**The Geologic Record of Saharan Climate Change and the Impact on Human History and Prehistory**

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**Summary**

This is a collection of homework assignments, in-class activities, and a final assignment in which students analyze the geologic record of climate change in North Africa (the Sahara in general and Egypt in particular), explore the impact of climate change over the past 10,000 years on human history and prehistory, and predict the future impact of global warming on North Africa.

**Context**

* This is an introductory geology course with no prerequisites. Class size is under 30. College is a private liberal arts college.
* This course satisfies the intro geo course requirement for a major in Geoscience and in Environmental Studies and counts as an elective course for a major in Africana Studies.
* Although the course meets for the same amount of time per week as a typical lab course, students attend three two-hour class/lab sessions each week, rather than the traditional three hours of lecture and three hours of lab.
* This “activity” is actually a collection of homework assignments, in-class activities, and writing assignments. In-class components of the activities are each designed for one two-hour class session but could be easily modified for other class formats.
* Although this set of activities occurs in the second half of the course, most of what students need in terms of skills and concepts is taught in the context of these assignments and activities. Students do need to be familiar with the geography of North Africa, and Egypt in particular, and they need to know how to use Google Earth. Modifying the activities for use in another course would be straightforward, and it would certainly be possible to do only some of the activities.

**Goals**

The primary goal is to give students personal experience in analyzing the geologic record in the Sahara to determine the nature and timing of climate change over the past 10,000 years and to assess the impact of climate change on where humans lived during what time periods, the cause and timing of the rise of agriculture in Egypt, the influence on the rise of Egyptian civilization and political legitimacy in Ancient Egypt, and the climate future for North Africa with global warming. Students then take the skills they have learned in this set of assignments, read an article from the professional geologic literature for an area elsewhere in the world, and evaluate the human/climate connections there and correlate those with what they learned about North Africa.

This series of assignments/activities supports a variety of skills: critical reading and self-teaching, teamwork, peer teaching, discussion, analysis of authentic data sets, synthesis and framing a compelling evidence-based argument, and writing.

**Activity description**

1. **Homework 1: Saharan playa lakes and sabkhas.** This assignment is designed to help students develop a picture of the modern Sahara (geography, critical locations, modern climate and vegetation, and hints about a wetter Sahara in the past). Must be completed before Class 1.
2. **Class 1: Saharan paleolakes.** This is a jigsaw activity with four stratigraphic columns from Holocene Saharan paleolakes. Data are authentic and come from the published geologic literature. Each team analyzes its assigned column to determine the nature and timing of rainfall changes, with evidence. Students then form mixed groups with one member from each team in each group. Students peer-teach what they have learned from their own columns, emphasizing the evidence and uncertainties. Each group then develops a timeline for changes in rainfall across space and time in the Sahara and predicts the future for the Sahara with global warming.
3. **Homework 2 and Class 2: Rise of agriculture in Egypt, Nile flood levels and political legitimacy in Ancient Egypt**. Homework 2, which must be completed before class 2, prepares students for a class discussion on the geologic evidence for what controlled the timing of the rise of agriculture in the Nile Delta and how environmental factors such as Nile flood levels affected political legitimacy in Ancient Egypt.
4. **Homework 3:** **Holocene climate change and the rise of Ancient Egypt.** Teams prepare for an in-class teaching session by reading an article on one of the main Neolithic or Paleolithic sites in the Western Desert of Egypt. Must be completed before Class 3.
5. **Class 3:** **Holocene climate change and the rise of Ancient Egypt.** Students from each team teach the class about the geologic and archaeological records at their site, what the evidence is for timing of climate change, and whether this evidence is consistent or not with what they have learned previously in the course. The class then has a discussion about the influence of climate change on the rise of Ancient Egypt.
6. **Final writing assignment:** Students download and read the abstracts for six papers on climate change ca. 4000 ybp elsewhere in the world from the professional geologic literature and choose one paper that particularly interests them. Choices include areas in the Middle East, central Asia, the Indus Valley, and mid-continent North America. Students write about the nature of the geological evidence presented and why it was useful in reconstructing paleoclimate, what conclusions the authors drew and why, what the influence was on humans, and how the events correlate with what they learned previously about paleoclimate in North Africa.