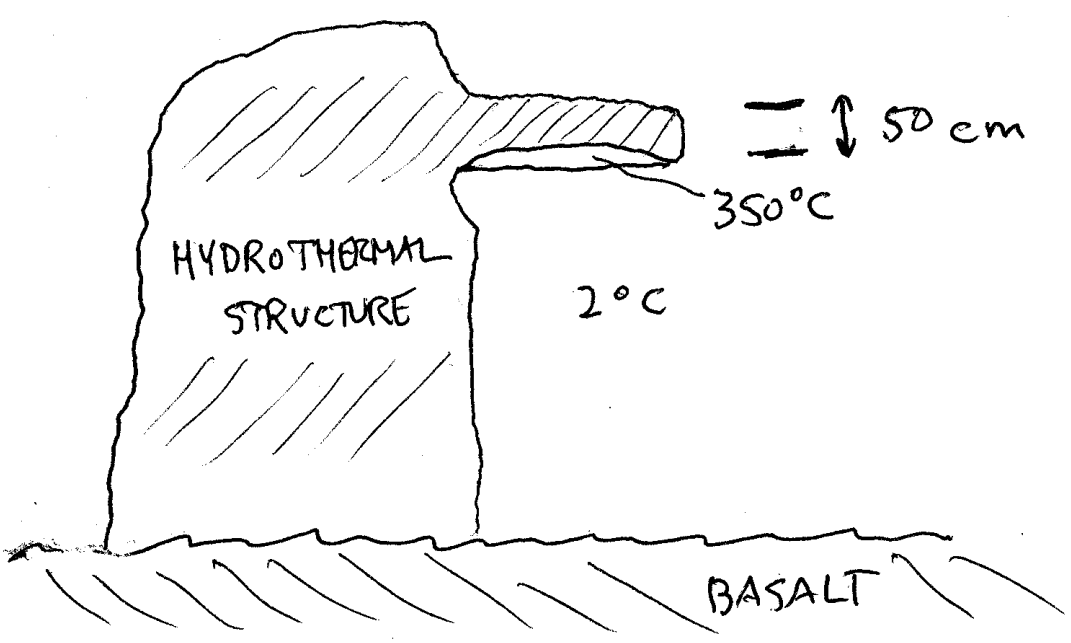
**Ocean 540=549b**
**Autumn 2002**
**Problem Set #1**

Due Monday October 14.

1. What is the total heat lost by conduction (energy per unit area) for a section of lithosphere from the time of its formation until it is subducted 180 My later. What fraction occurs within the first 10 My? The first 50 My?. Assume that the conductive plate model applies and that there is no convective heat loss (i.e., ignore measurements of conductive heat flow on young lithosphere.

2. Horizontal protrusions from large seafloor hydrothermal sulfide structures are called flanges. Fluids can pond under the lower edge of the flange, creating a quiescent, hot pool:




If there were no convection, what would be the conductive heat transfer out of the upper surface of this flange? (The thermal conductivity of the structure is ~40 W $m^{-1}$ $°C^{-1}$, the thermal diffusivity ~1.3 x $10^{-5}$ $m^2$ $s^{-1}$). If the structure were layered such that the upper 25 cm had a thermal conductivity 1/5$^{th}$ that of the lower 25 cm, what would the temperature be at the interface between these two.