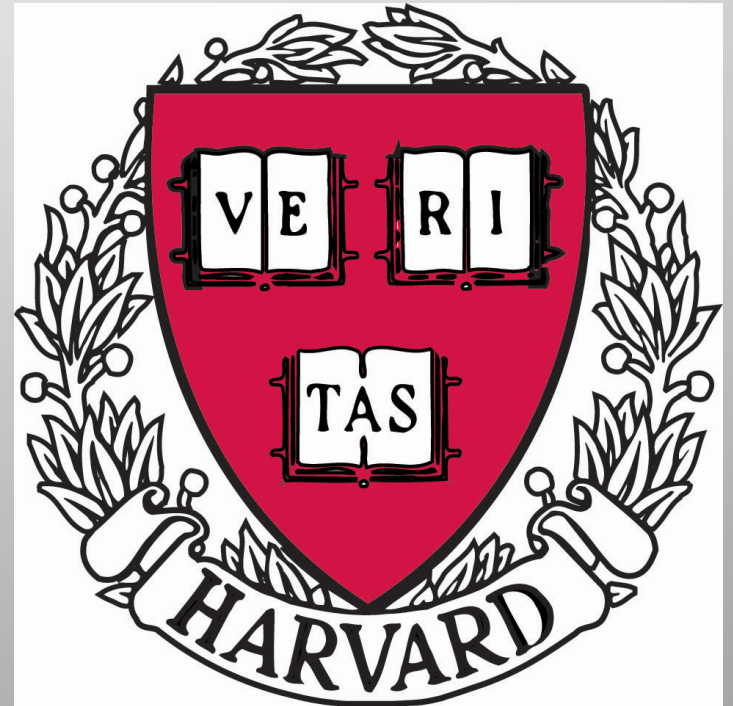


Harvard Study

- Introduction to Study
- Understanding Protocol
- Keying Out Specimens



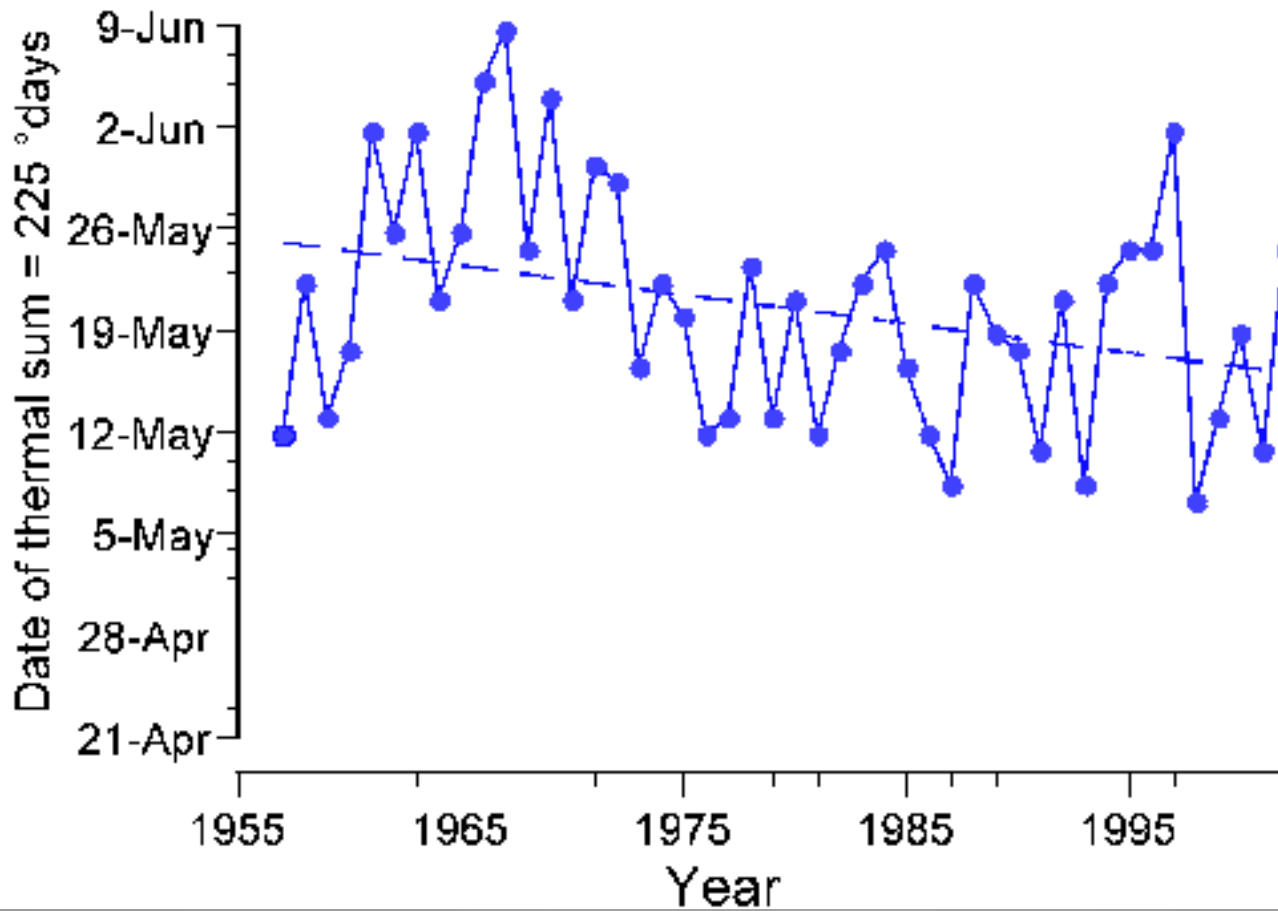
Harvard Forest Schoolyard Ecology Buds, Leaves, and Global Warming



<http://harvardforest.fas.harvard.edu> (Research/LTER)

LTER: Long Term Ecological Research Program

Fig. 3. Estimated leafout at Hubbard Brook Forest (253 m asl)



Phenology- study of periodic plant and animal life cycle events and how these are influenced by seasonal variations



Protocol

At least 10 trees (Mark 1-10)

Two branches (A/B) on each tree at opposite ends (if possible)

Fall Data- Size of leaf, when leaves drop, color change of leaf and tree

Spring Data- # of buds open, closed, puffy (bud burst), leaf length



Protocol Continued

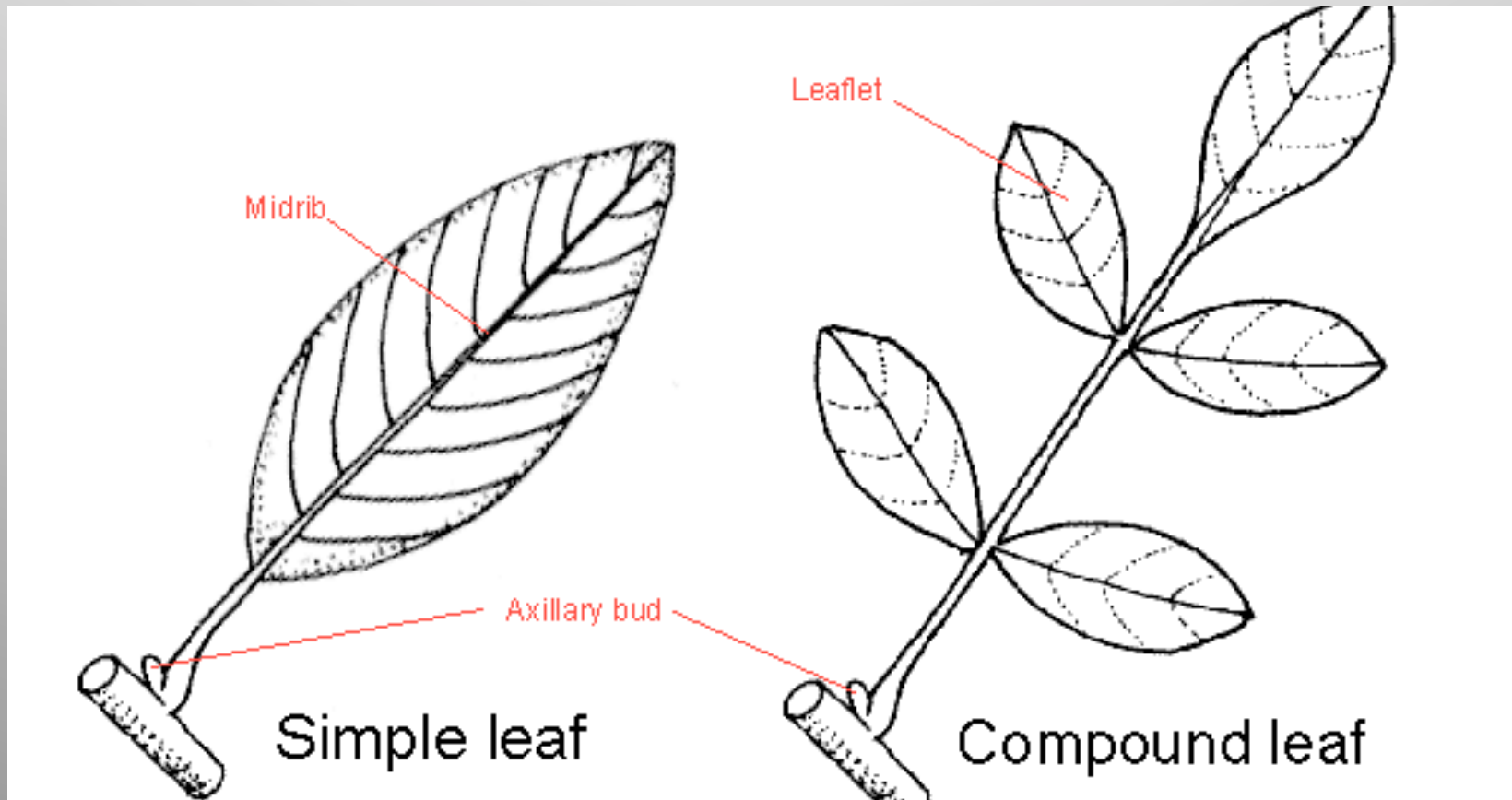
6 leaves (#1
closest to end on
left).

Do not count
terminals

Flags mark end
of counting zone



Compound Vs Simple Length X Width



Estimations

% Leaf/Tree NOT
green





Autumn Student Data Sheet

December 2007

Data Sheet

Name: _____ Date: _____
 Teacher: _____ School: _____

Tree Number: ____ Branch letter ____
 Tree Species: _____

Please measure leaves only once at beginning of season.

	Leaf 1	Leaf 2	Leaf 3	Leaf 4	Leaf 5	Leaf 6
Leaf Length (cm.)						
Leaf Width(cm.)						

Put a check mark in the correct column below to show Leaf Color and Leaf Drop

Leaf #	Fraction/ Percent of Leaf Color (not green)				Leaf Drop 0-not fallen 1- fallen
	0 - 25%	26 - 50%	51 - 75%	76 - 100%	
1					
2					
3					
4					
5					
6					
Whole Tree					N/A

Total number of study leaves observed per branch (fallen and not fallen) _____

Total number of leaves fallen _____

Teacher note: Remember that the branch total above must be added with branch totals from all branches on the same tree to get the total number of leaves dropped per tree to submit to Harvard Forest to post online.

Optional Field Notes:

Weather Notes:

Animal/ Plant notes:

Using a Dichotomous Key



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Tree Finder Book- Keying Out Specimen

14



If the leaves or buds grow opposite like this,



go below to



If the leaves or buds grow alternately like this,



go on page 21 to



If the leaves are compound, composed of several leaflets, (you can tell leaves from leaflets because there is no bud at the base of a leaflet),

go below to



If the leaves are simple, (not composed of leaflets),

go on page 18 to



If the 5 or more leaflets radiate from one point,

go on page 15 to



If the leaflets do not radiate from one point, or if there are only 3 leaflets,

go on page 16 to

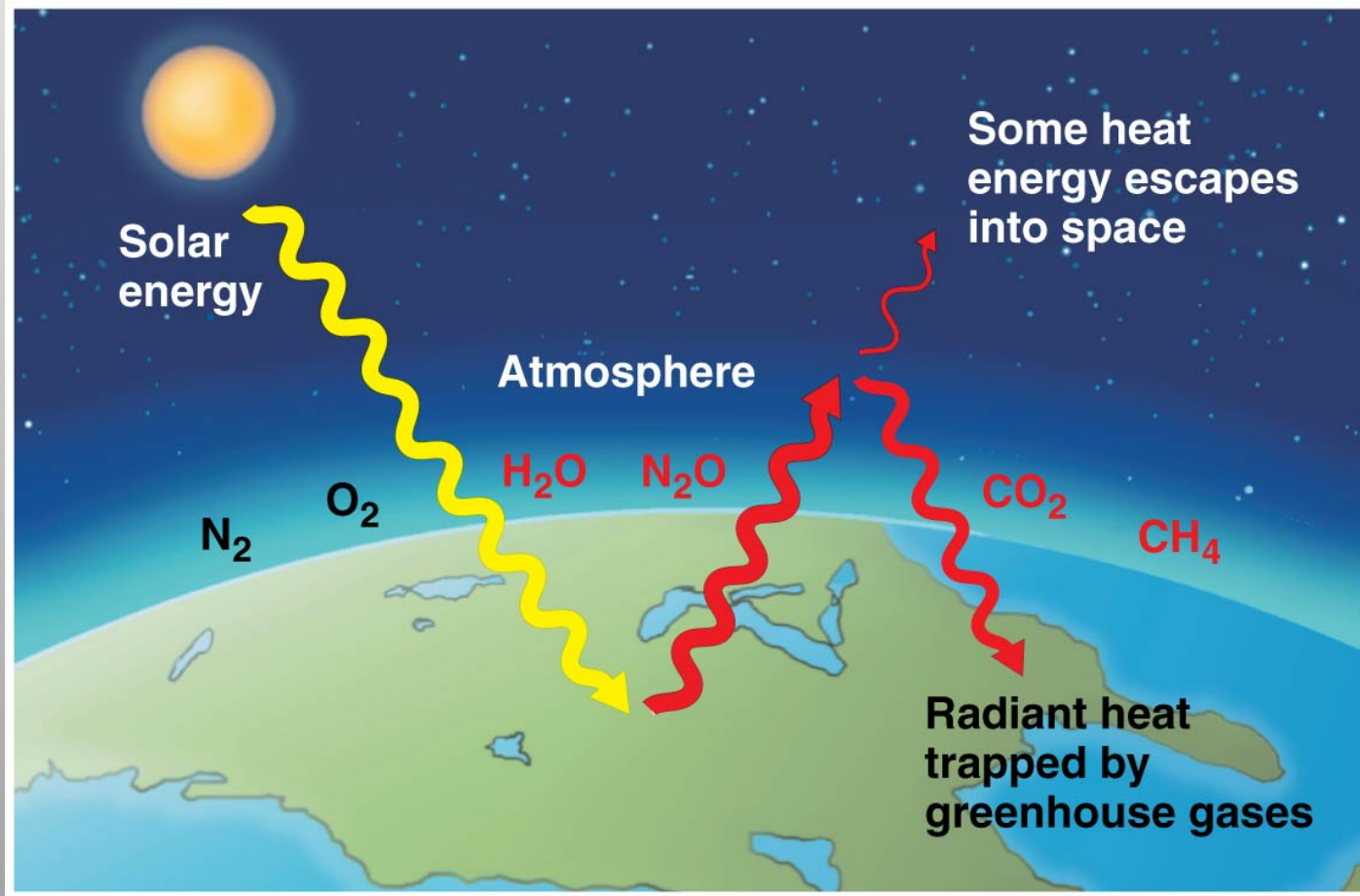


Global Warming Research Questions



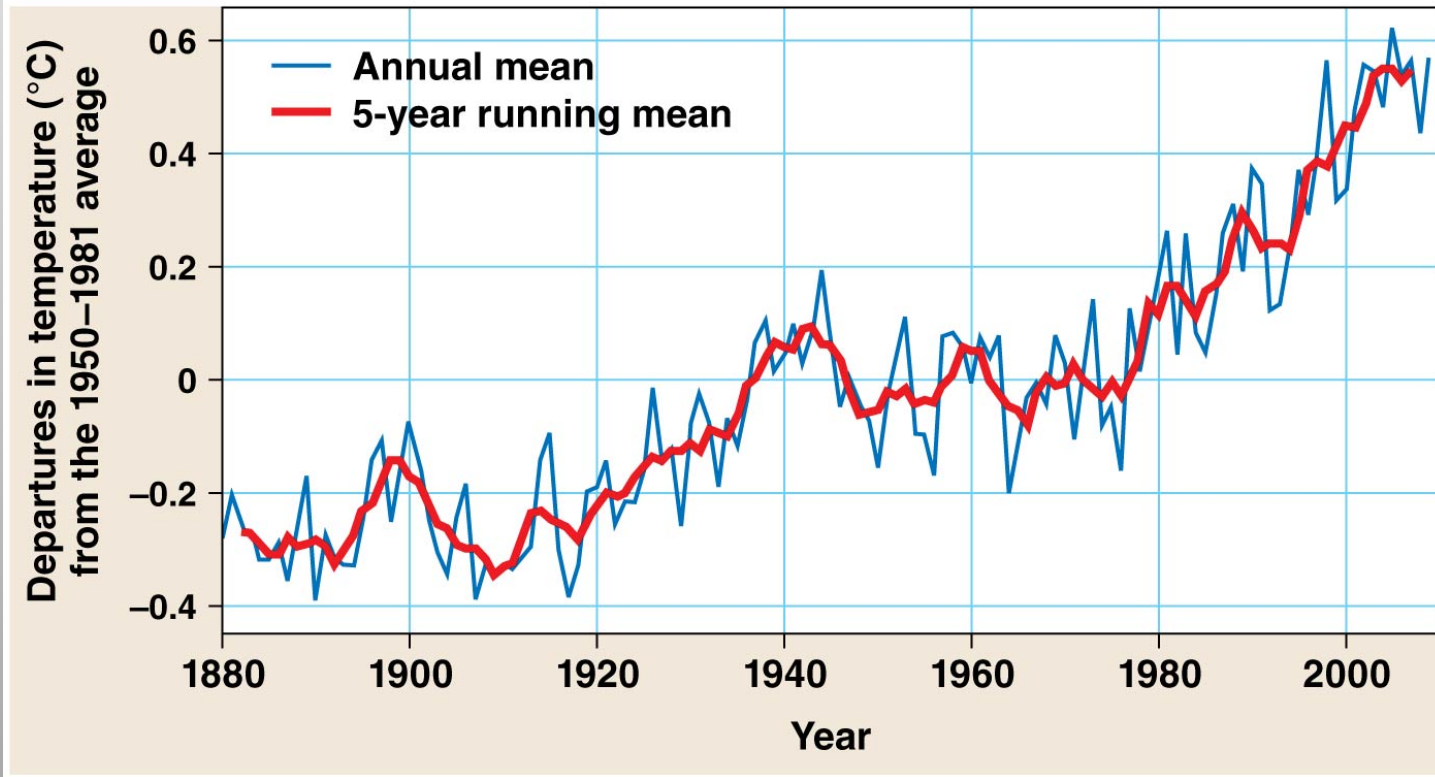
- What determines the global climate?
- How is the global climate changing?
- How does global climate change affect us?
- Are human activities causing global climate change?
- What is your impact on global climate change?

Global temperature patterns

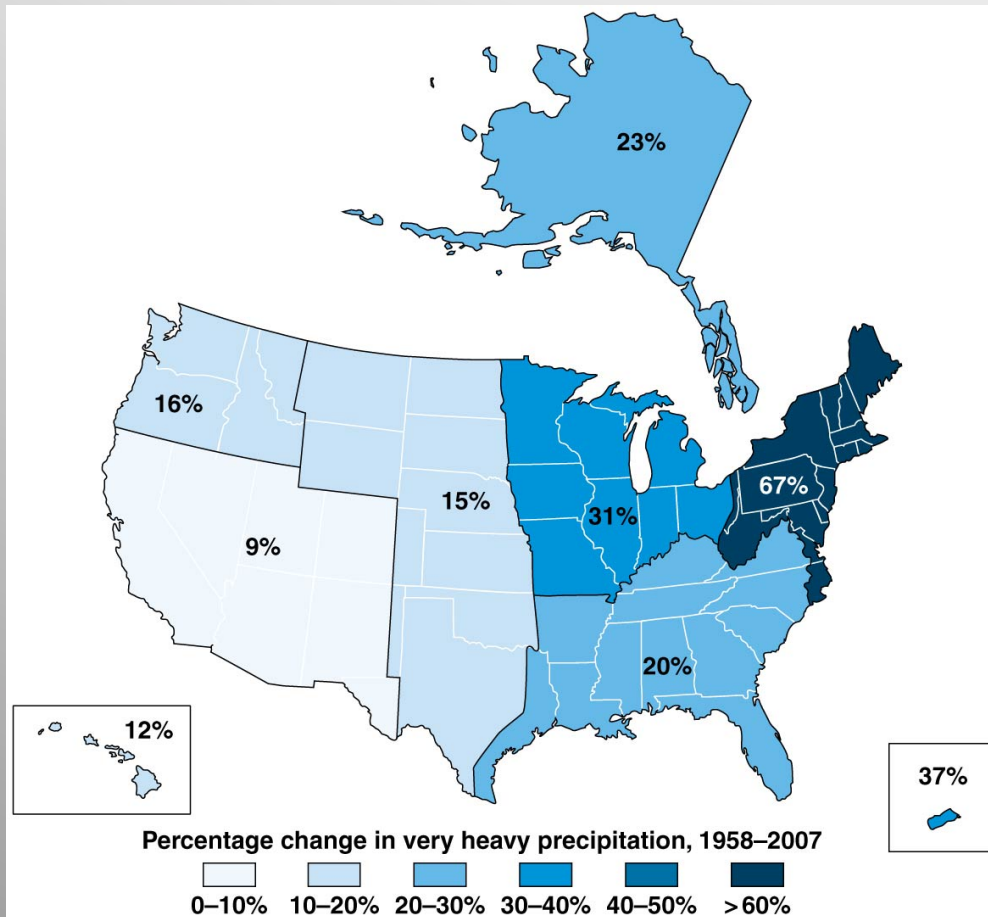


Changes in temperature patterns

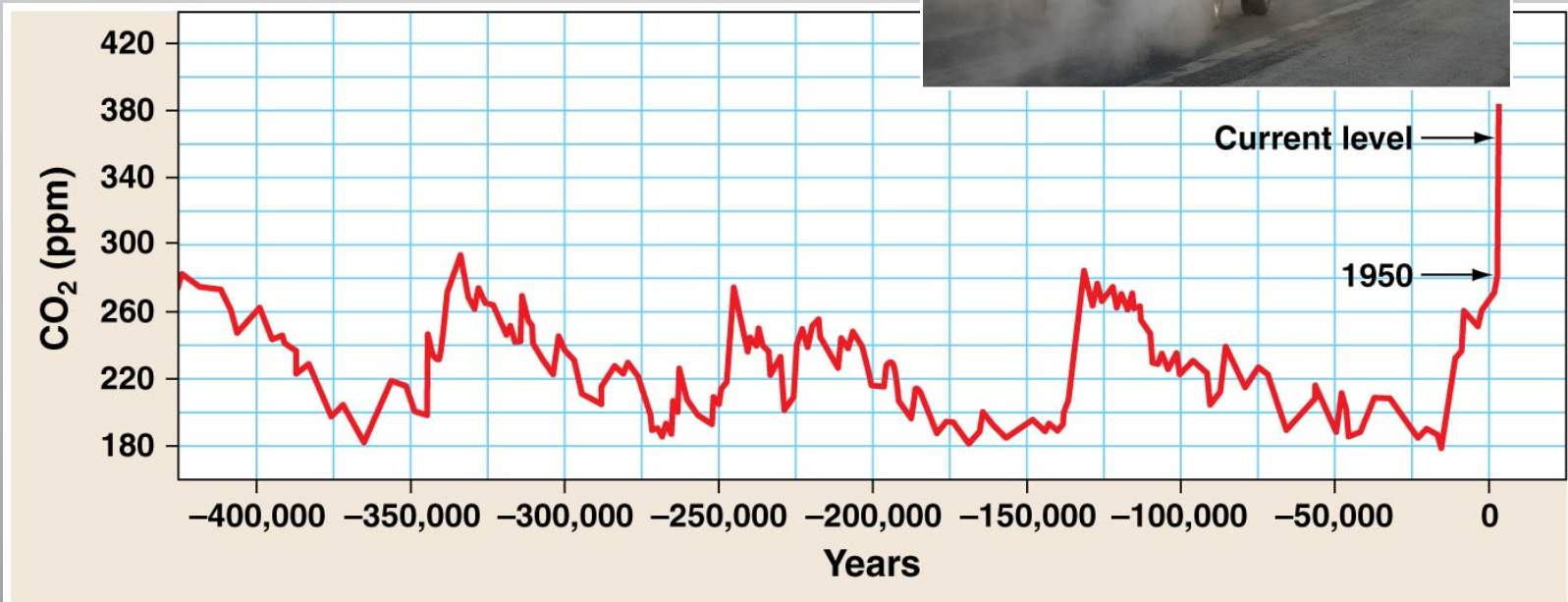
Global mean surface temperature



Changes in precipitation patterns



Carbon dioxide



ppm = parts per million

What's your impact?

