SUCLIM Climate Research School
Department of Physical Geography and Quaternary Geology (INK)
Department of Meteorology (MISU)
Department of Geology and Geochemistry (IGG)
Department of Applied Environmental Science (ITM)

Anders Moberg
Sep 21, 2007

PhD course

Historical Perspectives on Climate Change Science, 5 credits (ht 2007)

Course director: Anders Moberg
Teachers: Jan Backman, Bert Bolin, Patrick Crill, H-C Hansson, Margareta Hansson, Martin Jakobsson, Johan Kleman, Erland Källén, Kevin Noone, Henning Rodhe, Ninis Rosqvist

First lecture: Monday, October 8, 2007, at 09.00 in room Y10, Geoscience building.

Following lectures: See schedule. Course period is 8 Oct - 14 Nov.

Examination: Written essay and oral presentation where the student's PhD project is discussed in a science history context

Course contents

The following central themes are studied from a science history perspective:
- Evolution of the Atmosphere and Climate on our Planet
- Ice Age Cycles
- The Greenhouse Theory
- Climate-Society Interactions, including the Policy Dimension

Aim with the course

- To provide an insight in how central ideas in climate change science emerged, how the ideas have evolved, and how far they have reached today.
- To provide an understanding for the fundamentals of the scientific research process.
- To provide insights in the research traditions at the four departments involved, and the historical role SU has played for climate change science.
- To facilitate an understanding for the various PhD projects that are carried out by the course participants, who will come from different research and study environments.

Schedule see following pages

Literature see following pages

Institutionen för Naturgeografi och Kvartärgeologi
Stockholms Universitet
106 91 Stockholm

Tel 08 – 674 7814
E-post adress anders.moberg@natgeo.su.se

Schedule

8-12 Oct

Mon 8	09.00-10.00	Y10	Introduction (AM)
Mon 8	10.00-12.00	Y10	An idiosynchratic history of climate related research in Stockholm (PC)
Tue 9	10.00-12.00	Y10	The research process (JK)
Wed 10	10.00-12.00	Y10	Origin of the Earth and climate (PC)
Thu 11	09.00-11.00	Y10	Ice Age Cycles - geomorphological evidence and reconstruction of ice sheets (JK)

15-19 Oct

Mon 15	10.00-12.00	U13	Origin of the Earth and climate (PC)
Thu 18	10.00-12.00	Y13	Ice Age Cycles - terrestrial records (NR)
Fri 19	10.00-12.00	Y12	Ice Age Cycles - marine sediments (JB)

22-26 Oct

Mon 22	10.00-12.00	Y12	Ice Age Cycles - the Milankovic theory (MJ)
Mon 22	13.00-14.00	x	Orbital Forcing - computer exercise (MJ)
Tue 23	10.00-12.00	C625	Climate forcing by greenhouse gases and aerosols (HR)
Wed 24	10.00-12.00	U12	Ice Age Cycles - ice cores (MH)
Thu 25	10.00-12.00	C625	Climate forcing by greenhouse gases and aerosols (HR)

29 Oct - 2 Nov

Mon 29	09.00-11.00	C645	From Numerical Weather Prediction Models to comprehensive Climate System Models (EK)
Tue 30	14.00-16.00	C625	From Numerical Weather Prediction Models to comprehensive Climate System Models (EK)

5-9 Nov

Mon 5	13.00-15.00	C625	Climate-Society interactions (BB)
Tue 6	10.00-12.00	ITM	Climate-Society interactions (KN)
Thu 8	10.00-12.00	ITM	Climate-Society interactions (HC)
Thu 8	14.00-16.00	C625	Climate-Society interactions - "Geo-engineering" (HR)
Fri 9	11.15-12.00	U11	Anthropogenic climate change in historical perspective (Hans von Storch, guest lecturer)

12-14 Nov

Mon 12	10.00-12.00	Y12	The research process, seminar (JK + other teachers)
Wed 14	09.00-14.00	Y12	Presentations of PhD projects in a science history perspective (ca 15 min per student, AM + other teachers)

Y10, Y12, Y13, U11, U12, U13 = in Geoscience building, Svante Arrhenius väg 8C
C625, C645 = in Arrhenius laboratory, floor 6, at MISU, Svante Arrhenius väg 12
ITM = at ITM, which is located near the Naturhistoriska Riksmuseet, Frescativägen 50
x = room to be determined

Examination

- A 2-3 page written essay and oral presentation (10 min + 5 min for discussion) where the student's PhD project is discussed in a science history context.
- Active participation in the last week's seminar and presentations.

Literature

Each teacher is responsible for selecting literature for each respective part of the course, such that the aims of the course are met. The literature include both old, medium-old and modern texts.

- Literature given below in normal style comprise the compulsory texts.
- *Literature given in italics comprise additional reading material.*

Each teacher may distribute lists with additional relevant literature, which is useful to know about but need not be studied in depth.

An idiosynchratic history of climate related research in Stockholm (PC)

- Literature will be distributed at the lecture.

The research process (JK)

- Literature will be distributed at the lecture.

Origin of the Earth and climate (PC)

- Cloud P. 1972. A working model of the primitive Earth. American Journal of Science, 272, 537-548.
- Hoffman PF, Schrag DP. 2002. The snowball Earth hypothesis: testing the limits of global change. Terra Nova, 14, 129-155.
- Halliday AN. 2006. The origin of the Earth - What's new? Elements, 2, 205-210.
- Kasting JF, Ono S. 2006. Palaeoclimates: the first two billion years. Philosophical Transactions of the Royal Society B, 361, 917-929, doi:10.1098/rstb.2006.1839.

Ice Age Cycles - geomorphological evidence and reconstruction of ice sheets (JK)

- Kleman J, Hättestrand C, Stroeven AP, Jansson KJ, De Angelis H, Borgström I. 2006. Reconstruction of paleo-ice sheets – inversion of their glacial geomorphological record. In: Glaciology and Earth's Changing Environment, ed. Peter Knight, Blackwell Publishing.

Ice Age Cycles - the Milankovic theory (MJ)

- Hays JD, Imbrie J, Shackleton NJ. 1976. Variations in Earth's orbit: Pacemaker of the Ice Ages, Science, 194, 1121-1132.

Ice Age Cycles - marine sediments (JB)

- **Zachos J. et al. 2001. Trends, rhythms, and aberrations in global climate 65 Ma to present. Science, 292, 686-693.**

Ice Age Cycles - ice cores (MH)

- **Dansgaard W. et al. 1969. One thousand centuries of climatic record from Camp Century on the Greenland Ice Sheet. Science, 166, 377-381.**

- **EPICA community members. 2004. Eight glacial cycles from an Antarctic ice core. Nature, 429, 623-628.**

Ice Age Cycles - terrestrial records (NR)

- **Literature to be determined**

Climate forcing by greenhouse gases and aerosols (HR)

- **Callendar GS. 1938. Artificial production of carbon dioxide and its influence on temperature. Quarterly Journal of the Royal Meteorological Society, 64, 223-240.**

- **Rodhe H, Charlson R. 1998. The legacy of Svante Arrhenius, Understanding the greenhouse effect. Royal Swedish Academy of Sciences and Stockholm University;**

  p. 13-20: Svante Arrhenius and the Greenhouse effect (H Rodhe, R Charlson, E Crawford)

  p. 43-58: A review of the contemporary global carbon cycle and as seen a century ago by Arrhenius and Högbom (M Heimann)

From Numerical Weather Prediction Models to comprehensive Climate System Models (EK)

- **Rodhe H, Charlson R. 1998. The legacy of Svante Arrhenius, Understanding the greenhouse effect. Royal Swedish Academy of Sciences and Stockholm University;**

  p. 104-114: Early development in the study of greenhouse warming: The emergence of climate models (S Manabe)

  p. 127-142: A numerical simulation of anthropogenic climate change (L Bengtsson)

- ***Bjerknes V. 1904. Das Problem der Wettervorhersage, betrachtet vom Standpunkte der Mechanik un der Physik. Met. Zeitschr., 21, 1-7. (English translation: Weather forecasting as a problem in mechanics and physics. Y Mintz. 1954. Copies will be provided.)***

Climate-Society interactions (BB)

- **Bolin B. 2007 (in press). Science and Politics in the global warming issue (preliminary title). Cambridge University Press, UK.**
  - Chapter 12: Are we at a turning Point in addressing Global Warming?
  - Chapter 13: Climate Change and the future global Energy Supply System

- **Fermann G. (ed) 1997: International Politics of Climate Change** : key issues and critical actors. **Scandinavian University Press, Oslo. Chapter 3, p. 83-109; in particular section 3.2, p. 100 onward.**

Climate-Society interactions (HC)

- **Hansson HC, O'Dowd C. (eds) 2006. Common issues between air quality & climate change: Research & policy recommendations. Report from ACCENT workshop, Dublin, January 2006, 43 pp. (pdf file will be provided)**

Climate-Society interactions - "Geo-engineering" (HR)

- **Crutzen PJ. 2006. Albedo enhancement by stratospheric sulfur injections: A contribution to resolve a policy dilemma? Climatic Change, DOI: 10.1007/s10584-006-9101-y, 7 pages.**

Climate-Society interactions (KN)

- **Mitchell RB, Romero Lankao P. 2004. Institutions, Science, and Technology in the Transition to Sustainability. In: H J Schellnhuber, P J Crutzen, W C Clark, M. Claussen, H Held (Eds.), Earth System Analysis for Sustainability. The MIT Press, 387-407. (ISBN 0-262-19513-5)**

- **Steffen W, Sanderson A, Tyson P, Jäger J, Matson P, Moore III B, Oldfield F, Richardson K, Schellnhuber J, Turner II BL, Wasson R. 2004. Global Change and the Earth System: A Planet Under Pressure - Executive Summary, 41 pp.**

Anthropogenic climate change in historical perspective (Hans von Storch, guest lecturer)

- ***von Storch H, Stehr N. 2006. Anthropogenic climate change: A reason for concern since the 18th century and earlier. Geografiska Annaler 88A, 107-113.***