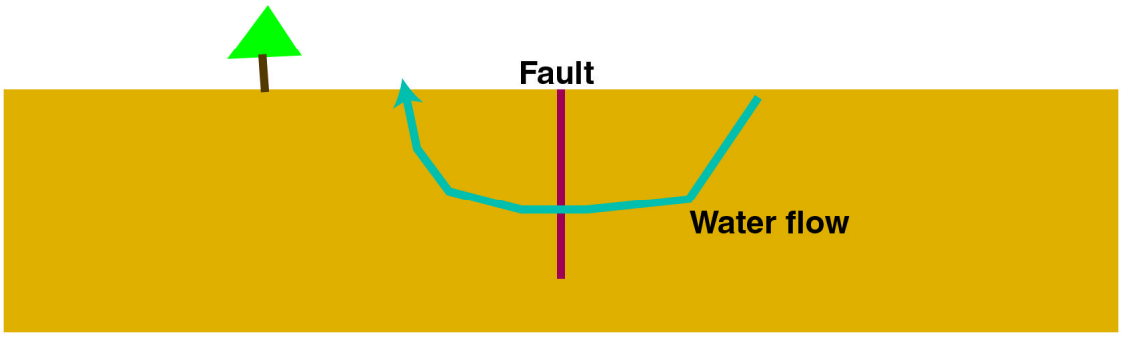
Geophysics 150: Home set due Oct. 18, 2002

1. Ground water flow is sometimes considered to carry the heat from the San Andreas fault. Assume for simplcity that the water goes into the ground at one side and comes out the other. The water must do this without greatly perturbing the measured heat flow.



a. The fault sides at ~3 cm/yr (10^{-9} m/s) and the shear stress is ~100 MPa for a strong fault. Compute the equivalent heat flow generated by the fault surface.

b. The circulating water increases in temperature by 50°C when it crosses the fault plane. The heat capacity of water is 4×10^{6} J m^{-3} K^{-1}. At what velocity must the water flow to remove this heat. The mean annual rain fall is 0.3 m/yr (10^{-8} m/s). Is it reasonable to expect this much water flow in southern California given that much of this water runs off?

c. Compute the scale length of the flow. Is the flow likely to perturb the geotherm measured in a 1 km deep well?