

Additional Exercises

Chapter 14

Exercise 14.2

Using the concept of effective normal stress, which represents the difference between total normal stress and total fluid pressure, and the definitions for hydrostatic pressure, non-equilibrium pressure, total fluid pressure, and total normal stress derived in Exercise 14.1 (Chapter 14), sketch a sequence of diagrams showing profiles of fluid pressure, total normal stress, and effective stress at times $t = 0$ (fully liquefied state), $t = \Delta t$ (intermediate state), and $t = \infty$ (when $p_* = 0$).

Exercise 14.3

- (a) Measurements during large-scale experimental debris flows have shown that total bed normal stress varies directly with flow depth. If the measured total bed normal stress of a decelerating sandy debris flow is 2.5 kPa, and the flow depth is 0.12 m, what is the estimated average total bulk density of the flow? Is this a reasonable value for total bulk density?
- (b) Assuming a grain density of 2650 kg m^{-3} , estimate the porosity of the debris flow. Is this a reasonable estimate of porosity of sandy debris?
- (c) If this was a dry granular flow, estimate its total bulk density.
- (d) Measurements of dry bulk density of the experimental debris flow deposits ranged from 1870 to 1930 kg m^{-3} . How do these values compare with that estimated above? What do the estimates of bulk density of flowing debris and that measured in deposits indicate?