can occur when sedimentary rocks with high concentrations of heat producing elements are buried during continental collision. As a result, middle and lower crust that has highly radioactive sedimentary protoliths undergoes focused metamorphism, melting, and deformation.

Because the enrichment of U in sediments is most efficient when Earth's surface reservoirs are oxygenated, the most radiogenic sediments were deposited during the Paleoproterozoic Great Oxygenation Event and since the late Neoproterozoic when atmospheric O₂ rose to near present-day levels. These sedimentary sections, when assimilated into orogens, have become fertile radiogenic heat sources. Thus, in some instances, focused heating in continental collision zones is a result of the oxygenation of Earth's atmosphere.