

GEOLOGIC EVOLUTION OF ALASKA

Geos 612 (3 credits)

Class times: MWF, 10:30-11:30 AM

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Natural Sciences 233

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Office hours after class, Tu 1 - 2, or by appointment

This class aims to provide a coherent overview of the bedrock geology and geophysics of Alaska, and to explore multiple competing concepts for Alaska's tectonic evolution. This will be done mainly through lectures, supported with outline and figure handouts. We will discuss the major geologic provinces in their approximate reverse order of formation. This will allow the consequences of younger and more easily understood (supposedly!) events to be restored conceptually so that the evidence for earlier events can be better recognized. The geology of Alaska is both complex and poorly known, but these attributes provide an opportunity to explore an unusually broad spectrum of possible interpretations. Paper critiques and a research paper will provide students with the opportunity to explore controversies and alternative interpretations.

A coherent overview of the geology of Alaska cannot be gained easily from published papers. The scientific literature is very uneven in what it covers about Alaska and in the extent to which interpretations are actually constrained by observations. Papers tend to be aimed at a regional audience and to emphasize detail about local areas rather than providing a broad view that emphasizes general scientific questions. I will assign a relatively small number of papers that highlight some of the main areas, problems, and controversies.

The most comprehensive overview is "The Geology of Alaska", a volume in the Geological Society of America's Geology of North America series. This book is far too long and descriptive (in other words, tedious!) to be a textbook for this class, but is an excellent starting point for research on a particular area or topic.

I will provide reduced copies of the "Lithotectonic terrane map of Alaska" (USGS Map MF-1874A) and the "Lithotectonic terrane map of western Canada and southeastern Alaska" (USGS Map MF-1874B), both of which are now out of print. I also suggest that you get a copy of the geologic map of Alaska (\$12.00) and the digital shaded relief map of Alaska (\$6.00), both of which are available from the map office in the International Arctic Research Center (IARC).

The class will be letter-graded based on the following grading policy:

1. Readings (20%): Write one paragraph on each of 12 assigned readings to identify the hypothesis put forward by each paper and to assess the paper's success in supporting that hypothesis.
2. Critiques of papers (15%): Each student will summarize and critique one paper during the semester. Each critique will be at the beginning of class and should be strictly limited to 10 minutes plus discussion. The papers address new or controversial topics in Alaskan geology and presenters should try to stimulate class discussion. One critique per class will begin on **1 March**.

3. Research paper (65%): Preparation and presentation of a research paper will allow you the opportunity to explore a subject or area in more detail than is covered in class, and to derive your own testable hypotheses. The paper should **not** be primarily descriptive or simply restate what others have said. Instead, it should identify a significant unresolved problem and present and evaluate multiple, testable hypotheses that fit the available data. The paper should then identify the hypothesis that is best supported by the existing data and suggest a practical approach to test that hypothesis further. I will provide a list of possible topics, but you may suggest other topics that you consider appropriate. The paper will be due mid-semester so that I have time to review and return it to you for revision prior to final submission and an oral presentation.

The research paper will include three parts, each of which contributes separately to your grade:

a. Topic proposal (5%): This will be a one-page summary of your proposed topic to give me the opportunity to provide you with feedback on your topic and approach before you begin writing. **Due by 22 February.**

b. Written paper (45%): This will be where you present your data and analysis in detail. However, it will be subject to strict page limitations like published papers. I will provide you with guidelines for format and content. As with published papers, you will submit the paper, then revise it based on reviewer comments. **Paper due on 5 April, revised paper due on 3 May.**

c. Presentation (15%): At the end of the semester, you will present the subject of your paper in a GSA-style abstract and talk. Grading will be based your success in achieving a clear, concise, and informative abstract, a clear and logical sequence of statements leading to a conclusion in the oral presentation, a convincing argument in support of your preferred hypothesis, and supporting graphics that are clear and appropriate. **Presentations on 1 and 3 May.**

Tentative Class Schedule

1. 20 January Physiography and geologic overview of Alaska
2. 23 January Terrane concept and global tectonic setting
- 25 January **No class**
3. Friday, 27 January Evolution of the northeastern Pacific
4. 30 January Plate boundaries, seismicity, and neotectonics
5. 1 February Aleutian trench and arc
6. 6 February Yakutat block
7. 8 February Prince William and Chugach terranes
8. 13 February Wrangellia and Peninsular terranes
9. 15 February Terranes and basins of southwestern Alaska and the central Alaska Range
10. 20 February Bering Sea shelf, Aleutian basin, and ancestral Aleutian arc
11. 22 February Terranes and accretion in southeastern Alaska and western British Columbia
- 1-page paper proposal due**
- 27 February **No class**
12. 1 March Magmatic belts of southern Alaska and western Canada
- Begin paper critiques**
13. Friday, 3 March Models for the tectonic evolution of southern Alaska
14. 6 March Models for the tectonic evolution of southern Alaska (continued)
15. 8 March Yukon-Tanana terrane
- 13-17 March **Spring break**
16. 20 March Paleozoic continental margin of northwestern Canada

17. 22 March Displaced continental terranes of interior Alaska
18. 27 March Yukon-Koyukuk basin and its margins
19. 29 March Brooks Range
20. 3 April Brooks Range (continued)
21. 5 April Brooks Range foothills and Colville basin

Papers due

22. 10 April Northeastern Brooks Range, North Slope, and northern Alaska continental margin
23. 12 April Arctic Ocean basin
24. 17 April Seward Peninsula and Chukotka
25. 19 April Russian Far East
26. 24 April Models for the tectonic evolution of northern Alaska and Russian Far East
27. 26 April Tectonic synthesis
28. 1 May **Student presentations**
29. 3 May **Student presentations** (during exam period, 8-10 AM)

Revised papers due