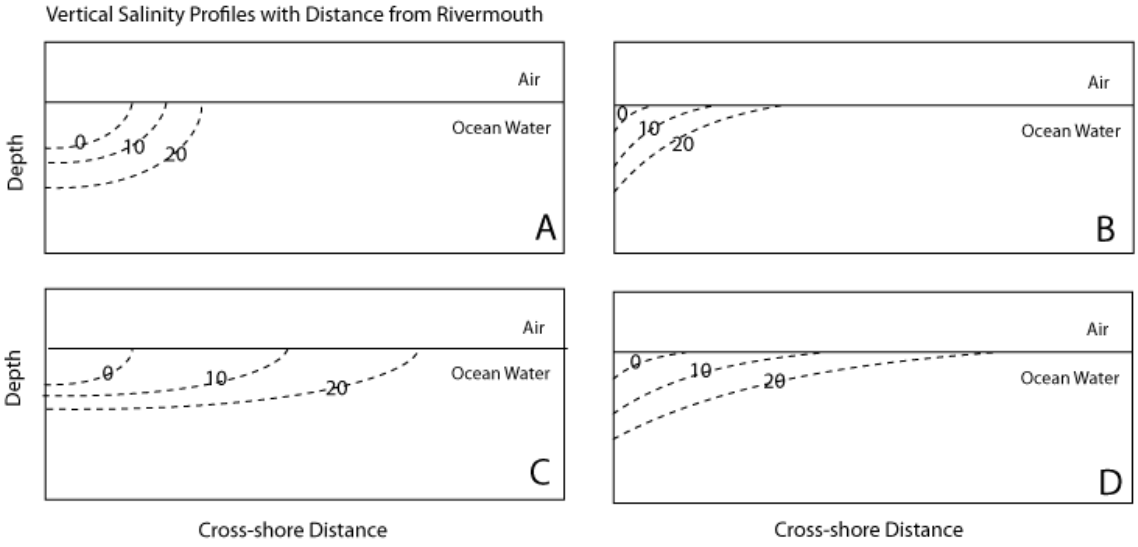
DRAFT Concept Inventory Questions for ROMS-Lite Labs
By Irina Overeem, October 2016

STUDENT NAME:
STUDENT ID NUMBER:

This exercise is part of the CSDMS Education efforts. The results of this exercise will **NOT** count towards your class grade!

- Please fill in your name and your ID number
- In the next 20 minutes please answer the following questions to the best of your ability
- For each question select the answer that you think is **most correct**.

1. **Which one of the following diagrams illustrates best the vertical salinity profile of a river plume entering a coastal ocean with a strong longshore current? The current comes out of the paper and we are in the Northern hemisphere.**



2. Densities of freshwater (river) and salt water (ocean) are different. When rivers drain into the coastal ocean density stratification (i.e. layering) can occur.
What conditions are most likely to promote density stratification?

A) High river discharge, low wave action, and a shallow basin.
B) High river discharge, low wave action, a deep basin.
C) Low river discharge, low wave action, a shallow basin.
D) Low river discharge, low wave action, a deep basin.

LandSat 5Tm image of the Connecticut River draining into Long Island Sound. This image was captured after hurricane Irene caused widespread rains and river flooding in September 2011.

3. Why can you detect a river plume on a satellite image?

A) River sediment colors the ocean water
B) Freshwater has a lower density then saline ocean water so the plume keeps floating on the surface.
C) Algae blooms color the water bright in response to nutrients delivered to the ocean.
D) All of the above.

4. Which force is greater, when a sediment grain is sinking down at settling velocity, the weight or the drag force?

E) The weight, because the particle is sinking
F) The forces are equal, because the particle is sinking at constant velocity
G) The drag force, because the particle is dragged down.

5. How long would it take clay particles to settle in 15 m water depth? Settling velocity for clay is in the order of 10^{-6} m/s.

A) After 173 days
B) Settling would not occur because the water would never be slack or stagnant for so long.
C) The settling rate is not accurate because the clays will flocculate and settle much faster.

6. Water moving along the sea floor will incur a shear stress. Shear stress (commonly written as τ) originates from the force vector component parallel to the cross section. What is the unit of shear stress?

A) kg m^{-3}
B) kg m^{-1} s^{-2}
C) kg m s^{-2} m^{-2}
D) pascal
E) both C and D are correct.

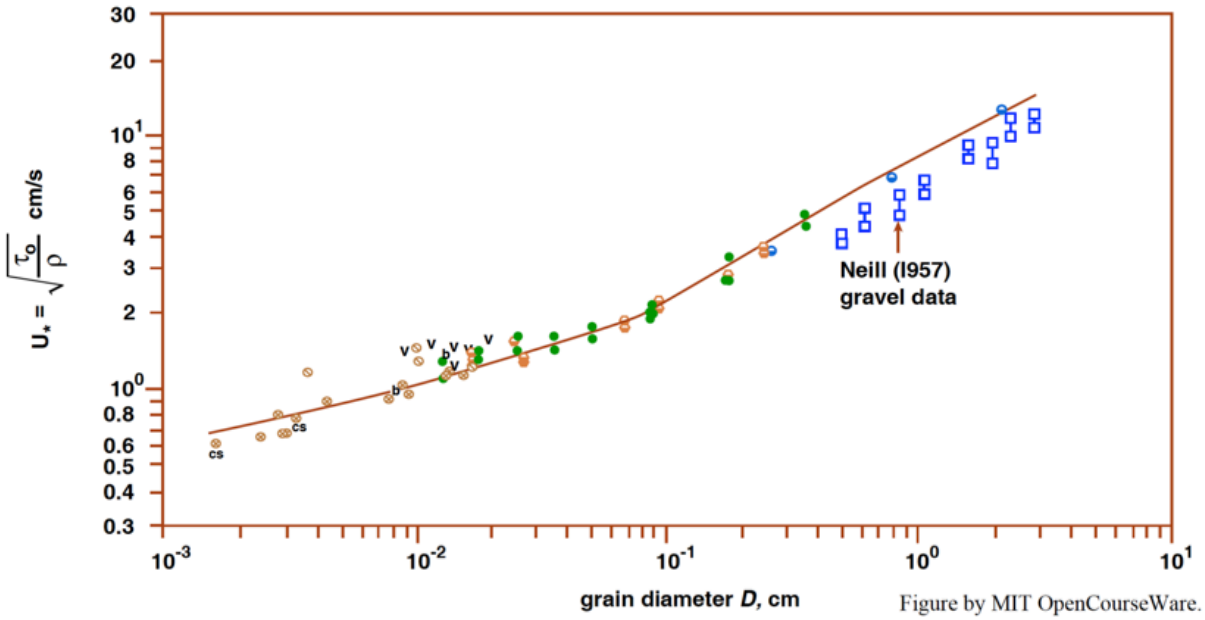


Figure by MIT OpenCourseWare.

Figure 9-10. A version of the updated Shields diagram, recast in terms of shear velocity u_* and particle diameter D, and standardized to temperature 20°C. (From Miller et al., 1977.)

This figure is a modification of the Shields diagram; it shows experimental data on fluid shear velocity and grainsize of the sediment (after Miller, 1977).

7. Using the diagram and your own reasoning, answer the following question. What happens to grains finer than about 0.1 mm (i.e. very fine sand) when the critical shear velocity is reached?

A. Very fine sediment will experience bonding forces, so despite high shear velocity it does not get picked up.
B. Very fine sediment is more cohesive, so despite high shear velocity it does not get picked up.
C. If the shear velocity is exceeded, very fine sand will travel in suspension.
D. If the shear velocity is exceeded, very fine sand will travel as bedload.

8. On waves: which statement is FALSE:

A) A wave transports energy through the ocean.
B) Significant wave height is the highest wave height over a particular time.
C) Wave height is 2x wave amplitude.
D) Waves in the ocean are surface waves, not body waves.

9. What effect do you expect energetic waves to have on sediment deposition near a river mouth?

A. Sediments will not settle as rapid, because the waves stir up the sediment and keep it in suspension.
B. Sediments will not settle as rapid, because the waves increase bottom friction.
C. The waves break near the river mouth,and thus cause the sediment to settle more rapidly.
D. The waves increase the spreading of the river plume, so that it looses momentum, and thus cause more rapid settling.

10. The hinterland of a muddy medium-sized river has been extremely dry over the last 5 years, the drought in California is a good example. Scientist are making a detailed map nearby the river mouth every 5 years in the same week in October. How do you expect the map to look different this dry year from more normal conditions?

A. You can not tell the difference, the deposits are too chaotic.
B. You can not tell the difference, because the older river deposits are still there.
C. The map would show more coarse sediments because the waves have resuspended the fines and there is no new sediment delivered.
D. The map would show more fine sediments spread out over a larger distance because the waves are now the dominant mode of transport.

11. What causes most of the waves in the ocean?
A. Tides
B. Earthquakes
C. Wind
D. Tsunamis