

Geophysics 150: Home set due Oct. 23, 2002

2. The Earth's core is 1/3 of the mass of the planet. The mass specific heat of the mantle and core are 1.25 and $0.62 \text{ kJ kg}^{-1} \text{ K}^{-1}$.

a. Assume that the whole Earth cools at 50 K per billion years. What is the average heat flow needed to provide this heat? That is the contribution of cooling to global heat flow.

b. Assume instead that the core stays isothermal. Obtain the global heat flow contribution from cooling of mantle in this case.

c. We ignored the lithosphere in the above calculation. Assume that a 100 km thick lithosphere as stayed isothermal throughout the time span of interest. Estimate the fraction of the Earth's heat capacity that is in the lithosphere.

d. The lithosphere of Mars is ~ 2.5 times as thick as that of the Earth. Estimate fraction of Mars' heat capacity that is in the lithosphere. Table is on page 17.

e. The lunar lithosphere is 6 times as thick as Earth. Repeat d for the Moon. Note that the Moon has a very small core so assume it is all mantle.