

OCEAN 506B/497B – THE CHANGING ARCTIC OCEAN - 2009
WRITTEN ASSIGNMENT # 2

Electronic (.doc) copy due by 5 pm Friday 5th June 2009 to both:
jdeming@u.washington.edu and woodgate@apl.washington.edu.
Text should be 11 pt font or greater with minimum line spacing of 1.5.
Maximum length is 5 pages (not including figures, tables and references).

INSTRUCTIONS:

A major and critical part of being a research scientist is writing proposals to seek funding for your research ideas. This second homework assignment is designed to develop (or hone) the skills you need to prepare compelling, fundable research plans. We are not asking for a fully developed research proposal (such as NSF would require), but a shorter version that provides evidence of your ability to identify a compelling problem and to design a reasonable approach to resolving it.

The specific assignment is to develop a research plan addressing a topic of relevance to the Arctic that is suitable for an interdisciplinary 1-2-year project. You are free to select any area of Arctic/sub-Arctic research that interests you, as long as you can make a significant connection to Arctic/sub-Arctic oceanography. By Arctic/sub-Arctic we mean the geographical regions that we have covered in lectures - the Arctic Ocean, including its shelf areas and deep basins, and the surrounding marginal seas (i.e., the Bering Sea, the Barents Sea, Baffin Bay, and the Greenland Sea). If in doubt, please check with us as to the suitability of the topic and region.

In your written submission, you should propose a plan for future research using new measurements and field studies, numerical experiments, theoretical studies, or some new analysis of existing data (or some combination of two or more of these). The research should strive to advance our current understanding of some part of the Arctic system. You should generate a working hypothesis, and then design a way to test it. The best hypotheses are not diffuse and general but focused on specific topics. The most competitive proposals have some urgency to them, some reason why it should be done this year and not next. Some examples are given below. In lectures we have been pointing out subjects of active research and topics where little is known. Feel free to contact us for guidance in specific areas.

In developing your research plan, you may assume free access to national waters and to currently known instrumentation and equipment, platforms, satellite data, and numerical models. If you choose to develop a plan that involves fieldwork, limit yourself to a maximum of two field-trips. Also limit yourself to the amount of work that you alone or a group of no more than five people can accomplish in 1-2 years. For example, you can indicate that other collaborators will be responsible for obtaining ancillary measurements in order that you focus the assignment on your specific research problem and plan.

EXAMPLE TOPIC (Although you are welcome to start with variants of these examples, do not use these precise examples.):

Pacific Water forcings on Arctic Ecosystems: Pacific waters are the most nutrient-rich waters entering the Arctic Ocean, yet little is known about the impacts of changing pathways on Arctic ecosystems.

EXAMPLE HYPOTHESIS AND RESEARCH PLAN: We hypothesize that the spatial distribution of sea-ice algae in the Arctic is strongly related to the nutrient content of the underlying water. We propose a pan-Arctic ship-based survey of under-ice algae (how would you do this?). We will use the nutrient content and O¹⁸ values of the water and results implied by the current state of the Arctic Oscillation to determine presence of Pacific Waters, and study the relationship to sea-ice algal concentration.

ANOTHER EXAMPLE HYPOTHESIS AND RESEARCH PLAN: We hypothesize that sea-ice algae are strongly affected by the nutrient content of the underlying water. We will perform incubation experiments growing sea-ice algae in a controlled environment to assess how productivity changes with different nutrient content of the water. From the results we will predict conditions for maximum and minimum sea-ice algal growth and then test predictions with aircraft sampling of field sites in the Arctic.

5th May 2009

GUIDELINES:

1) Title: You should present an informative and compelling title for your research project. It should convey the essence of the proposed work. “Some research on Pacific Water in the Arctic” is an example of a poor title – it could mean anything. “The relationship between Pacific Water pathways and the distribution of Arctic sea-ice algae” is a much better title – the reviewer knows immediately what to expect.

2) Layout: Organize your text - do not let it ramble! Use subheadings to define sections of the proposal. An example set of subheadings for this assignment is:

a) Introduction or Background: Here you explain the basic information on your topic that a reader would need to know to appreciate its importance and the rationale of the research plan.

b) Hypothesis to be tested: Here you are specific about what you hope to learn..

c) Methods to be used: Here you give the details of what you are going to do. Be as specific as you can within the page limit. For example, “we will do a pan-Arctic ship-based survey of ice algae” is too vague; better would be something like “we will place sea-ice observers on 10 ships performing hydrographic projects in the Arctic. These observers will make hourly observations/estimates of ice thickness, snow cover and the presence of sea-ice algae, and take hourly samples of the surface seawater from the ship’s underway seawater intake. These samples will be analyzed for nutrients and O¹⁸. Every day, three ice cores will be collected and analyzed for the magnitude of sea-ice algal biomass.” Feel free to cite a methods reference for details too lengthy to provide in your text, but strive to give enough information that the reader can understand your plan.

d) Summary: Here you get to summarize the main points of what you propose and why the work will provide a significant advance to our understanding of the problem you have chosen. This section provides a chance to reiterate (with different phrasing) what you believe will be your most important contributions.

3) Figures, tables, references: Figures and/or tables should be used to illustrate science arguments and/or to outline proposed hypotheses or research plans. If you use a figure or table from a paper or website, at the end of the caption, indicate “Figure and caption reproduced from Smith et al, 2001” or “...from <http://...>” Developing a time-line can be helpful to organizing a realistic research plan. Include a reference list of at least five papers that you have read and cited within the body of your text. Cite a paper at the point where the information is used, e.g., “A comparison of ice-drift and Arctic atmospheric circulation patterns suggests that the state of the Arctic Oscillation (Thompson and Wallace, 1998) may explain recent thinning of Arctic Sea-ice (e.g. Rigor et al., 2002).” Cite the author(s) and year in the text (as per the Journal of Geophysical Research and Polar Biology), rather than using a number that refers to a numbered reference list (as per Nature).