

EPS260: Solid Earth Dynamics and Paleoclimate

This course will cover a wide range of topics related to applications of solid Earth geophysical theory and modeling to problems in paleoclimate research. The course will be run as a seminar and reading course that deals with a different topic each week. I will review the general area of research; a student will present a seminar on the journal readings and lead a class discussion; and invited experts will join – virtually or in-person – for the last 30 minutes of the class.

Grading: The final grade in the course will be based on the seminar (50%) and class participation (50%).

Prerequisites: Interest in the course material!

Areas of Discussion:

1) Climate Change Across the Cenozoic

What global and regional scale Earth processes drove long-term global temperature trends over the last 50 Myr?

2) Dynamic Topography and Long-Term Sea-Level Changes

The complications and potential of inferring ice mass changes within evolving, global sea level geometries.

3) Mantle Dynamics and Ice Sheet Stability

Feedback between bedrock elevation change – or equivalently sea level change – due to dynamic topography and ice sheet stability.

4) Tectonics, Dynamic Topography and the Climate System

Crustal elevation changes as a driver of landscape, ecosystem and climate change in the Earth System.

5) Continental Drift, TPW and Dynamic Topography: Glacial Inception

Did a suite of global scale solid Earth dynamics control Pliocene glacial inception in the Arctic?

6) Ice Mass Flux, Sea Level Changes and Volcanism

Do ice mass changes and associated sea level variations drive local, regional, and global volcanism? Is this connection an important climate feedback?

7) Glacial Isostatic Adjustment and Ice Sheet Stability

Sea level changes driven by ice mass flux act to stabilize grounded, marine based ice sheets.

8) **Solid Earth Dynamics and Catastrophic Lake Flooding**

What are the deformational and gravitational controls on catastrophic lake flooding?

9) **The Mid-Pleistocene Transition**

What processes led to the change in the period of ice age cycles in Mid Pleistocene?

10) **Earth's Shape and Milankovitch Cyclicity**

Is there evidence of secular and quasi-periodic changes in Earth's dynamic ellipticity in Milankovitch climate cycles?

11) **Earth Rotation Variations and Climate Change?**

Are Earth rotation changes – as reflected in modern observations and ancient eclipse records – accurate measures of climate change over the past century?

Accommodations for students with disabilities:

Students who need academic adjustments or accommodations because of a disability have a right to have these needs met, so notify Prof. Mitrovica as soon as possible. Please present him with your Faculty Letter from the Accessible Education Office (AEO). All discussions are confidential, but Faculty may contact the AEO to discuss appropriate implementation (without disclosing personal information).

Classroom Culture:

Our classroom will be a place where everyone is treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, immigration status, religious affiliations, sexual orientations, ability, and other visible and nonvisible identities. All members of this class are expected to contribute to a respectful, welcoming, and inclusive environment for every other member of the class and all visitors.