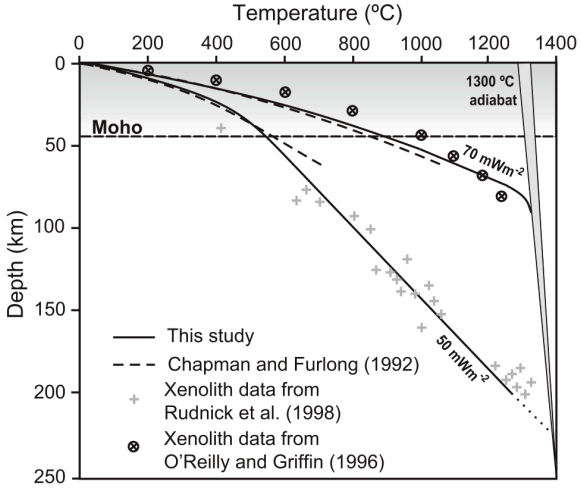
ESC3332 Global Dynamics WEEK 2

The following figure summarises data from Xenolith and calculations providing constraints on two types of continental geotherms, a “cold” and “warm” geotherm (from Afonso and Ranalli, 2003).



Assuming a simple linear increase of the temperature T with depth z, plot the temperature profile of these types of continental geotherms. Assume a function

T = gradient(T) * z

Where

gradient(T) = T_{base}-$T_{surface}$/h

and h is the lithosphere thickness.

Then, plot the density following the function

$\rho = \rho_0 (1 - \alpha T)$

with ρ_0 = 3380 kg/m^3 the density of Olivine at room conditions and a = 10^{-5} 1/˚C
and the Pressure

$P = \rho g z$

Using a value for g = 9.81 m/s^2 and $\rho = \rho_0$.
Compare this assumption of a constant density with the integral
$P(z) = \int_h \rho(z) g \, dz$
NOTE this is provided in the script

Answer the following questions:

1) Describe the pressure profile (linear/non-linear, depth- or density-dependent)
2) Describe the assumptions of depth-dependent (and density-independent) pressure
3) What is the Pressure at the base of the cold and warm lithospheres?