



UNIVERSITY OF THE ARCTIC

Circumpolar Studies Program



Advanced Emphasis Title: Polar Meteorology and Oceanography

Institution: [University Centre in Svalbard \(UNIS\)](#)

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Start Date: Mid-August – Mid-December (only available in the Fall semester)

Delivery Method: Only onsite – no option for online delivery because of field course work

Application deadline: 15 April

Credits: 30 ECTS (15 North American credits at most institutions)

Requirements: The program requires that the student has completed 90 ECTS (3 semesters) in mathematics, physics, or geophysics (or a combination thereof) at the university level. The program is suitable for an advanced undergraduate student in geophysics. This is a sciences based undergraduate programme.

Advanced Emphasis Description:

Through the courses AGF-213 Polar Meteorology and Climate (15 ECTS-credits) and AGF-214 Polar Ocean Climate (15 ECTS-credits) the program gives insight into the dynamics and climatology of the Arctic and Antarctic regions. The courses run from mid-August until mid-December and all teaching is local in Longyearbyen (78 deg. N) on the Spitsbergen Island. The courses provide the student with extensive field training as well as a thorough theoretical basis taught by a variety of experts. This program prepares the student for further studies in related topics as well as gives valuable training for those who wish to pursue a professional career within the field.



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Courses:

[AGF-213 Polar Meteorology and Climate \(15 ECTS\)](#)

Prerequisite: 90 ECTS in Mathematics/Physics/Geophysics (3 full-time semesters at university)

Objective: To give basic understanding of the physical and dynamical processes in the atmosphere with special emphasis on the Polar regions.

Content: The course gives an introduction to boundary layer meteorology and the theory for exchange of energy and momentum between the atmosphere and different types of surfaces. Special attention will be paid to the characteristics of stable boundary layers and local phenomena, such as catabatic and mountain winds. Further, the theory of physical and dynamic processes that lead to the development of synoptic scale and mesoscale phenomena that are typical for polar regions will be included, e.g. extra tropical cyclones, Arctic fronts and Polar lows. Introductions to climate processes and atmospheric chemistry in the Polar regions will also be included.

The field part of the course gives an introduction to some of the observational techniques that are used in meteorology. Special attention will be paid to the measurement and calculation of fluxes in the boundary layer, the use of satellite images and weather map analyses for weather forecasting in the Arctic. Students should have basic knowledge in meteorology equivalent to “Essentials of Meteorology, An Invitation to the Atmosphere” by C. Donald Ahrens. The course has strong links to AGF-214.

Period:	Autumn semester 2010
Teaching:	65 hrs lectures; 20 hrs seminars; 4 days field work.
Evaluation:	Oral exam (graded), approved field exercises and reports
Course responsible:	Anna Sjöblom

[AGF-214 Polar Ocean Climate \(15 ECTS\)](#)

Prerequisite: 90 ECTS in Mathematics/Physics/Geophysics (3 full-time semesters at university)

Objective: To give an understanding of the dynamic and thermodynamic processes determining the circulation in the different Polar regions and the formation of dense water masses and its impact on global thermohaline circulation.

Content: The course gives an overview of the water masses and current systems in the Arctic Basin, the Greenland, Norwegian and Barents Seas, and a comparison with the Southern Ocean around Antarctica. Convection associated with cooling and freezing of surface water influences the vertical structure of the water masses. The thermobaric effect on the compressibility of sea-water has its relevance for determining the deep circulation in the world's oceans. The small-scale double diffusion also has an impact on convection in regions where the conditions for this process are favorable. The dynamic theory is associated with the circulation



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and current systems in the different Polar regions, in particular the Arctic Basin, the Greenland Sea and the circulation around Antarctica.

Essential processes here are the wind-induced circulation, including rotational effects, upwelling, and downwelling associated with wind-induced divergence and convergence, and also tidal currents. Frontal dynamics and the topographic impact on current systems are also covered. As a background for discussing the stability of current systems and fronts, relevant wave theory will be covered, both pure gravity waves and waves influenced by rotation. Students should have a minimum basic knowledge of oceanography. The most relevant combination with this course would be AGF-213.

Period: Autumn semester 2010
Teaching: 60 hrs lectures, 20 hrs exercises, 4 days scientific cruise with mandatory cruise report
Evaluation: Oral exam (graded), approved field exercises and reports
Course responsible: [Frank Nilsen](#)