# SIO 217a Atmospheric and Climate Sciences I: Atmospheric Thermodynamics

ROAST: Peer Review as a Learning and Assessment Tool in Graduate Education
**Fall 2009**

Basic concept of the ROAST exercise:
Constructivist learning theory and inquiry-based educational practice stress the parallels between learning and research. Although peer review has long been a central feature of the working lives of research scientists, it has rarely found its way into the classroom. Motivated by this thought, an imaginary journal, *Reviews of Atmospheric Science Topics* (ROAST), has been integrated into a graduate-level course in atmospheric thermodynamics. The instructor acts as editor of ROAST. Students in the class are divided into teams and assigned topics on which to write survey papers and give in-class presentations, using the text, the Internet, the library, and other resources. The assigned topics range over the subject matter of the course. The submitted survey papers are sent by the ROAST editor to other members of the class, acting as anonymous reviewers. Just as in the case of real research journals, the editor asks the authors to respond to criticisms of reviewers and then sends the revised papers back to the reviewers. Each student is thus a researcher and co-author of one paper as well as an anonymous reviewer of the others. ROAST has proven to be not only a useful means of fostering learning, but also a natural and effective assessment tool. The peer review mechanism allows the student authors to address the defects in their papers, and hence in their learning, as pointed out not by an authority figure or an examination but by their own peers. As an important side benefit, the students gain experience with the peer review process itself and come to appreciate its strengths and weaknesses in evaluating scientific papers.

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This year ROAST will invite a special issue of position papers for the historic Copenhagen meeting which will be held starting 7 December 2009 (http://en.cop15.dk/about+cop15). We will consider four different approaches to limiting climate change for the 2050 and 2100 target dates to a specified amount (*e.g.* 1K). Each group will consider a different approach, limited to a specific class of atmospheric components.

Today we will divide into teams (Groups A,B,C,D, etc.) of 3 or 4 people each. The topics and starting points for research in Curry and Webster (C&W) are:
Group A: What reductions in $CO_2$ emissions would be required? C&W 3, 12.
Group B: What reductions in non-$CO_2$ GHG emissions would be required? C&W 3, 12.
Group C: What reductions in particle emissions would be required? C&W 3, 5, 12.
Group D: What additional emissions to the atmosphere would be required? C&W 3, 5, 12.

These starting points are exactly that: starting points. Do not simply summarize and paraphrase the text or other references such as the IPCC report (Ch. 2). Instead, use the Internet, go to the library, check research journals (search ISI), talk to scientists, and try to bring your knowledge of the subject up to date.

This year's ROAST project will be in two parts. Note that each paper should first address what an acceptable warming would be (and why) and then should recommend a particular solution at the level that would be required to limit climate change to an acceptable amount (*e.g.* 1K). The first part will be written only and will ask each group to address the question:

1) What is an acceptable target for global mean temperature increase for the years 2050 and 2100?

The second part will be written and oral and will add to the first part by addressing the question:

2) What reductions/additions in your group's emissions would allow this to be achieved?

For each part, each team will email a single pdf-format file including all text, figures, and references for the written report to the class and the instructors (suggested length: 3 to 4 pages) surveying the assigned topic. The report should be in the style of a formal scientific paper, suitable for publication, with an abstract, introduction, main text, conclusions, references, figures, etc. Try to follow approximately the format of *Journal of Climate*. However, this paper should be a review article understandable by scientists who are non-specialists. The reports will be handed out for review on the same day they are handed in. Written reviews will be due by email to the editor. Earlier submission before the deadline is fine. They will be redacted (reviewer's identifying information removed) and returned to authors by email. Each team will give a 25-minute, in-class, oral presentation. Each member of the team should give part of the presentation. Please prepare and use a Powerpoint presentation or other visual aids.

The proposed due dates for these parts are given below:
Topic assignments, groups meet to assign reading/writing: Oct 8 (after class)
Group meeting to discuss and merge writing assignments: Oct 29 (in class)
Part (1) manuscript due to editor: Nov 5
Part (1) review comments due to editor: Nov 9
Part (2) manuscript (incl. revised part (1) and responses to review) due to editor: Nov 19
Review comments due to editor: Nov 24
Oral presentations: Dec 1-3
Final revised version and responses to review due to editor: Dec 3

The final assignment is for the teams that wrote the reports. Revised reports and written responses to all comments by the reviewer and editor are due to the editor on Dec 4. Grades will be based on oral presentations, review comments, responses to review, and the final revised manuscript.

For the final exam, all students are responsible for knowing the material in all the papers.