

GEOS 615 Overview	Labs	Project assignment	Course schedule
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GEOS 615, Sea Ice (3 CR), Fall 2010

Time & place: **Tuesdays 3.30-5.00pm, Thursdays 9.30-11.00am REIC 229**

Instructors & contact information:

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Class outline:

Sea ice plays a major role in the climate system, is an important habitat for a wide range of biota, controls the exchange of heat, matter and momentum between ocean and atmosphere in the polar seas and is of great significance to Arctic indigenous communities as well as in a broader socio-economic and geopolitical context. This course provides an overview of the geophysics of sea ice as pertaining to growth and decay of an ice cover, its properties and the different functions it serves in the environment.

In recent years, Arctic sea-ice change has figured prominently in the public's imagination and has led to a surge of interest in sea ice as a material, as the tangible product of key energy exchange processes and as a provider of important services to people and ecosystems. In the class we will examine these issues in more depth.

These concepts will be applied in a class project, centered around questions concerning the Arctic Council's Arctic Marine Shipping Assessment or a set of international standards under development to mitigate and address risks posed to offshore structures by sea ice in the Arctic.

The course is primarily addressing graduate students in the fields of geophysics & geology, marine & atmospheric sciences, cold regions engineering and related disciplines. However, students with a different disciplinary background or advanced undergraduate students are also encouraged to enroll (please check back with the instructor prior).

A course schedule can be found [here](#).

Expected outcomes:

- Students will gain an understanding of the fundamental sea-ice properties and processes in the polar and sub-polar regions and learn to apply them to evaluate overarching problems in the context of climate and ecosystem change
- Students will be familiarized with key concepts and techniques employed in the study of sea ice,

including analytical and numerical models of ice growth and decay, models of key ice properties derived from sea-ice phase relations, strengths and drawbacks of remote sensing techniques and other relevant methodological approaches

- Students will synthesize their knowledge about sea-ice properties and processes in the context of services delivered by the sea-ice system
- Building on the case study of sea ice, students will gain deeper insight into one key aspect of present-day climate change and the challenges inherent in analyzing and forecasting such change and its impacts
- Students will develop a grasp of key issues underlying information transfer and application of sea-ice geophysics concepts to applied problems such as shipping in the Arctic or related issues
- Students will develop their ability to communicate effectively in oral and written form by presenting results of their class project amongst their peers and generating a product in the form of, e.g., a report, manual or web page

Grading policy: Grades will be based on the mid-term (20%) and final exam (30 %), as well as a class project (40%), involving a presentation and a report or equivalent product, and class participation (10%), which is based on attendance and contribution to discussion in class.

The following letter grade system will be used: A+ for better than 95% performance (number of total possible points) summed over all categories, A >90 to 95%, A- >85 to 90%, B+ >80 to 85%, B >75 to 80%, B- >70 to 75%, C+ >67 to 70%, C >63 to 67%, C- >60 to 63%, D 50 to 60%, F <50%.

Required reading: Reading assignments will be given in class and include textbook chapters and scientific papers. Note that the course does not have a required text; however, students are encouraged to consult primary references listed below (on reserve and accessible for duration of semester at Keith Mather Library-GI/IARC).

- Carsey, F. D., ed. (1992) *Microwave remote sensing of sea ice*, Geophysical Monograph 68, American Geophysical Union, Washington - still a prime reference for microwave remote sensing and the physical basis of microwave data over sea ice
- Doronin Yu. P., and D. E. Kheisin (1977) *Sea ice*, Amerind Publ. Co., New Delhi - a comprehensive work, offering something of a Russian perspective
- Eicken, H., R. Grading, M. Salganek, K. Shirasawa, D. K. Perovich, M. Leppäranta (eds., 2009) *Field techniques for sea ice research*. University of Alaska Press, Fairbanks - Introduction to field research methods with background on different sea ice themes; comes with a multimedia DVD with videos documenting sea ice, sea ice research and additional resources
- Leppäranta, M., ed. (1998) *Physics of ice-covered seas*, 2 vols. Helsinki University Press, Helsinki.
- Leppäranta, M. (2005) *The drift of sea ice*. Springer, Berlin.
- Lubin, D. & R. Massom (2006) *Polar remote sensing, vol. 1, atmosphere and oceans*. Springer, Berlin.
- Thomas, D. & G. S. Dieckmann, eds. (2010) *Sea ice*. London: Wiley-Blackwell - very good overview and introductory text [Available as online electronic resource through [Rasmuson Library](#)]
- Wadhams, P. (2000) *Ice in the ocean*, Gordon & Breach, London.
- Weeks (2010) *On sea ice*. University of Alaska Press, Fairbanks - Very insightful and personal perspective based on five decades of sea ice research

- Zubov N. N. (1945) *Arctic ice*, Izd. Glavsevmorputi, Moscow (translated by U.S. Navy Oceanogr. Office Springfield, 1963) - an almost timeless classic

Special needs. Students with learning or other disabilities who may need classroom accommodations are encouraged to visit the [Disabilities website](#) and make an appointment with the Office of Disability Services (474-5655). Please meet with the instructor so that the appropriate accommodations and supports to assist in meeting the goals of the course can be made in collaboration with the Office of Disability Services.

Academic integrity. Those enrolled in this class are subject to the [Student Code of Conduct](#) as outlined in University Regents' Policy on [Student Rights and Responsibilities](#).

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