Agronomy 406
also MTEOR 406, ENSCI 406

World Climates
January 9, 2018

Review for today:

Online textbook: Introduction.

Section 1.2.1: Composition and temperature.

Reading for Thursday

Online textbook: 2.1.1 The heat balance at the top of the atmosphere.

Reading: "Bad Greenhouse".

Instructors

Raymond Arritt

3009 Agronomy Hall, phone: 294-9870

Office Hours: 11 a.m.-12:30 pm Tuesdays and Thursdays or by appointment

TA: Alexandra (Alex) Caruthers

email: **agron406@gmail.com**

(Don’t send email to other addresses.)

Course goals

Basic understanding of climate and its variations.

Understand how climate interacts with humans worldwide, including agriculture and health.

Professional skills:

- Oral and written communication.
- Teamwork.
- Critical thinking.
- These are taken from surveys of employers and alumni.

See the online syllabus for more details.

TABLE C-3 **Skill Sets and Abilities that Agribusiness Employees Seek in New College Graduates (study by Nat. Food & Agribus. Manage. Educ. Comm.)**

Skill Sets and Abilities	Rating[a]
Interpersonal Communication Skills	5.00
Critical Thinking Skills	4.92
Writing Skills	4.36
Computer Skills	4.27
Cultural/Gender Awareness/Sensitivity	4.08
Quantitative Analysis Skills	4.07
Knowledge of Business Management	4.00
Oral Presentation Skills	4.00
Knowledge of Accounting and Finance	3.62
Intern/Co-op Work Experience	3.29
Knowledge of Macroeconomics, Trade	3.08
Broad-based Knowledge in Liberal Arts	2.75
International Experience	2.75
Foreign Language Skills	2.56
Production Ag Experience	2.36

From Transforming Agricultural Education for a Changing World–Nat. Acad. Press, 2009.

Prerequisite

AGRON / MTEOR 206

If you have not taken the prerequisite:

- You can take the class with permission. See me to discuss.
- It is **your responsibility** to know the material covered in 206. I will give some suggestions for background materials.

Course materials

Course materials are at the class Canvas page.

- Syllabus.
- Preliminary schedule is linked from the syllabus. The schedule **will** change, so best not to print it.

Online climate textbook is at:

http://www.climate.be/textbook/contents.html

Readings from the textbook and other sources will be linked from the course schedule.

Bring a scientific calculator to class every day.
We will work examples in class.

Academic accommodations

I will be glad to work with anyone who needs accommodations. Please see me as soon as possible so we can make sure your needs are met.

Begin by visiting with the Student Disability Resources (SDR) office, located on the main floor of the Student Services Building, Room 1076. Their phone number is 515-294-7220, email disabilityresources@iastate.edu.

Grading

Class assignments: 30%

- Climate news presentation, in-class problems and quizzes, readiness tests, homework, etc.
- All assignments are due by the **start of class** on the due date. No credit will be given for late assignments.

Midterm exam: 25%

- February 22, date subject to change.

Final exam: 25%

- Wednesday, May 2, 9:45-11:45 a.m.

Climate fact sheet and presentation: 20%

Your responsibilities

Be aware of requirements stated in class and Canvas.

Get help if you need it. **Please** see me before you get in over your head!

Come to class ready to **participate actively:**

- **Complete each day's reading before class.** Readings are chosen to be short and to the point.
- To allow for unavoidable absences (illness, schedule conflicts, etc.) your lowest two assignment scores will be dropped. Note some longer assignments are worth double.

First quiz

Thursday at start of class:

> In your own words, explain how the greenhouse effect works.

Team formation

- Teams are meant to have a mix of perspectives from different members.
- For this reason I may make a few adjustments to team membership.

Learning teams

Team members should sit together in class.
Membership will be linked on the Canvas page.

Most class discussions and some assignments will be done as part of your team.

- Contribute views from your field to discussions.
- Submitting assignments as a team **does not** mean everyone in the team gets the same grade!

All work submitted by a team must include a statement of who did what part of the work.
Assignments that do not include this information are incomplete and will not be graded.

Tips for working teams

Agree on a way to communicate. Choose a team leader or coordinator for each assignment.

For each assignment clearly spell out what needs to be done and who will do it.

Set reasonable but **firm** deadlines:

- **Never** accept late work, even in "emergencies."
- Don't cover for someone who does not do their part. If necessary leave their section blank, with an explanation that they did not submit their work by the team deadline.

Climate news

Each team will be report on a climate (not weather) related story recently in the news.

See the Course Schedule linked to the class web page for your team's date.

- First presentation: Team 3 on Tuesday, Jan 23.
- I will give an example on Thursday, Jan 18.
- If your presentation is moved to an earlier date you will get plenty of notice.

Regional climate report

Develop a one-page (front and back) fact sheet on a climate topic for a region **outside the United States.** Also present your findings in a poster session.

- Choose a topic that is interesting to you.
- **By start of class on Tuesday, Jan 16**, email agron406@gmail.com with your proposed title and a brief summary. Otherwise I will assign a topic.
- Topics will be “first come, first served".

Grading:

- 50% written fact sheet
- 50% poster presentation

Question for learning teams

What **two topics** would you like to cover during the course?

Be prepared to explain why your topics are important to cover.

Topic suggestions

Sea level rise

Climate change and agriculture

Climate change and animal habitats

How climate change affects severe weather

Global air flows and climate change

Causes for melting of ice caps (Greenland, Antarctica)

How climate affects crop production

How climate affects quality of life (drought, water rights)

How climate affects plant populations and crops

Water availabilty

What is climate?

Long term weather patterns in a given area

The average precipitation and temperature over a given time

Long term variation in weather across different areas

Average environmental conditions for an area over a period of time

Expected weather pattern over a seasonal period in a specific region

Some definitions of climate

"an area's long-term weather patterns"

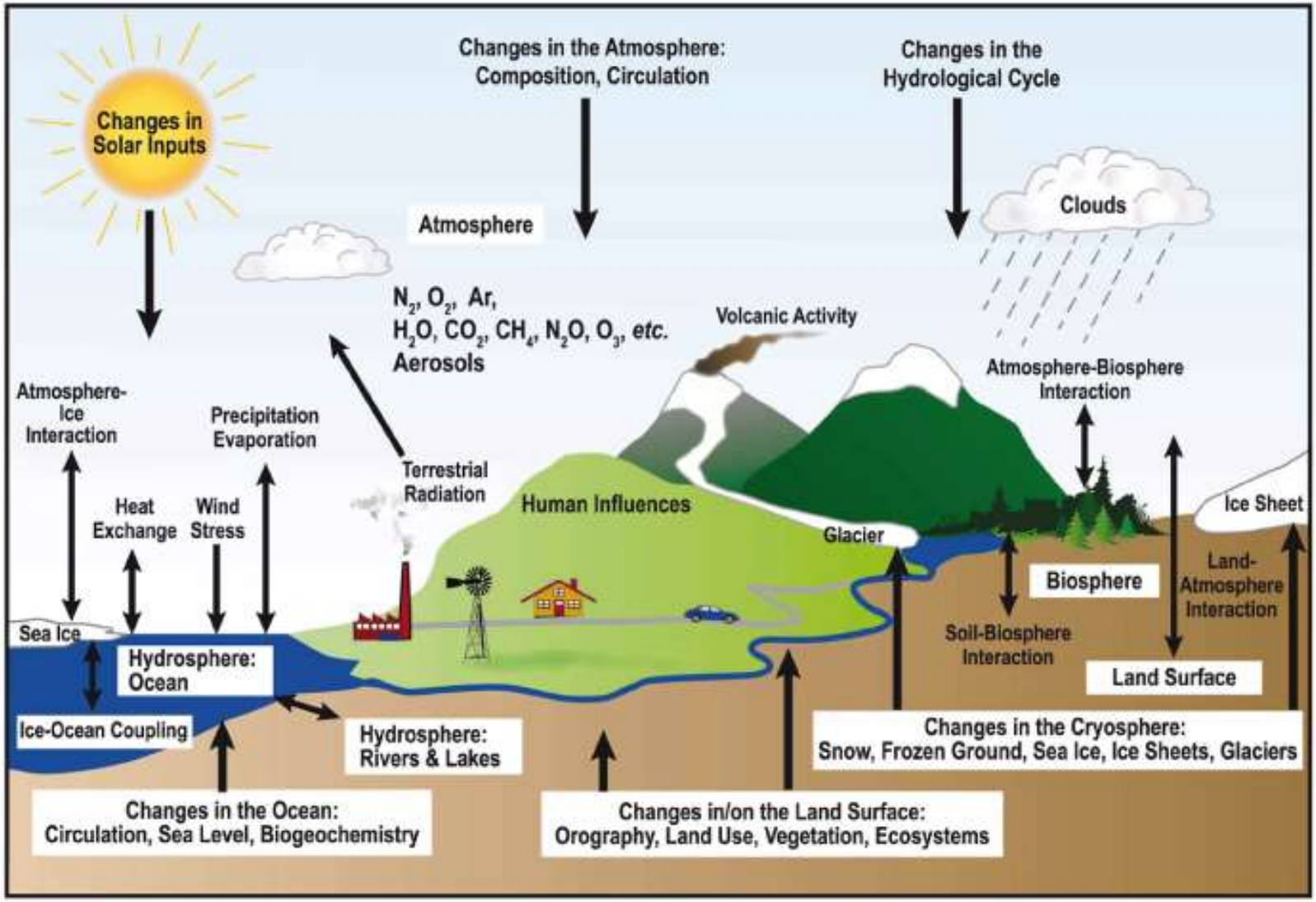
"the average weather usually taken over a 30-year time period for a particular region and time period"

"Climate includes patterns of temperature, precipitation, humidity, wind and seasons."

"Climate is traditionally defined as the description, in terms of the mean and variability over a 30-year reference period, of the relevant atmospheric variables (temperature, precipitation, winds). In a wider sense, it is the statistical description of the climate system." (Your online textbook)

"The slowly varying aspects of the atmosphere–hydrosphere–land surface system. It is typically characterized in terms of suitable averages of the climate system over periods of a month or more, taking into consideration the variability in time of these averaged quantities… **The concept of climate has broadened and evolved in recent decades.**" (American Meteorological Society Glossary)

Climate is determined by interactions between components of the Earth system (including humans)



To understand climate we need to think about the whole system

When people breathe, they release CO_2 into the atmosphere.

Do you think the combined breathing by all of humanity is a significant net source of CO_2 to the atmosphere?

Be prepared to explain your answer using "systems thinking," that is, consideration of the interdependent parts of the problem.

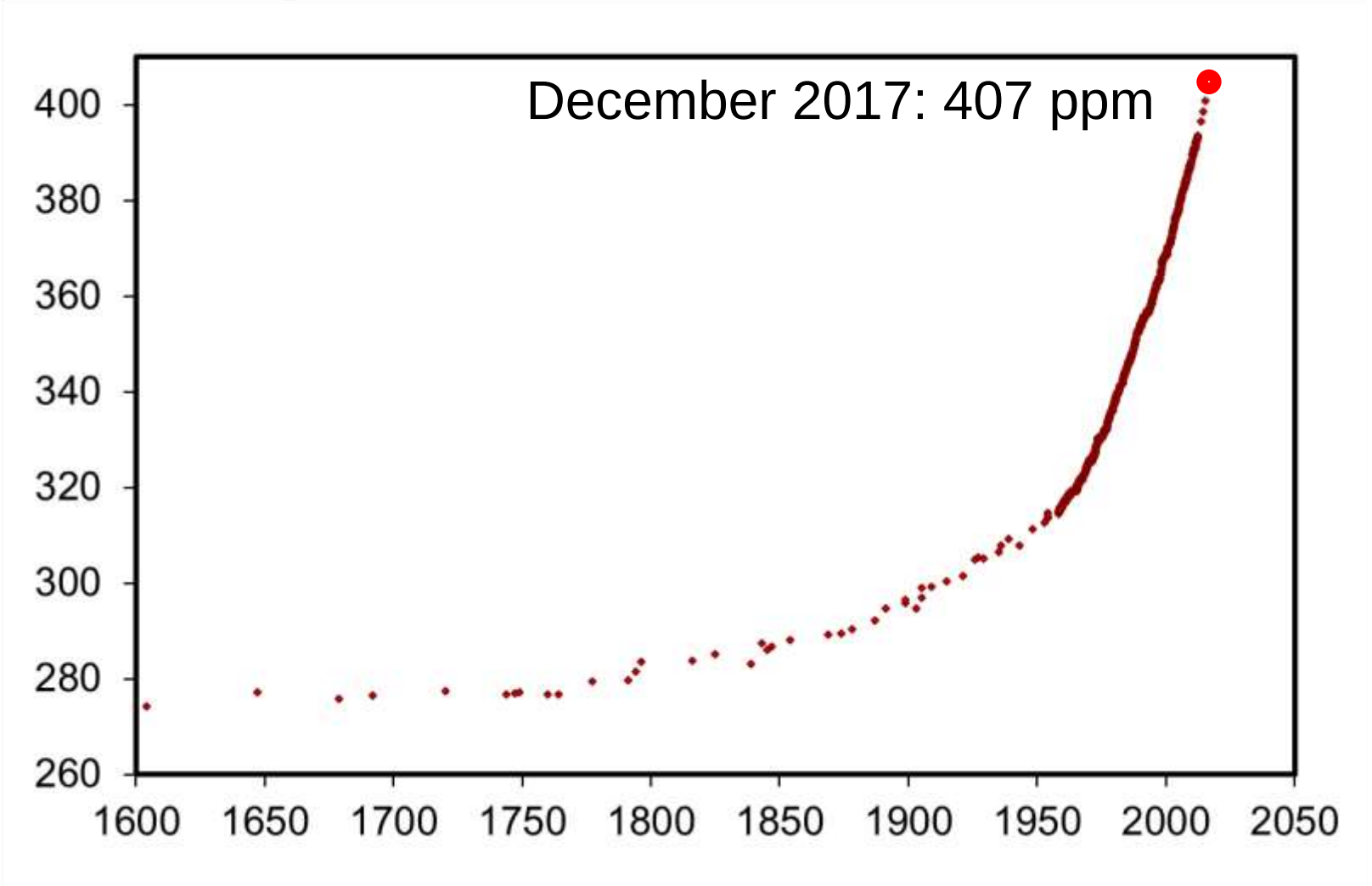
What is air?

Composition of dry air	
Gas	**Percentage**
Nitrogen	78.080
Oxygen	20.944
Argon	0.934
Carbon dioxide	0.041
Neon	0.002
All others	0.001

"All others" includes some gases with important effects despite very small concentrations, such as methane, ozone, and chlorofluorocarbons (CFCs).

Source: IUPAC Compendium of Chemical Terminology, 2nd ed. (1997). Adjusted for increase of carbon dioxide since publication.

Atmospheric CO2 since 1600

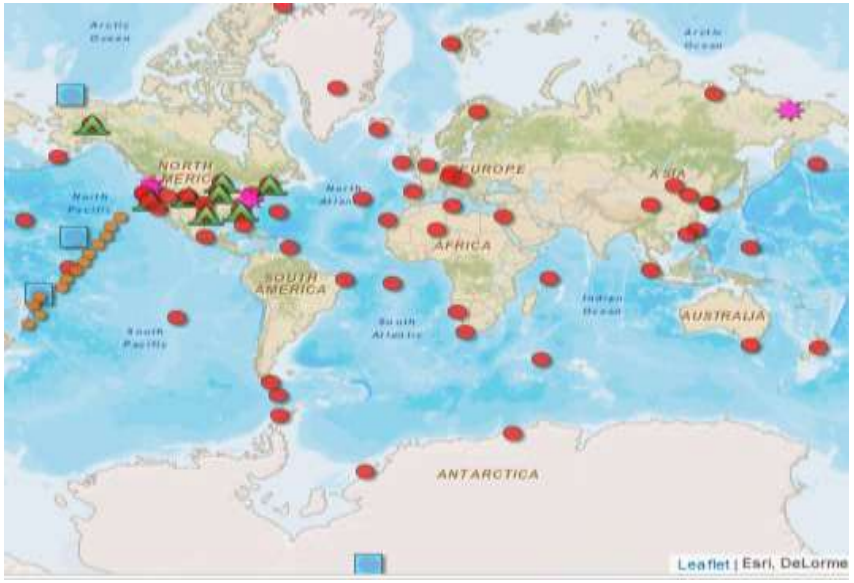


Values before 1958 are from Antarctic ice cores (Law Dome and Siple)

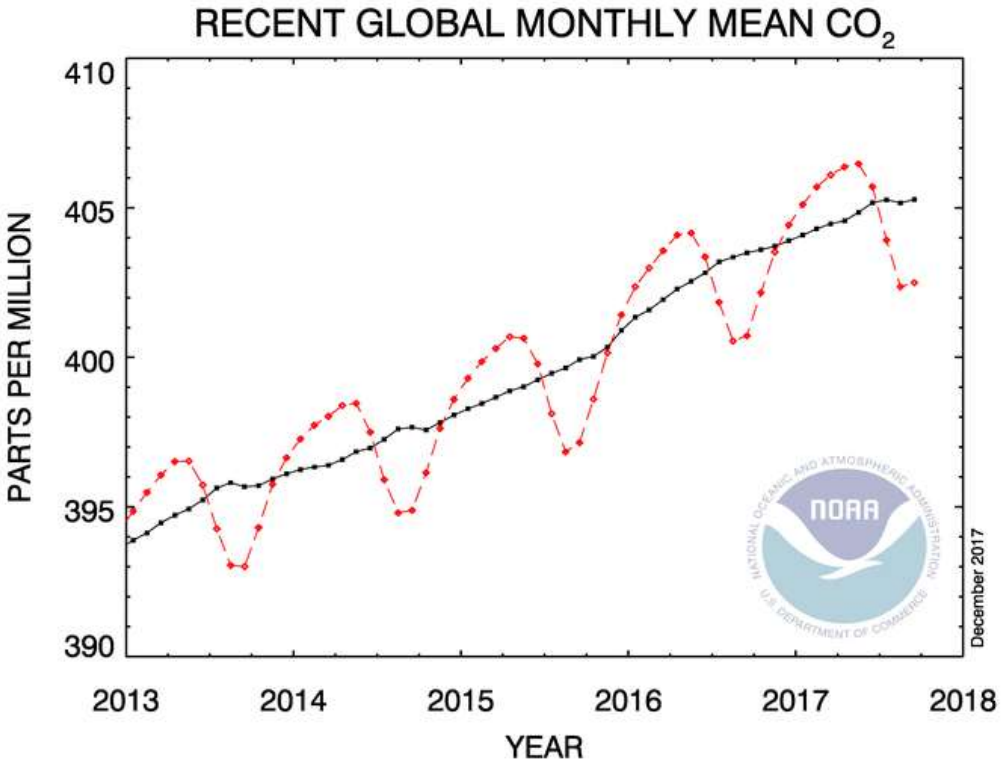
Values 1958-present are from Mauna Loa observatory.

Greenhouse Gas Reference Network

Reference Network sites



Global average CO2



Red curve shows raw monthly values.

Black curve is adjusted to remove the effect of seasonal variations.

http://www.esrl.noaa.gov/gmd/ccgg/ggrn.php
http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html

How fast has the increase been?

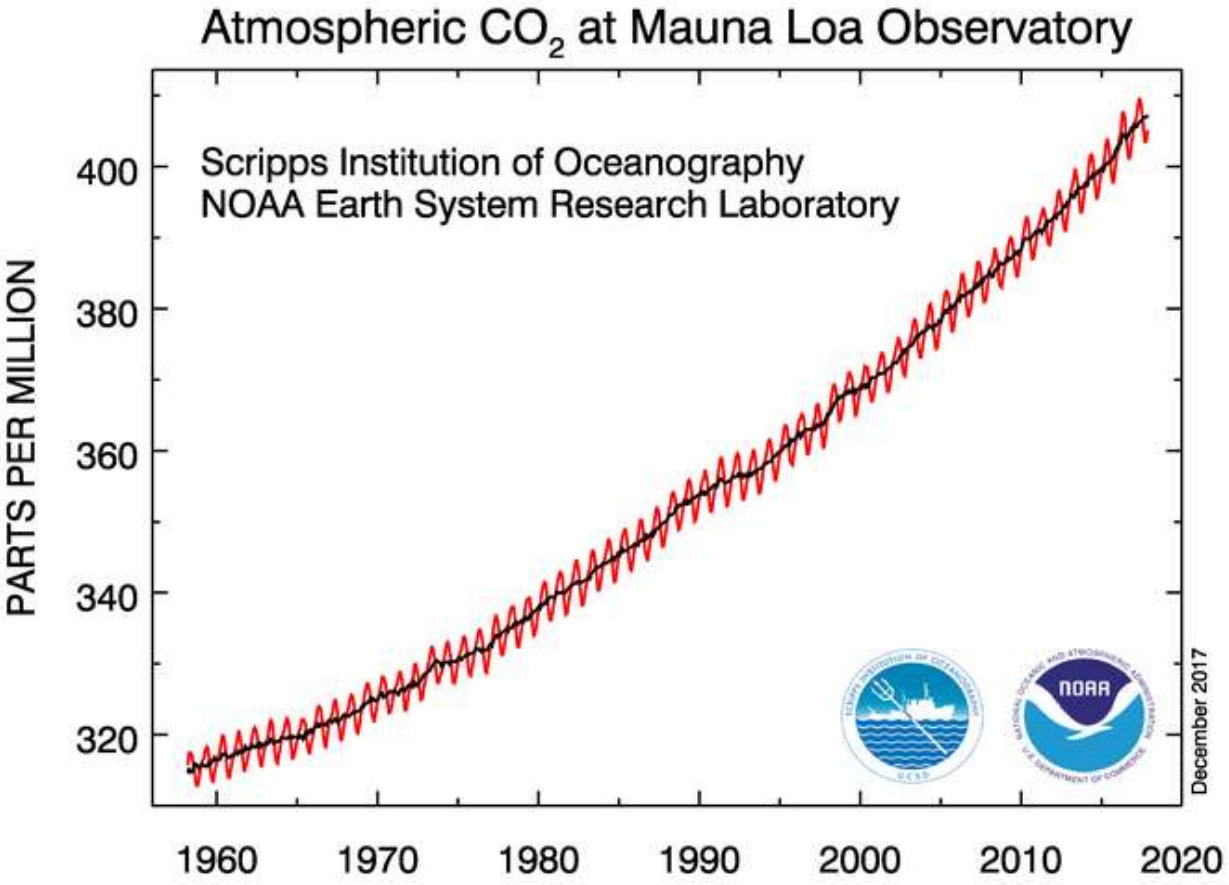
Pre-industrial CO_2 concentration before 1750 was about 280 ppmv (parts per million by volume).

Present concentration (Dec 2017) adjusted for seasonal variations is 407 ppmv.

Questions:

- **What is the midpoint value between the pre-industrial and present concentrations?**
- **About what year was this value reached?**
- **How long did it take for the first half of the increase since pre-industrial times?**
- **How long did the second half take?**

Trend of CO2 at Mauna Loa



Pre-industrial = 280 ppmv (1750 AD), Present = 407 ppmv

What is the midpoint? When was it reached? How long did the first and second halves of the increase take?

source:
https://www.esrl.noaa.gov/gmd/ccgg/trends/full.html