MGS 723: Term Project Overview

Papers due Dec. 4th, Class presentations to be scheduled Dec. 6th and 8th

Overview

The paper and presentation should outline a Geodynamics research topic using the following strategy: Firstly, outline an influential and quantitative Geodynamics paper (i.e., one which introduced a concept, expression, or modeling approach). Next, place this advance into the broader context of recent research (e.g., what subsequent research did this concept help with? What are problems that is/has been used to address? How has the original model been modified to address different/more complex problems?)

Hopefully this project will expose you to the following aspects of Geophysics: i) Analyzing a quantitative paper in detail (i.e., the "classic" paper); ii) Synthesizing a range of papers (i.e., the more recent ones) to summarize a research topic; and iii) Presenting your findings in a concise talk.

The first step is to choose a classic paper that has had significant influence. This should overlap with the class content and, if possible, your personal field of research. Some papers that are suitable include:

- ***Bending of subducting plates:***
  Conrad, C. P., and B. H. Hager, 1999. Effects of plate bending and fault strength at subduction zones on plate dynamics. *J. Geophys. Res.*

- ***Using Glacial Isostatic Adjustment to quantify mantle viscosity:***
  Two papers: Haskell, N. A., 1935. The motion of a fluid under a surface load. Physics *and/or* Mitrovica, J., 1996. Haskell [1935] revisited. *J. Geophys. Res.*

- ***Viscous modeling of continental deformation:***
  England, P., and D. McKenzie, 1982. A thin viscous sheet model for continental deformation. *Geophys., J. R., Ast. Soc.*

- ***Temperatures of subducting slabs:***
  Toksoz, M. N., Minear, J. W., and B. R., Julian, 1971. Temperature field and geophysical effects of a downgoing slab, *J. Geophys. Res. and/or* Furukawa, Y., 1993. Depth of the decoupling plate interface and thermal structure under arcs, *J. Geophys. Res.*

- ***The forces that drive plate motions*:**
  Forsyth, D.W. and Uyeda, S. (1975). On the relative importance of the driving forces of plate motion. *Geophys., J. R., Ast. Soc.*

- ***The energy release of large earthquakes*:**
  Kanamori, H., 1977. The energy release in great earthquakes. *J. Geophys. Res.*

- ***Corner flow in the mantle wedge:***
  McKenzie, D., 1969. Speculations on the Consequences and Causes of Plate Motion, *Geophys., J. R., Ast. Soc. and/or* Stevenson and Turner, 1977. Angle of subduction, *Nature*.

This is just a sample of papers that you could focus on. Feel free to choose something else (but do run it by me – I will check whether it is suitable for this term project).

Suggested paper outline:

1. Introductory paragraph summarizing the overarching topic.
2. An outline of the problem that the "classic" paper aims to solve.
3. Summarize the geodynamics component of the classic paper. Be sure to cover the quantitative component of the calculation/modeling (equations encouraged!). E.g.:
   - How is the main expression derived? Or the model setup?
   - What are the main results of the model/concept/expression?
   - How does this apply to the Earth?
4. Synthesize the more recent research that uses, is inspired by, or builds upon the work presented in the "classic paper". E.g.:
   - What subsequent research problems did this model/concept/expression help to solve? Or attempt to solve?
   - Did the original model/expression get modified to tackle other problems (e.g., more complex ones)?
   - Has an entirely different methodology surpassed this old technique/expression/model?
   - Presently, what are the big questions (/areas of focus) in the sub-field of the "classic" paper?
5. Wrap up with a concise conclusion summarizing the model/concept/expression and its impact.

Paper format guidelines

- Total length of 5 or more full text pages (excluding title page, references, and figures).
- Include a least one relevant figure that adds to scientific understanding.
- Use of equations is encouraged (particularly when outlining the concept of the "classic" paper).
- Use a font size that's roughly equivalent to 11 or 12pt Times New Roman, single spaced.
- Use a consistent scientific referencing style and include a significant number of references (as the 2nd portion of the paper is basically a literature review).

Presentation recommendations

- In terms of content, there is no need to depart from your paper (first cover the classic paper – e.g., walk through the equations as I do in class – and then summarize the modern research).
- Presentation time: Aim for 20 minutes.
- Presentation tips:
  - Include large figures (it should be much more visual than the paper!)
  - Don't use too much text (just the key points!)
  - Practice it before class.
  - Wrap the talk up with a concise conclusion/summary.