



11:628:320 Dynamics of Marine Ecosystems 2011

Homework 4 Due Monday December 5, 2011

The science underlying the IPCC 4th Assessment Report: Climate Change 2007 (AR4) is available online at http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml (there is a link on the class web page that you can use rather than typing this in).

Drawing on information in the class lectures and reading of the Executive Summaries of relevant parts of the AR4 documents, give brief answers to the following questions: (generally one paragraph per section).

(a) How will the global increase in atmospheric CO₂ alter the rate of the marine biological pump? Consider both the organic carbon and carbonate portions of the pump and explain your reasoning.

(b) What effect can increased temperature have on marine circulation, CO₂ uptake, and ecosystems? Discuss each of these possibilities and contrast the different effects on polar versus coral reef systems.

(c) Iron acts as a “supplemental” nutrient or micronutrient in many oligotrophic regions of the ocean. It has been proposed that fertilization of the open ocean with iron could draw down atmospheric CO₂ by increasing primary production. Discuss the pros and cons of this.

(d) Give some examples of both positive and negative feedback processes that involve changes to the earth-ocean albedo (the proportion of sunlight that gets reflected) due to clouds and ice.

(e) What effect would eutrophication of coastal waters have on marine primary production and the carbon cycle?

