EAR 433/633: Active Tectonics  
SYLLABUS: Fall 2016

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Website: http://blackboard.syr.edu

Material for class will be posted on Blackboard  
Class is scheduled to meet 14 times for 2 hours each  
Seminar meets Thursday 2 – 4 pm, Heroy 210  
Office Hours: By appointment – email me.

Description.  
The use of modern methods to study tectonic processes along active plate margins, focusing on the evolution of topography expressed in orogen and basin development, including the style and accommodation of crustal and mantle deformation.

A goal of this class is to understand active tectonic processes that may be operating around our planet, thus this class involves the study of active tectonic processes, notably those along active plate boundaries. This semester we will concentrate on those tectonic processes along the Pacific-Australian plate margin that runs through New Zealand. New Zealand is a natural laboratory for understanding tectonic processes because in the North Island there is subduction of the Pacific plate under the Australian plate, in the southern part of the South Island there is subduction of the Australian plate under the Pacific plate. Linking these two opposite-polarity subduction zones is a major continental transform fault, the Alpine Fault. The basic questions we examine are: what is the expression of the plate margin in the crust and mantle? What are the tectonic processes operating that accommodates this deformation? What are the methods used to study such fundamental processes? How does this plate margin compare to others; e.g., the San Andreas? We also look at other tectonic processes that may be relevant to the research that students are undertaking, such as intra-continental deformation, terrane accretion, and lithospheric rupture, and we will incorporate those into the fabric of the class.

Learning outcomes  
An understanding of selected geologic and active tectonic processes operating today at convergent, divergent, strike-slip plate boundary zones and plate interiors. How do these processes work and what controls them. A better understanding of active processes allows a better understanding of geologic and tectonic processes through geologic time and thus how our planet has evolved and continues to deform. Fundamentally, the course will examine dynamic, mechanical, thermal, geometric and kinematic processes in operation at all scales and in four dimensions at select modern plate boundaries in order to understand ancient plate boundary evolution. The course will involve the most recent advances and breakthroughs in our understanding of geologic and tectonic processes. The assignment will enable application of geologic and tectonic processes operating in either a discipline of your choice or a region where you are actively undertaking research.

Pre-requisites  
GOL 333 (Structural Geology), EAR 431/631 (Plate Tectonics) or equivalents  
Or Permission of Instructor

Email: Syracuse University has established email (your syr address) as a primary vehicle for official communication with students.
Grading: A-F, based on class participation, presentations, and the project. Graduate students are expected to present more often in class, and also tackle the more difficult subjects, plus their project will be more extensive.

Project outline (10%)
Project (50%)
Class presentations during the semester (20%).
Class presentation of your project (20%). Project presentation grades will also include an evaluation by your peers. The ability to positively critique scientific (or other) work is a skill that will be used throughout your career.

Project: In a region and time period of your choice (ideally this will be related to your own research), discuss the important tectonic processes that were operating to form the resulting geology and landforms. Use one or more present day examples of active tectonic processes as a comparison. Or: compare two regions of active tectonism where similar processes are operating explaining the process and emphasizing the similarities and differences and why?
Examples include" Terrane accretion, Strike-slip plate boundaries (Alpine Fault, North Anatolian), Intra-plate deformation, Propagation of seafloor spreading into continental crustal (Woodlark basin, middle east - 2 regions), Hotspot activity - its influence on continental lithosphere compared to oceanic lithosphere.

Outline of project: 2 pages of text plus a few key figures, plus references - due October 10th. 1" margins, 12 point Times, space and half.
Project is due Dec (Undergraduates: 10 pages including figures, not including references; Graduate students: 15 pages including figures, not including references or supplementary material)

Fieldtrip: An optional field trip (October 13-16, 2016) will run in conjunction with the EAR 430/630 “Radiometric dating of rocks and minerals”. Those participating will contribute to fieldtrip preparation by providing background material on the geology of the various trips attended as part of the NEIGC conference.
Oct 16: Trip C2 – Middle Ordovician to Early Silurian Terranes, Northern Casco Bay, Maine.

Departmental Seminars:
From time to time speakers at the Departmental Seminar Series on Thursday 4-5 pm will speak on Tectonics related subjects. It is expected that students will attend these tectonics related seminars. Attendance at the Nov 17 seminar where Eva Enkelmann will present “Exhumation processes at the Yakutat–North American collision zone (southeast Alaska)” is required.
Class schedule

Week 1: Thursday 9/1
Introduction to the Tectonics of New Zealand
Okaya et al. (2007) PAUL

Week 2: Thursday 9/8
Mountain Building Processes at an obliquely converging cont-cont collision zone: review of Late Cenozoic tectonism (importance of plate motion changes)
Cox and Sutherland (2007), Walcott (1998) ZACH, TED

Week 3: Thursday 9/15
Evolution of plate boundary, deformation, plate reconstructions and geophysical structure of the South Island orogen. Deformation along the Alpine Fault plate boundary zone using GPS (importance of distributed deformation) and seismic anisotropy in the South Island orogen
Davey et al. (2007), Beavan et al. (2007), Savage et al. (2007)

Week 4: Thursday 9/22
The Alpine Fault: surface geology and field relationships and its structural evolution

Week 5: Thursday 9/29 GSA-Denver
The Alpine fault - geodynamics and earthquakes along the central portion of the Alpine Fault
Stern et al. (2007), Sutherland et al. (2007)

Week 6: Thursday 10/6
Hikurangi margin – and slow slip “seismic events”
Earthscope, Wallace papers

Week 7: Thursday 10/13
Preparation for fieldtrip – overview of New England geology

Optional fieldtrip: October 14-16th. NE

Week 8: Thursday 10/20
Comparison of the Alpine fault with other plate boundaries: San Andreas fault, Taiwan
Fuis et al. (2007), Wu et al. (2007)

Week 9: Thursday 10/27
The Taupo Volcanic Zone – back-arc or arc? Papers TBD

Week 10: Thursday 11/3
Intraplate deformation along large strike-slip faults. Alaska and Mongolia.
Fitzgerald et al. (2014), Cunningham (2005)

Week 11: Thursday 11/10
Active tectonic processes of southern Alaska
Collision of the Yakutat microplate
Haussseler et al. (2008), Eberhart-Phillips et al. (2006), Worthington et al. (2012)
Week 12: Thursday 11/17
Active tectonic processes of southern Alaska
Meet with Eva Enkelmann – seminar speaker
   - papers to be decided with Eva, Likely Enkelmann et al. (2010, 2014)
   4-5 pm: Eva’s seminar

Week 13: Thursday 11/24 Thanksgiving
No class

Week 14: Thursday 12/1
Project Presentations, discussion

Week 15: Thursday 12/8
Project Presentations, discussion

References


### SYLLABUS ADDENDA

**ACADEMIC INTEGRITY STATEMENT**

Syracuse University’s academic integrity policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The university policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same written work in more than one class without receiving written authorization in advance from both instructors. The presumptive penalty for a first instance of academic dishonesty by an undergraduate student is course failure, accompanied by a transcript notation indicating that the failure resulted from a violation of academic integrity policy. The presumptive penalty for a first instance of academic dishonesty by a graduate student is suspension or expulsion. SU students are required to read an online summary of the university’s academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. For more information and the complete policy, see [http://academicintegrity.syr.edu](http://academicintegrity.syr.edu).

**DISABILITY SYLLABUS STATEMENT**

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), [disabilityservices.syr.edu](http://disabilityservices.syr.edu), located at 804 University Avenue, room 309, or call 315.443.4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue “Accommodation Authorization Letters” to students as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. My goal is to create a learning environments that are useable, equitable, inclusive and welcoming. If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment or achievement, I invite any student to meet with me to discuss additional strategies beyond accommodations that may be helpful to your success.
FAITH TRADITION OBSERVANCES
Syracuse University does not set aside non-instructional days for any religious holiday. SU’s religious observances policy, found at supolicies.syr.edu/emp_ben/religious_observance.htm, recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their tradition. Under the policy, students should have an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors no later than the end of the second week of classes. Student deadlines are posted in MySlice under Student Services/Enrollment/My Religious Observances/Add a Notification.

EQUAL OPPORTUNITY, INCLUSION AND RESOLUTION SERVICES
The Code of Ethical Conduct is a statement of principles guiding the activities of all faculty, staff, and students. It provides, in part, that we:

Respect the rights and dignity of all persons and recognize that discrimination or harassment in any form undermines the fundamental principles of the University; and

Support a respectful environment through our own actions, encourage respectful behavior in others, and speak out against hatred and bias.

Additional information can be found at www.syr.edu/hcd/equal-opportunity.html. If you have any concerns about these matters, write to the Office of Equal Opportunity, Inclusion and Resolution Services at titleix@syr.edu.