



30 May, 2012

Earth's Climate: Old Problems, New Thoughts

Introduction:

During the last three billion years, Earth's climate has nurtured life. However, records of Earth's history indicate that climate has changed dramatically with major consequences for its inhabitants. What drives such climate changes? What are the consequences? In tonight's lecture, we discuss the effects that greenhouse gases can have, as well as a novel engineering approach to reduce carbon dioxide emissions and the devastating effects caused by desert dust on the Earth's climate.

Speakers:



Elizabeth Thomas is a third year PhD student in the Brown University Department of Geological Sciences. Elizabeth's research focus is currently East Asia, where she is studying how the monsoon changed in the past, and how this will affect future food security. When she isn't working in the lab or in the field, you can find Elizabeth running, cycling to work, or cooking delicious food grown by local farmers. Elizabeth will discuss what geologists understand about past global climate, and point out how climate change today is unique in the past several million years.



Sujit Datta is a fifth year Ph.D. candidate in Physics at Harvard University. He studies the physics and chemistry of fluids. A focus of his research is flow within porous media, with applications to oil recovery, geological carbon dioxide sequestration, and mitigating groundwater contamination. He grew up in Toronto, Canada and did his undergrad at the University of Pennsylvania, in Philadelphia. Outside of the lab, he kickboxes, runs, and explores Cambridge/Boston. In his lecture, Sujit will be discussing a promising new approach to reducing atmospheric CO₂ emissions by storing liquefied CO₂ underground.



Atreyee Bhattacharya has completed her PhD in earth and planetary sciences from Harvard this year. She will talk about how dust from the Sahara maybe prolonging droughts in sub Saharan Africa and climate in the northern hemisphere.

Glossary

Aerosol: A mixture of small liquid or solid particles floating in a gas. Examples include dust, cigarette smoke, and pollen.

Caprock: A hard layer of rock that does not allow fluids to pass through it. It can trap oil, gas, or water deep in the Earth and prevent them from moving to Earth's surface.

Carbon dioxide (CO₂): A molecule made of two oxygen atoms and one carbon atom. It is released when fossil fuels, such as oil, are burned. In the atmosphere, it traps heat near the Earth's surface and can lead to an overall warming effect. It is therefore considered a greenhouse gas.

Carbon emissions: The carbon dioxide that is released into the atmosphere as a result of burning fossil fuels such as gas, oil, and coal.

Desert dust: Aerosols (small particles) of minerals from arid regions that are lifted from the ground and spread through the atmosphere by strong winds. They absorb sunlight and can prevent the formation of storm clouds.

Drought: A prolonged period of little to no rainfall, which leads to a shortage of water in effected regions and can have a major impact on agriculture.

Energy budget: For the Earth, it is the balance of incoming energy in the form of solar radiation (sunlight) and the outgoing energy in the form of infrared radiation (heat).

Greenhouse gases: The group of gases in Earth's atmosphere that are capable of trapping heat close to Earth's surface. These include carbon dioxide, methane, and ozone, among others.

Ice core: A segment of ice removed from ice sheets. They contain layers of snow from many past years and can be used to understand the climate of the Earth in the past.

Infrared radiation: A form of radiation made up of wavelengths longer than those of visible light, but shorter than radio waves. It includes thermal radiation, which is the heat emitted by warm objects. It is the form of outgoing energy that the Earth releases and is trapped by greenhouse gasses to causes the warming effect.

Methane (CH₄): A molecule made of one carbon atom and four hydrogen atoms. It can trap heat near Earth's surface while in the atmosphere and is considered a greenhouse gas.

Paleoclimate: The climate of the Earth in the past. These past climates are reconstructed to better understand current changes to the Earth's climate.

Sahel: The region that stretches across Africa between the Sahara desert and the savannahs to the south. It is considered a transition zone between the two different climates.

Sub-Saharan Africa: The geographic region that includes all land in Africa south of the Sahara desert.

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