Round: 6B
Category: Chemistry
Time: 5 minutes

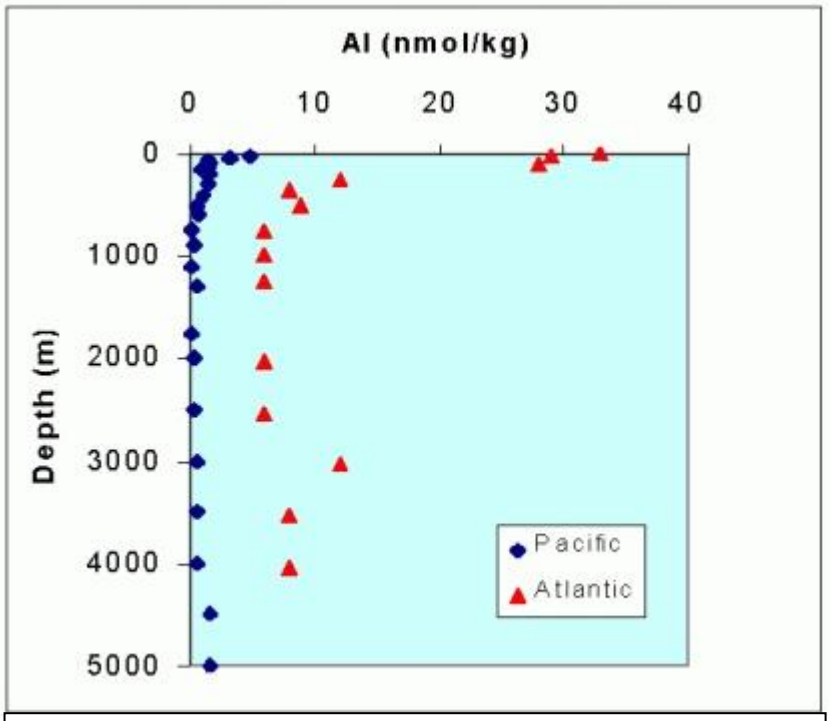


Figure 1: Open ocean vertical profiles of dissolved aluminum in the North Atlantic and North Pacific

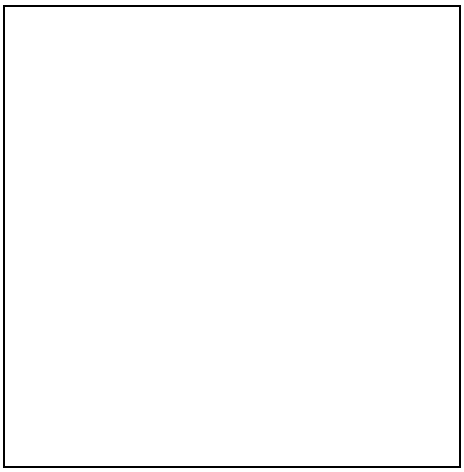
1. What are the two (2) most likely source of aluminum to surface waters? (4 pts)

2. Why are dissolved aluminum concentrations higher in the Atlantic than the Pacific? (2 pts)

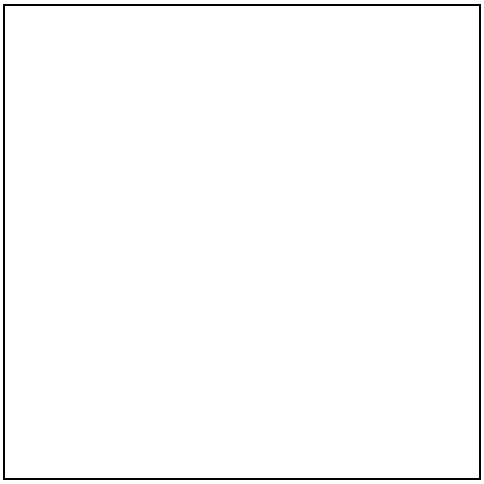
3. What process causes aluminum concentrations to decrease in the upper 1000 meters of the water column? (2 pts)

4. What is the most likely explanation for the anomalously high data point at 3000 m in the Atlantic? (2 pts)

5. a. Iron exhibits a nutrient-like vertical profile in the ocean. On the plot below, draw and label the axes for a nutrient-like profile. (5 pts)



b. Other elements in seawater exhibit a conservative element profile. On the plot below, draw and label the axes for a conservative element profile. (5 pts)



ANSWER **ANSWER** **ANSWER**

Round: **6B**
Category: **Chemistry**
Time: **5 minutes**

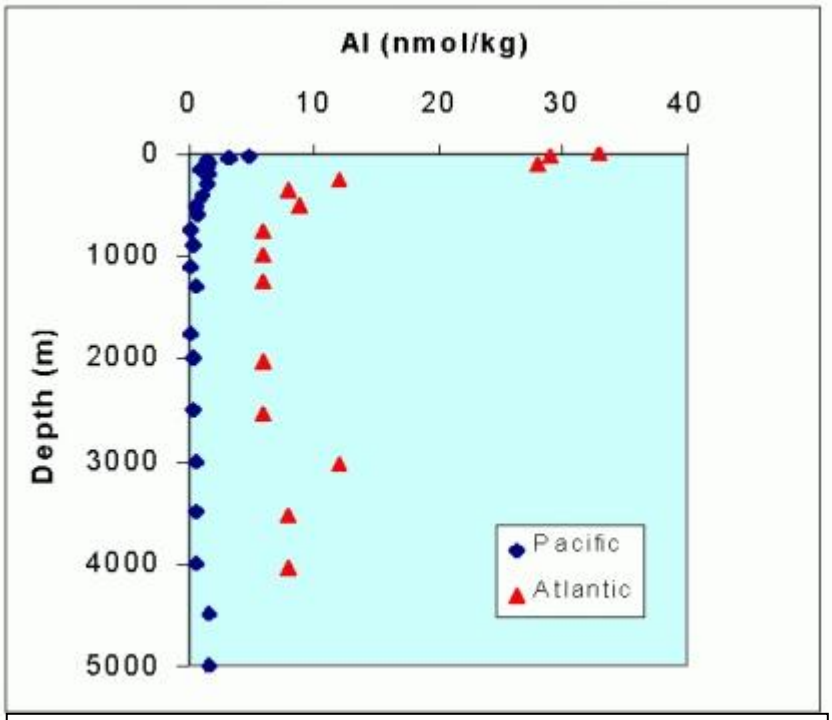


Figure 1: Open ocean vertical profiles of dissolved aluminum in the North Atlantic and North Pacific

1. What are the two (2) most likely source of aluminum to surface waters?

   Atmospheric dust inputs (2 pts) AND river inputs (2 pts)

2. Why are dissolved aluminum concentrations higher in the Atlantic than the Pacific?

   Greater contributions from river inputs in the Atlantic (2 pts)
   (NOTE: Saharan dust is NOT the dominant factor driving the difference between the Atlantic and Pacific Oceans).

3. What process causes aluminum concentrations to decrease in the upper 1000 meters of the water column?

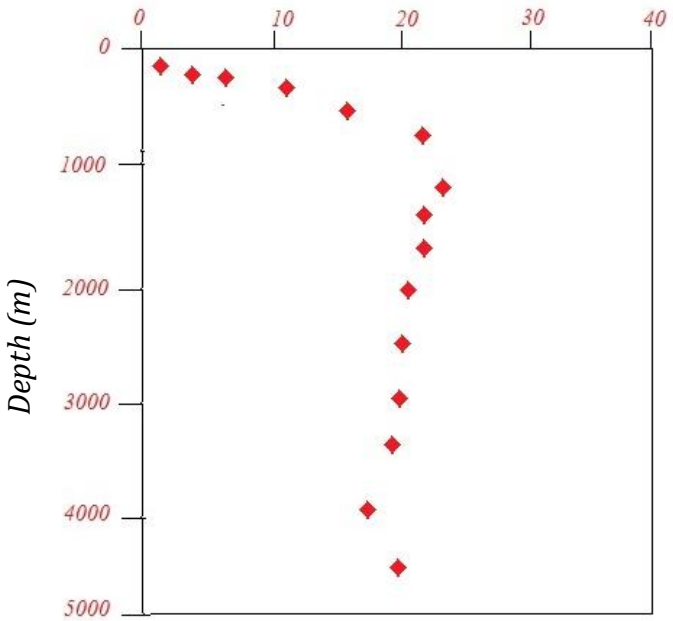
   Scavenging OR particle scavenging OR adsorption to particles (2 pts)

4. What is the most likely explanation for the anomalously high data point at 3000 m in the Atlantic?

   Most likely reflects an advected source of hydrothermal vent fluid (2 pts).

5. On the plots below, draw and label the axes for:

a. A nutrient-like profile (*5 pts*)

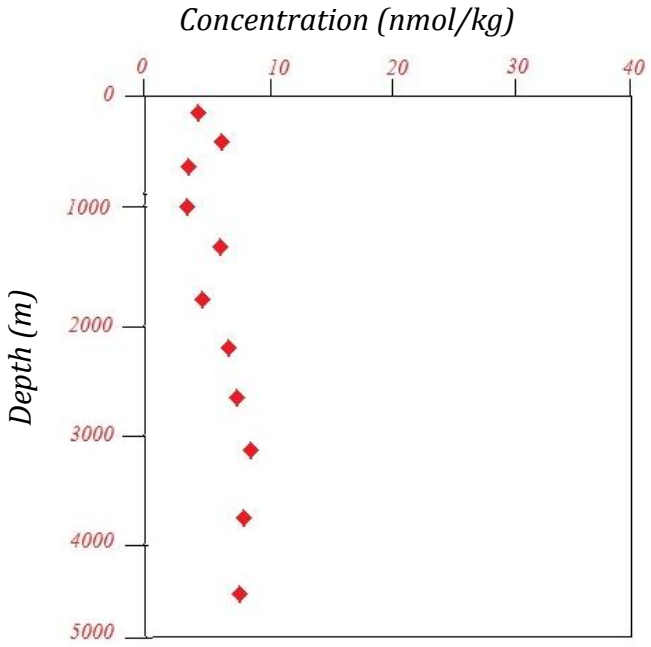


-1 pt for correctly labeled X axis

-1 pt for correctly labeled Y axis

-3 pts for the correct shape of profile, with concentration increasing with depth for the first 1 km, and then leveling out (NOTE: a drawn line is also acceptable)

b. A conservative element profile (*5 pts*)



-1 pt for correctly labeled X axis

-1 pt for correctly labeled Y axis

-3 pts for the correct shape of profile, with remaining more or less constant, regardless of depth (NOTE: a drawn line is also acceptable)

Reference:

http://www.mbari.org/chemsensor/pteo.htm
image source: http://www.mbari.org/chemsensor/al/algraph.gif
http://www/ocean.washington.edu/courses/oc400/Lecture_Notes/CHPT4.pdf