

Course Syllabus
Earth's Climate: Past, Present and Future

Fall Term - OLLI West
September 16– November 4, 2011

Tuesday, September 16th, 9:30-11:30 am

My email contact is (copy/paste) pebelanger@glassdesignresources.com

OLLI WEEK 1, September 16, 2014 page

Welcome to our first class Tuesday September 16th 9:30-11:30

Climate Principles, feedbacks, cycles and climate self-regulation

1. Tuesday September 16th, 9:30-11:30 a.m.: Introduction
 - Introductions
 - web page: <http://denverclimatestudygroup.com/>
 - DU portfolio: <http://portfolio.du.edu/earthclimate>
 - Key principles of climate change
 - The difference between weather and climate
 - Climate system: feedbacks, cycles and self-regulation (climate, not government)
 - What determines Earth's climate

Intro: my background, web page <http://denverclimatestudygroup.com/> (OLLI tab) and DU portfolio, CV (about tab)

Logistics

Stan Hamilton: classroom assistant, liaison to me/OLLI

Reflective learning: notes, write a blog, etc. I might use a WordPress blogger, or comment on the home tab, box OLLI, or DU's Portfolio <http://portfolio.du.edu/earthclimate> which I'm still figuring out :

- Insights,
- examples,
- case studies,
- comments/ other

Credits/acknowledgements helping me organize my thoughts/syllabus go to the MOOC course I took January/February 2014 from the University of Exeter:

As well as and HHMI (<http://www.hhmi.org/>) especially their streaming video holiday series (4 hours) in 2012-13 that can be found at <http://www.hhmi.org/biointeractive/changing-planet-past-present-future>

Key Principles

- Greenhouse metaphor effect: essential for keeping Earth moderate day/night

- Visible vs. Infrared/longer wave – a function of “black body” temperature: instead of glass keeping the heat in it’s the gas properties keeping the heat of infrared in; blanket effect.
- Greenhouse gases (GHGs) and feedback:
 - Water – H₂O – the amount is a feedback of temperature held in by the “blanket” of other GHGs
 - Carbon dioxide - CO₂
 - Methane - CH₄
 - Ozone - O₃
 - Nitrous oxide- N₂O
 - others

Blanket Earth:

<http://climate.nasa.gov/causes/>

What is climate?

[https://www.futurelearn.com/courses/climate-change-challenges-and-solutions/steps/563/progress go to 1.4](https://www.futurelearn.com/courses/climate-change-challenges-and-solutions/steps/563/progress%20go%20to%201.4)

You tube link: https://www.youtube.com/watch?v=bjwmg_ZVw

This video, produced by the UK Met Office, is an excellent introduction to understanding the climate system and, in particular, the key differences between weather and climate.

See: <http://www.metoffice.gov.uk/climate-guide>

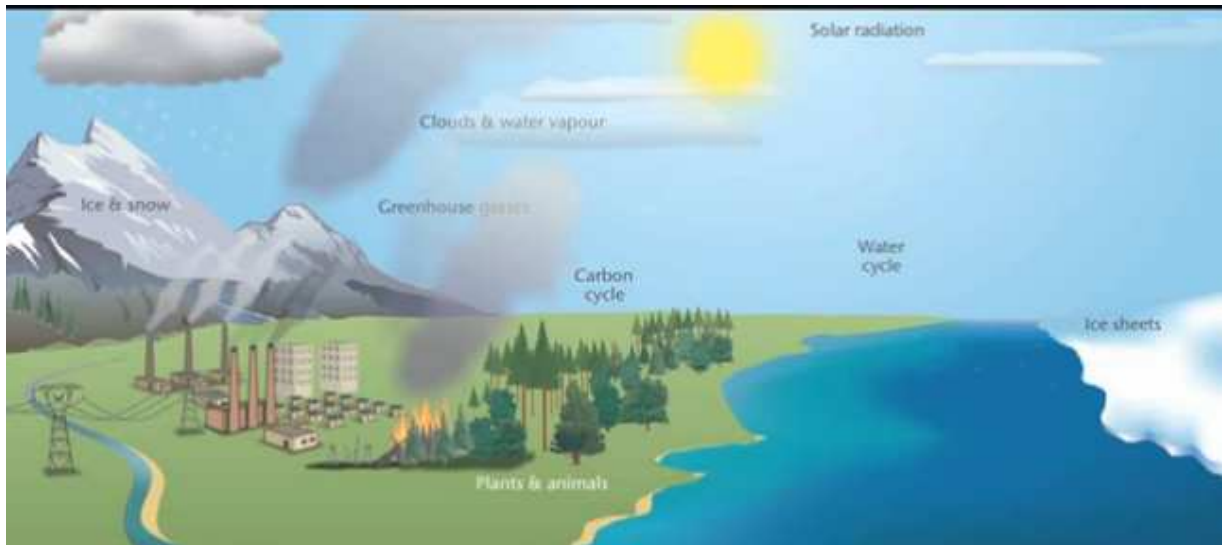
The difference between weather and climate

Weather: temp, rain, wind; hour by hour and day by day

Climate: 30 year average

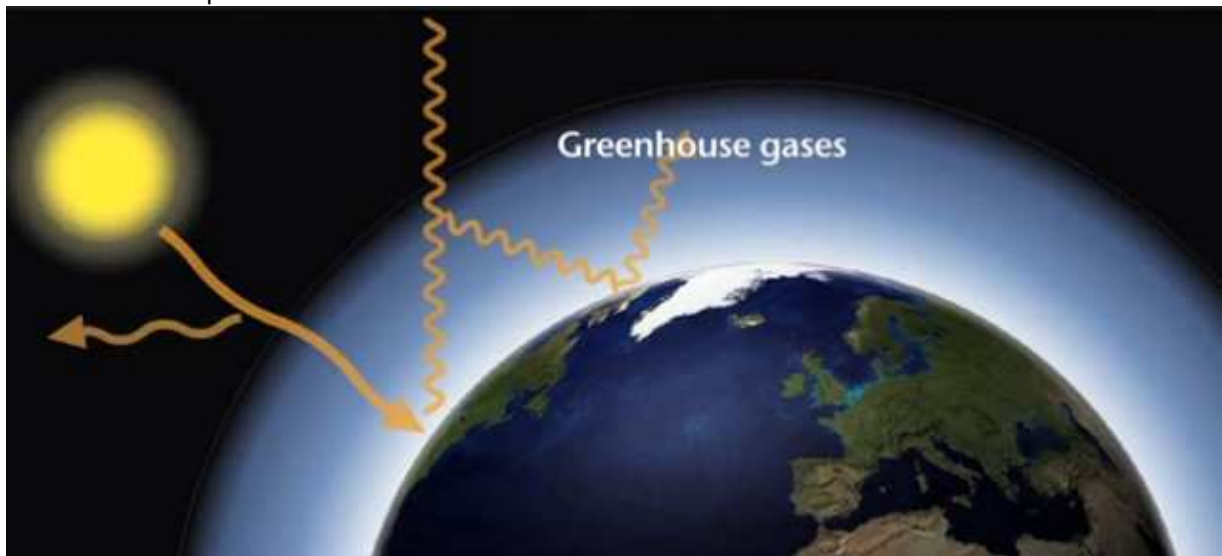
Climate zones:





a climate system

role of the atmosphere:



Climate change: the statistics of weather change

Discussion:

What's the difference between weather and climate?

The climate system, feedbacks, cycles and self-regulation

<https://www.futurelearn.com/courses/climate-change-challenges-and-solutions/steps/3294/progress> (7 mins)

an alternate: <https://www.youtube.com/watch?v=lrPS2HiYVp8>

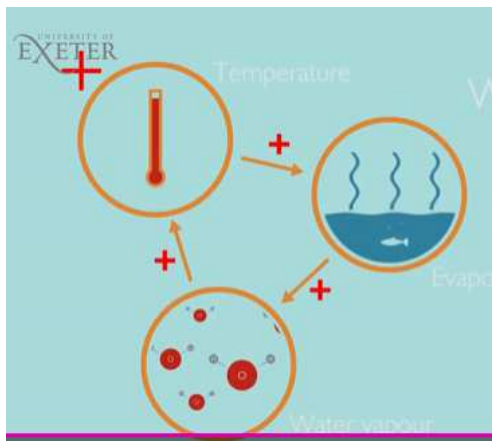
5 key elements and their interrelationships:

1. Atmosphere
2. Hydrosphere
3. Biosphere
4. Cryosphere
5. Lithosphere

The sun is key to linking all these through water.

Feedbacks: positive and negative

1. Water vapor
2. Ice albedo
3. Radiation feedback



Long term regulators of climate:

Positive feedbacks in a mathematical sense:

1. Water feedback: increase temp >>> ++ evaporation >>> ++ water vapor
2. Ice Albedo feedback: --- sea ice/high albedo >>> --- reflection >>> warming >>> --- sea ice
3. Radiation feedback: the warmer a body is the greater the radiation it gives off – i.e. it cools it down.

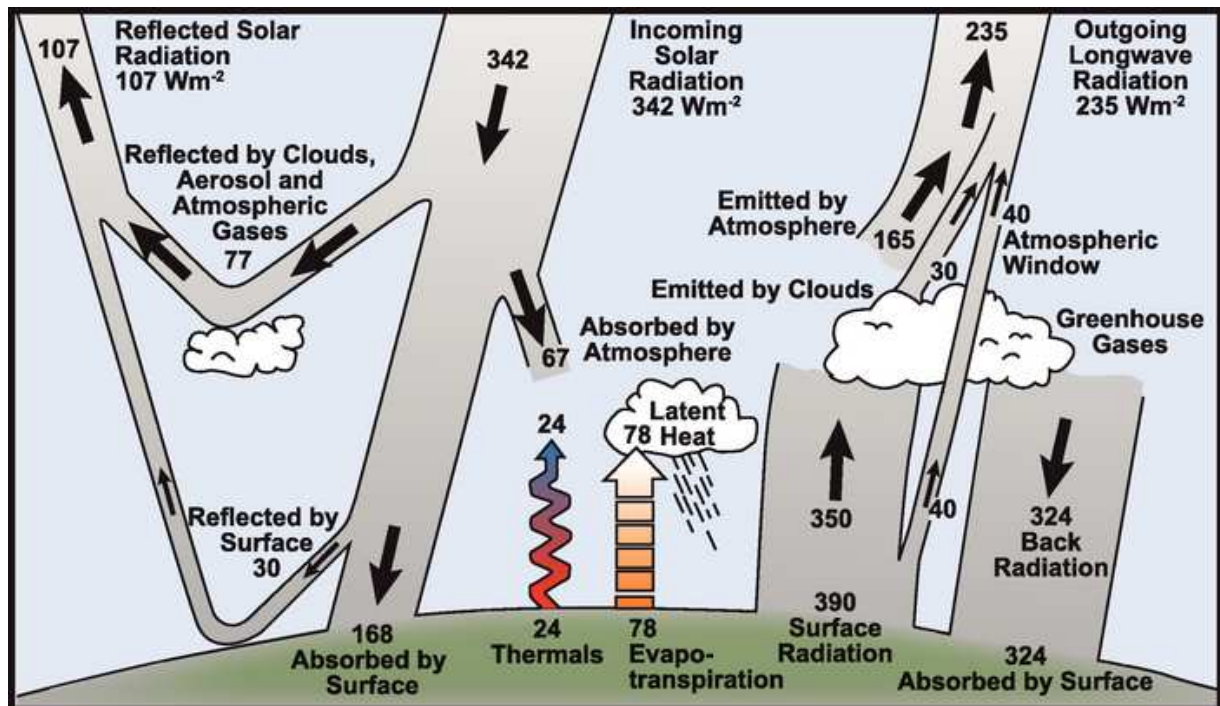
http://en.wikipedia.org/wiki/Stefan%E2%80%93Boltzmann_law

What factors determine Earth's climate:

See IPCC-AR5 (2013-2014) tab on my web page:

And this link from AR4 (2007) http://denverclimatestudygroup.com/?page_id=63

http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-1-1.html



Questions:

1. Which of the following are GHGs:
 - Water vapor
 - CO₂
 - CH₄
 - O₂
 - Ar
 - O₃
 - N₂O

2. Which is correct:
 - a. Greenhouses keep warm by reducing heat loss from convection
 - b. Greenhouses gases limit loss by reducing convection
 - c. Greenhouses gases trap long wave radiation in the atmosphere

3. How much solar radiation does the Earth reflect (albedo) ? How about ice/snow?
 - a. 70
 - b. 30
 - c. 10
 - d. 95

4. Which has the highest albedo?
 - a. Desert sand
 - b. Tropical forest

- c. Ice/snow
 - d. Ocean
5. What does IPCC mean? What does AR# mean?
Intergovernmental or International? What?

Reflect on these key questions:

1. What are the key scientific principles that explain climate change including the greenhouse (blanket) effect?
2. What are the key feedback mechanisms that help to explain why our climate is able to “self-regulate”?
3. How can our climate be conceptualised as a system containing a series of components that interact with one another?

Also consider:

1. What are the most important themes you have learned this week?
2. What aspect of this week did you find difficult?
3. What did you find most interesting? And why?
4. Was there something that you learned this week that prompted you to do your own research?