Homework 2
Due: February 12, 2013

1. Using GeoMapApp, make a base map of a region of the North Atlantic Ocean north of the equator (anywhere between 10N-40N, avoid the margins if you can), and do the same for the South Pacific (anywhere between 10S-40S, avoiding the margins). On this map please include the core locations of the Archer, 1999 coretop dataset (Datasets>Seafloor Composition>CaCO3… > Archer (1999)). Use the color tool to color points by CaCO3%.
   a. What is the general relationship you observe concerning the dominant control of CaCO3 percentages?
   b. Why did we avoid the margins?
   c. What did we avoid the equator?

2. Now copy all data from the data-cells area for each of your study areas (select all cells in GMA window and paste into excel or some other analysis program). Make a plot of CaCO3% (x) vs water depth (y) for each basin. [Note: this works best if you use a region large enough to produce ~100-150 coretop values.]

   The Lysocline and CCD are sedimentary indicators of the ocean chemical process of dissolution. The lysocline is where CaCO3 ‘starts to dissolve’, whereas the CCD is sometimes operationally defined by <10% CaCO3.
   a. What are the approximate depths of the lysocline for the Atlantic and Pacific?
   b. What are the depths of the CCD in the Atlantic and Pacific (where CaCO3 dissolution and rain rates are equal)?
   c. Now for each basin, plot CaCO3% (x) versus “dCO32-- (“ (y) (which is bottom water undersaturation, ΔCO3^2). Comment on the relationship you observe in each basin, what does this tell you about where CaCO3 accumulations in the world oceans?
   d. Why do you observe the trends you see in (c)?

3. Clear the workspace using the “close” button. Now upload Datasets>Seafloor Composition>Calcium Carbonate (CaCO3)... > Ruddiman and Farrell (1992) compilation. (downcore CaCO3% measured at core sites around the world). Use the zoom tool to zoom in on the 25N – 45N region of the North Atlantic. Pick any three core sites between 3000-5000m and plot them all together vs. depth (using Excel or some other program).

   The observed downcore changes at any core site mostly reflect changes in CaCO3 preservation due to variable bottom water dissolution from to glacial-interglacial deep circulation changes (sedimentation rates are typically 2-4 cm/ka, so 1 meter is about 50-25 ka in time).
a. Do these dissolution cycles affect the full 3000-5000m water depth range?
b. Explore some of the other core data in this region to find the depth at which the cycles start to appear. What do you think this means?
c. Any ideas on how to test your hypothesis?