Activity description

This is an activity that I do at the beginning of a critical thinking seminar when we talk about the emergence of human civilization and its relationship to climate change. It sets the framework, and introduces some of the concepts, that will be discussed later in class in more detail.

1. I hand out a graph of the Vostok icecore dataset (http://commons.wikimedia.org/wiki/File:Vostok-ice-core-petit.png) and have students discuss the graph in groups. I describe the dataset (where it comes from, what a “proxy” is, etc.) but let the students discover the trends themselves.
2. The discussion starts by me asking the students to identify patterns (I am looking mostly for the periodicity and the sawtooth pattern), unique events (I am mostly aiming at them identifying the Holocene stability), and covariations (temp and co2 co-varies, but dust offset).
3. I have students identify important points in human evolution during “pre-history” and the rise of civilizations (e.g., cave paintings, tools, emergence of modern man, first cities, ancient Egypt and Mesopotamia, etc.) Most students don’t know these dates and are surprised about how recent “civilization” is compared to the record.
4. The discussion than leads to why the trends are periodic, especially CO2, in the absence of intense human activity and what might drive it. Some students then get the underlying “natural forcing” idea and I derive the planetary energy balance equation with them and mention Milankovitch cycles (the idea is expanded in a later class session).
5. I quickly mention one feedback mechanism that can drive CO2 in response to changes in solar luminosity and albedo (this idea is then picked up in a later class where we focus on positive and negative feedback loops).
6. Finally, I then quickly mention that there are different hypotheses about the Holocene stability and the emergence of agriculture (e.g., Ruddiman’s idea).

That fills one class discussion (75 min).