

Spring 2012 Climate Seminar

Monsoons: Past, Present, Future

Instructors: Shanahan, Quinn

Location: TBD

Who should take this seminar for credit (2 credits): Graduate students with interests in the past, present or future climate in areas affected by monsoons

Scope: We will cover the basics of monsoon circulation, examine various paleoclimatic approaches to the reconstruction of monsoon circulation (oceanographic records, cave deposits, lake records), and look at how monsoons might change as CO₂ rises in the atmosphere. There will be an emphasis on the Asian Monsoon, but we will also consider examples from other monsoon systems.

Format: This is a seminar, and the emphasis will be on discussion of the literature. There will also be some background lectures delivered by the faculty. Most weeks there will be one or two assigned readings, and one graduate student will be selected to lead the discussion. The discussion leader will be responsible for summarizing key points of paper, reproduction of key figures (powerpoint is easiest), providing supplementary information relevant to the paper and leading the discussion. It is absolutely essential that all students have read the papers before class and come prepared with questions and points for discussion.

Note: for the presenter it may be necessary to read additional supporting material for the paper. Supplementary data and figures are part of the paper and should always be read.

Presentation framework:

1. A few (3-5) slides detailing the objectives, background and approach of the study
2. Summary of findings (2-3 slides) highlighting the main findings and conclusions of the study
3. Discussion slides
4. All the main figures should be inserted into the ppt with captions where needed. This may include supplementary figures.

*try to avoid lots of slides with words – focus on figures for promoting discussion.

Website: All papers will be posted on blackboard

Grading: Based on participation in discussion and leading discussion.

Grading rubric:

PRESENTATION	Excellent					Poor
1. Introduction	5	4	3	2	1	
2. Enunciation and delivery	5	4	3	2	1	

3. Talk organization: Logical and understandable	5	4	3	2	1	
4. Visual aids: Clear and effective	5	4	3	2	1	
5. Ability to promote/lead discussion	5	4	3	2	1	
6. Knowledge of the paper	5	4	3	2	1	
7. Was the scientific contribution of this study clear?		5	4	3	2	1

Schedule:

Introduction to Monsoons

Encyclopedia of Atmospheric Science 1; Encyclopedia of Atmospheric Science 2

Webster PJ, Magana VO, Palmer TN, et al. (1998) Monsoons: processes, predictability, and the prospects for prediction. *Journal of Geophysical Research* 103(C7): 14 451–14 510.

Orbital controls and ocean feedbacks on monsoon variability

Kutzbach et al., (1981) Monsoon Climate of the Early Holocene: Climate experiment with the Earth's orbital parameters for 9000 years ago. *Science*, 214, pp. 59-61.

Liu et al., (2004) Global monsoons in the mid-Holocene and oceanic feedback. *Climate Dynamics* 22: 157–182

West African monsoon- Holocene

Kutzbach et al., (1996) Vegetation and soil feedbacks on the response of the African monsoon to orbital forcing in the early to middle Holocene. *Nature*, 384, 623-625.

Levis et al., (2004) Soil feedback drives the mid-Holocene North African monsoon northward in fully coupled CCSM2 simulations with a dynamic vegetation model, *Climate Dynamics* (2004) 23: 791–802.

Liu et al., (2010) Indirect vegetation–soil moisture feedback with application to Holocene North Africa climate, *Global Change Biology* 16, 1733–1743.

West African monsoon feedbacks

deMenocal et al., (2000) Abrupt onset and termination of the African Humid Period: rapid climate responses to gradual insolation forcing, *Quaternary Science Reviews* 19 (2000) 347}361

deMenocal et al., (2000) Coherent High- and Low-Latitude Climate Variability During the Holocene Warm Period. *Science*, 288, 2198-2202.

West African monsoon revisited

Kropelin et al., (2008) Climate-Driven Ecosystem Succession in the Sahara: The Past 6000 years, *Science* 320, 765

Liu et al., (2006) On the cause of abrupt vegetation collapse in North Africa during the Holocene: Climate variability vs. vegetation feedback, *GRL* 33, L22709

Liu (2007) Simulating the transient evolution and abrupt change of Northern Africa atmosphere–ocean–terrestrial ecosystem in the Holocene, *QSR*, 26, 1818–1837

West African Monsoon –millennial variability

Stager, et al. (2011) Catastrophic Drought in the Afro-Asian Monsoon Region During Heinrich Event 1, *Science* 331, 1299.

Tjallingi et al., (2008) Coherent high- and low-latitude control of the northwest African hydrological balance *Nature Geoscience*, 1, 670-675.

Multiza et al., (2008) Sahel megadroughts triggered by glacial slowdowns of Atlantic meridional overturning, *Paleoceanography*, 23, PA4206.

North and South American monsoons

Adams and Comrie (1997) The North American Monsoon, *Bulletin of the American Meteorological Society*, 78, 2197-2213.

Vera et al., (2006) Toward a Unified View of the American Monsoon Systems, *Journal of Climate*

Garraud et al., (2009) Present-day South American climate, *P3*, 281, 180-195.

South America –orbital forcing

Baker et al., 2001, Tropical climate changes at millennial and orbital timescales on the Bolivian Altiplano, *Nature*, 409, 698

Cruz et al., (2009) Orbitally driven east–west antiphasing of South American precipitation, *Nature Geoscience* 2, 209-

Wang (2007) Millennial-scale precipitation changes in southern Brazil over the past 90,000 years, *GRL*, 34, L23701.

South America - Holocene

Haug et al., (2001) Southward migration of the ITCZ through the Holocene, *Science*, 293, 1304.

Strikis et al., (2011) Abrupt variations in South American monsoon rainfall during the Holocene based on a speleothem record from central-eastern Brazil *Geology*, 39, 1075.

South America- Little Ice Age

Bird et al., (2011) A 2,300-year-long annually resolved record of the South American summer monsoon from the Peruvian Andes, *PNAS*, 108, 8583-8588.

Reuter et al., (2009) A new perspective on the hydroclimate variability in northern South America during the Little Ice Age. *GRL*, 36, L21706.

Indian monsoon background

Gadgil (2003) The Indian monsoon and its variability, *Ann Rev Earth Sci*, 31, 429-67.

Indian monsoon orbital

An et al., (2011) **Glacial-Interglacial Indian Summer Monsoon Dynamics**, *Science* **333**, 719.

Clemens and Prell (2007) The timing of orbital-scale Indian monsoon changes, *QSR*, 26, 275-278.

Ruddiman (2006), What is the timing of orbital-scale monsoon changes? *QSR*, 25, 657-658.

Indian monsoon millennial

Cai et al., (2006) High-resolution absolute-dated Indian Monsoon record between 53 and 36 ka from Xiaobailong Cave, southwestern China, *Geology*, 34, 621.

Schulz et al., (1998) Correlation between Arabian Sea and Greenland climate oscillations of the past 110,000 years *Nature*, 393, 54-57.

Indian Holocene

Fleitman et al., (2007) Holocene ITCZ and Indian monsoon dynamics recorded in stalagmites from Oman and Yemen (Socotra), *Quaternary Science Reviews* 26 (2007) 170–188

Gupta et al., (2005) Solar influence on the Indian summer monsoon during the Holocene, *GRL*, 32, L17703.

Indian LIA

Sinha et al., (2011) The leading mode of Indian Summer Monsoon precipitation variability during the last millennium, *GRL*, 38, L15703.

Sinha et al., (2009) A 900-year (600 to 1500 A.D.) record of the Indian summer monsoon precipitation from the core monsoon zone of India, *GRL*, 34, L16707.

Anderson et al., (2010) Indian summer monsoon during the last two millennia, *JQS*, 25, 911-917.

Anderson et al., (2002) Increase in the Asian Southwest Monsoon During the Past Four Centuries, *Science* 297, 596

Asian Monsoon – Orbital

Cheng et al., (2009) Ice Age Terminations, *Science*, 326, 248.

Wang et al., (2008) Millennial- and orbital-scale changes in the East Asian monsoon over the past 224,000 years, *Nature* 451, 1090.

Yuan et al., (2004) Timing, Duration, and Transitions of the Last Interglacial Asian monsoon, *Science* 304, 575

Asian monsoon- Holocene

Cosford et al., (2008) East Asian monsoon variability since the Mid-Holocene recorded in a high-resolution, absolute-dated aragonite speleothem from eastern China, *EPSL*, 275, 296-307

Hu et al., (2008) Quantification of Holocene Asian monsoon rainfall from spatially separated cave records, *EPSL*, 266, 221-232.

Maher (2008) Holocene variability of the East Asian summer monsoon from Chinese cave records: a re-assessment, *The Holocene*, 18, 861-866.

Wang, (2005) The Holocene Asian Monsoon: Links to Solar Changes and North Atlantic Climate, *Science* 308, 854

Asian monsoon 1 kyr

Cook et al., (2010) Asian Monsoon Failure and Megadrought During the Last Millennium, *Science* 328, 486

Zhang et al., (2008) A Test of Climate, Sun, and Culture Relationships from an 1810-Year Chinese Cave Record, *Science* 322, 940

Isotopes in speleothems

Dayem et al., (2010) Lessons learned from oxygen isotopes in modern precipitation applied to interpretation of speleothem records of paleoclimate from eastern Asia, *EPSL*, 295, 219-230.

LaGrande and Schmidt (2009) Sources of Holocene variability of oxygen isotopes in paleoclimate archives, *Climate of the Past*, 5, 441-455.

Pausata et al., (2011) Chinese stalagmite $\delta^{18}\text{O}$ controlled by changes in the Indian monsoon during a simulated Heinrich event, *Nature Geoscience*, 4, 474

