

SEMESTER AT SEA COURSE SYLLABUS

Discipline: Biological Science
Semester and Year: Fall 2006
Course # and Title: **The Earth's Climate System**
Faculty Name: Dr. Timothy Kittel

Suggested Pre-requisites:

Introductory course in the environmental sciences is recommended, not required.

COURSE DESCRIPTION

Climate plays a major role in shaping human endeavor around the world. At the same time, human activities are arguably having a cumulative impact on global climate. This course presents an overview of the earth's climate system, starting with a focus on processes that generate weather systems from the tropics to the poles. These processes include dynamics of the atmosphere, oceans, biosphere, and cryosphere (snow/ice-covered surfaces). We will pay particular attention to understanding how these processes result in the global pattern of climate regimes and how the climate of places we visit during the voyage fit into such a scheme. The course also evaluates aspects of climate that have a strong impact on society and ecosystems at different temporal scales, including hurricane (typhoon) dynamics, interannual patterns of climate variability (such as El Niño-Southern Oscillation), and global climate change.

COURSE OBJECTIVES

Course objectives are to develop a global and regional framework for studying climates of the areas we visit, to foster an understanding of the climatic context for different societies, and to appreciate the impact of human activities on the climate system. As an introductory class, the goal is to present material on geophysical and biophysical processes in a manner accessible to students who have had little exposure to the physical sciences. We will emphasize **four themes** to meet these objectives:

- (1) **Global context** – What key processes govern the Earth's climate system? And how do these processes result in a repeated pattern of climate regimes around the world?
- (2) **Regional dynamics** – Within this global perspective, what regional factors give rise to the distinctive nature of the climates of areas we visit? How do these climates vary spatially within these regions and temporally on interannual and longer time scales?
- (3) **Climate and society** – What is the relationship between different societies and their climates? In what manner are these societies connected economically, culturally, and ecologically to climate?
- (4) **Global climate change** – What impacts are human activities having on different components of the Earth's climate system? And what climate changes might ensue with what consequences for the societies we visit?

TOPICAL OUTLINE OF COURSE

#	Date depending on A or B schedule	Topic / Activity (lecture topics in bold ; each meeting starts with a student giving a weather briefing)	Readings Chapters (§=Sections) Text: Barry&Chorley(B) Recommended reserve reading: Trewartha(T)	Voyage location
1		Course intro – A Global Survey of the Earth’s Climate Regimes – Overarching Themes	B: Ch 1(§A)	Ensenada to Honolulu
2		Components of the Earth’s Climate System – Earth’s Energy Balance – General Circulation of the Atmosphere and Oceans	B: Ch 1(§B-D,H), 7(§B-C)	to Honolulu
		<i>In port</i>		Honolulu
3		Mid-latitude Climate Dynamics – Climate Variability Patterns	B: Ch 1(§E), 9(§A-D)	to Japan
4		Temperate/Subtropical Continent-Eastside Wet Climates – Climate Dynamics of East Asia – Climates of Japan (Intro)	B: Ch 5(§B-D), 10(§C:2) T: Ch 13 (p 207-220, 225-232)	to Japan
5		Quiz 1 Tropical Wet Climates – Climate Dynamics of SE Asia – Climate Variability in the Tropics	B: Ch 1(§F), 11(§A-B,D,G-H) T: Ch 12 (p 199-206)	to Japan
6		<u>Student Presentations I: Climates of Japan</u> Temperate Continental Interior Dry Climate –Climates of China (Intro)	B: Ch 1(§G), 13(§A-D) T: Ch 13 (p 220-225)	to Japan
		<i>In port</i>		Japan
7		<i>Field Reports: Japan</i> <u>Student Presentations II: Eastern & Southern China</u> Climates of Indochina (Intro)		to China
		<i>In port</i>		China/Hong Kong
8		<i>Field Reports: China & Hong Kong</i> <u>Student Presentations III: Vietnam</u>		to Vietnam
		<i>In port</i>		Vietnam
9		<i>Field Reports: Vietnam</i> Monsoonal Tropical Wet Climates – Climate Dynamics of South Asia – Climates of Myanmar & India (Intro)	B: Ch 11(§C) T: Ch 11 (p 173-198)	to Myanmar
10		<u>Student Presentations IV: Myanmar</u> Quiz 2		to Myanmar
A11		Climate Change (paleo & future) [if B schedule, see B13]	Reserve reading	to Myanmar
		<i>In port</i>		Myanmar
B11/ A12		<i>Field Reports: Myanmar</i> <u>Student Presentations V: Southern & Western India</u>		to India

TOPICAL OUTLINE OF COURSE (*continued*)

		<i>In port</i>		India
B12/ A13		<i>Field Reports: India</i> Subtropical Dry Climates – Climate Dynamics of the Sahara & Arabia	B: Ch 10 (§C:1,4) T: Ch 15 (p 275-278)	to Egypt
B13		[=A schedule A11] Climate Change (paleo & future)	Reserve reading	to Egypt
14		Subtropical Cold Current Desert Climates – Trade Wind Climates	Reserve reading	to Egypt
15		Quiz 3 Mediterranean-type Climates – Climate Dynamics of the Mediterranean Basin – Climates of Egypt & Turkey (Intro)	B: Ch 10 (§C:3) T: Ch 15 (p 255-275)	to Egypt
16		<u>Student Presentations VI: Egypt</u> Temperate Continental Interior Moist Climates – Climates of Central & Eastern Europe (Intro)	B: Ch 10 (§A-B) T: Ch 14 (p 235-254)	to Egypt
		<i>In port</i>		Egypt
17		<i>Field Reports: Egypt</i> <u>Student Presentations VII: Turkey</u> Temperate Continent-Westside Wet Climates – Climates of Atlantic Europe (Intro)		to Turkey
		<i>In port</i>		Turkey
18		<i>Field Reports: Turkey</i> <u>Student Present'ns VIII: Climates of Europe(Croatia,Spain)</u>		to Croatia
		<i>In port</i>		Croatia
19		<i>Field Reports: Croatia</i> Voyage Climate Workshop – <i>Student Project Presentations and Discussion</i> (session schedule subject to change) Topic 1 – Regional climate dynamics Topic 2 – Interannual variability		to Spain
20		Topic 3 – Climate and society		to Spain
		<i>In port –</i>		Spain
21		<i>Field Reports: Spain</i> Climate Workshop (con't) – Topic 4 – Climate-ecosystem interactions		to Florida
22		Topic 5 – Global climate change Workshop wrap-up discussion		to Florida
23		<i>Final Exam</i>		to Florida
		<i>In port – Home</i>		Florida

FIELD COMPONENT: Students will develop and execute a field-based project in at least 3 parts of call to explore a given aspect of climate more in depth. The 3 sites should be selected to sample each of the major regions visited: E/SE Asia, S Asia, and the Mediterranean. The projects are to compare and contrast the 3 regions with respect to the selected topic, and to put these in the context of other parts of the world. They can be based on either directed or individual field practica, as well as on readings regarding similar environments around the globe. Topic areas include, but are not limited to:

1. **Regional climate dynamics** (Theme 2, in part) – Factors that give rise to the distinctive nature of the regions’ climates, and how these factors result in spatial variation within each region.
2. **Interannual variability** (Theme 2, in part) – Temporal variability patterns of the regions’ climates at interannual and longer time scales, and their relationship to global patterns (“teleconnections”)
3. **Climate and society** (Theme 3, in part) – Economic, historical, or cultural connections between the regions’ societies and their climates.
4. **Climate-ecosystem interactions** (Themes 2 & 3, in part) – In this topic area, a project can focus on any of various interactions between ecosystems and climate, such as (a) two-way interactions between the land surface and the atmosphere that affect a region’s climate, or (b) how a region’s climate facilitates “ecosystem services” that support the area’s socioeconomic well-being. (This topic area is not available to those also taking BioSci 1060)
5. **Global climate change** (Theme 4) – Impacts that human activities are having on different components of the Earth’s climate system in these regions, the sensitivity of the climate system to such changes, and potential climate change consequences for the regions’ societies or ecosystems.

Projects must be approved beforehand and devised in consultation with the instructor. Students are expected (1) to keep a field journal of observations and of what they learned from guides, experts, other on-site resources, and follow-up research and (2) to periodically report on these activities back to the class during field reports. Final products are a written report and a 10-minute oral presentation during the last weeks’ “Climate Workshop”.

METHODS OF EVALUATION

- 25% *Exams* – There will be 3 quizzes (5% each) and a final exam (10%) covering material from lectures, readings, student presentations, and in-class discussion. The final will be cumulative.
- 20% *Pre-port Presentations* – Prior to arrival in each port, groups of 3-4 students will give short (15-20 min) presentations on a global comparative climate analysis for the region we are visiting – the comparison is to be with regions under similar climate regimes. Each student should choose a topic drawn from course themes (see page 1) to be the focus of their presentation; the topic can be directly related to their individual field project. Grades will be based on oral presentation and a one-page annotated outline prepared for the class. Each student will have the opportunity to present such analyses twice during the voyage (2 presentations @10%).
- 25% *Field Reports and Journal* – Following each port-of-call, students will lead a debriefing consisting of (1) individuals or groups orally presenting reports from related practica and updates on individual projects and (2) discussion of their experiences and insights. Each student is expected to contribute significantly to these discussions (20%). In addition, students are to keep a field journal (5%) of observations and information learned from guides and experts related to their individual project and other topics pertaining to the course. The journal should include a daily weather log while onboard and in-country and notes placing these observations in the context of regional climate processes.
- 25% *Individual Project Reports and Presentations* – As described for the Field Component (p. 4), project products will be (1) a written report in the form of a well-annotated PowerPoint file and (2) a 10-min oral presentation during a “Climate Workshop” held in the final weeks of the voyage. Workshop sessions will be organized by topic and conducted as a professional meeting.
- 5% *In-class Participation* – Each student is expected to participate in class activities, including daily weather briefings, group activities, and discussions.

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REQUIRED TEXTBOOKS

AUTHOR: Roger G Barry & Richard J Chorley
TITLE: Atmosphere, Weather, and Climate
PUBLISHER: Routledge / Taylor & Francis Group
ISBN #: 0415271711
DATE/ED: 2003, 8th ed
COST: \$47.95

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RESERVE LIBRARY LIST

AUTHOR: Glenn T. Trewartha
TITLE: The Earth's Problem Climates
PUBLISHER: University of Wisconsin Press – see *Note (1)*
ISBN #: 0-299-08230-X
DATE/ED: 1981, 2nd ed.
COST: \$10-25 – see *Note (2)*

Instructor Notes:

- 1) This book is out-of-print but available from on-line booksellers for reasonable prices. See:
<<http://www.bookfinder4u.com/IsbnSearch.aspx?isbn=029908230X&mode=direct>>
- 2) Prices through these outlets as of 11/21/05 ranged from \$10-25 for used books in good to very good condition

AUTHOR: S. Rivas-Martinez, A. Penas, M.A. Luengo & S.Rivas-Saenz; H. Lieth (eds.).
TITLE: Worldwide Bioclimatic Classification System. (CD-Series: Climate and Biosphere II)
PUBLISHER: Backhuys Publ. – see *Note (1)* for US outlet
ISBN #: 90-5782-139-7
DATE/ED: 2003, CD-ROM
COST: \$96 + 6 shipping from US outlet, price as of 11/21/05 – see *Note (2)*

Instructor Notes:

- 1) This CD is available in the US from:
Balogh International, Inc.
1911 North Duncan Road, Champaign IL 61822 USA
+1 217 355 9331; fax: +1 217 355 9413
<http://www.balogh.com/>
balogh@balogh.com
The CD is listed on-line at <<http://www.balogh.com/backhuys/spb-eco.html>>
 - 2) Their US price is not fixed – based on price in Euros (€ 60)
 - 3) This item is also requested as a Reserve item for the course BioSci 1060 – World Ecosystems
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