

Earth's Climate: Past, Present and Future - reasons for concern today

Facilitator: *Paul Belanger*

Earth's climate has varied significantly in its 4.5 billion year history. In its early history before 600 million years ago the Earth had inhospitable intervals of a "snowball" Earth due to the changes of the Earth's developing atmosphere. Since 600 million years ago the Earth has been mostly a "hot-house" Earth with up to ten times higher levels of carbon dioxide (CO₂) than present with a climate like the dinosaurs experienced. Other ice-house periods like the one we currently live in are rarer. So what controls these variations?

This class will examine the geologic data and those things that control Earth's constantly changing climate: the distribution of continents (plate tectonics), ocean currents, changes in the sun, orbital changes of the Earth around the sun, and the net influence of volcanic eruptions vs. weathering rates through time that affects the atmospheric levels of carbon dioxide (CO₂). We will see that the Sun is important but so are levels of greenhouse gases (GHGs).

We will take a field trip to the National Ice Core Lab where empirical data of our atmosphere's composition for the past 800,000 years has been extracted from ice cores from Greenland and Antarctica. Additionally we will examine proxy data suggesting what levels of CO₂ were prior to 800,000 years ago. The climate is changing, as always, and we are currently undergoing global warming. Understanding the geologic record is important to being an informed citizen able to evaluate the hype, the media (mis)representation, and the politics surrounding "Climate Change" or "Global Warming". We will investigate related issues regarding rates of change, ocean acidification and extinctions. The class can then have a discussion about adapting, mitigating, or doing nothing about the coming changes associated with global warming. The Earth will survive; it becomes a matter of our sustainability of our way of life.

Books/Materials: None. Slides, links, and additional resources will be posted on my web site <http://www.denverclimatestudygroup.com/> and on the OLLI Portfolio website.

Class Type: Illustrated Lectures/Discussion; field trip to National Ice Core Lab located at USGS lab in Lakewood; <http://icecores.org/> at **9 a.m. Tuesday September 30th**.

Materials Fee: None.

Paul Belanger, Ph.D. is a geologist and currently a Research Associate at the Denver Museum of Nature and Science. He is a graduate in geology, with a minor in oceanography from the University of Washington (BS) and Brown University (MS, Ph.D.); he was a National Research Council postdoctoral fellow with the USGS at Woods Hole, MA. His research background is in paleoclimate and paleoceanography of the late Cenozoic. This included serving as a scientist on Leg 161 in the Mediterranean of the International Ocean Discovery Program (<http://www.iodp.org/>). He is currently an applicant for similar contribution for a drilling program in the Indian Ocean in the winter 2014-2015. His research background gives him an understanding of past climates. Leading the Denver climate study group (see <http://www.denverclimatestudygroup.com/>) in talks and discussions on climate change, energy issues, and related socio-economic sustainability issues have given him a big-picture view of the present climate and the changes expected to occur associated with global warming in the future.