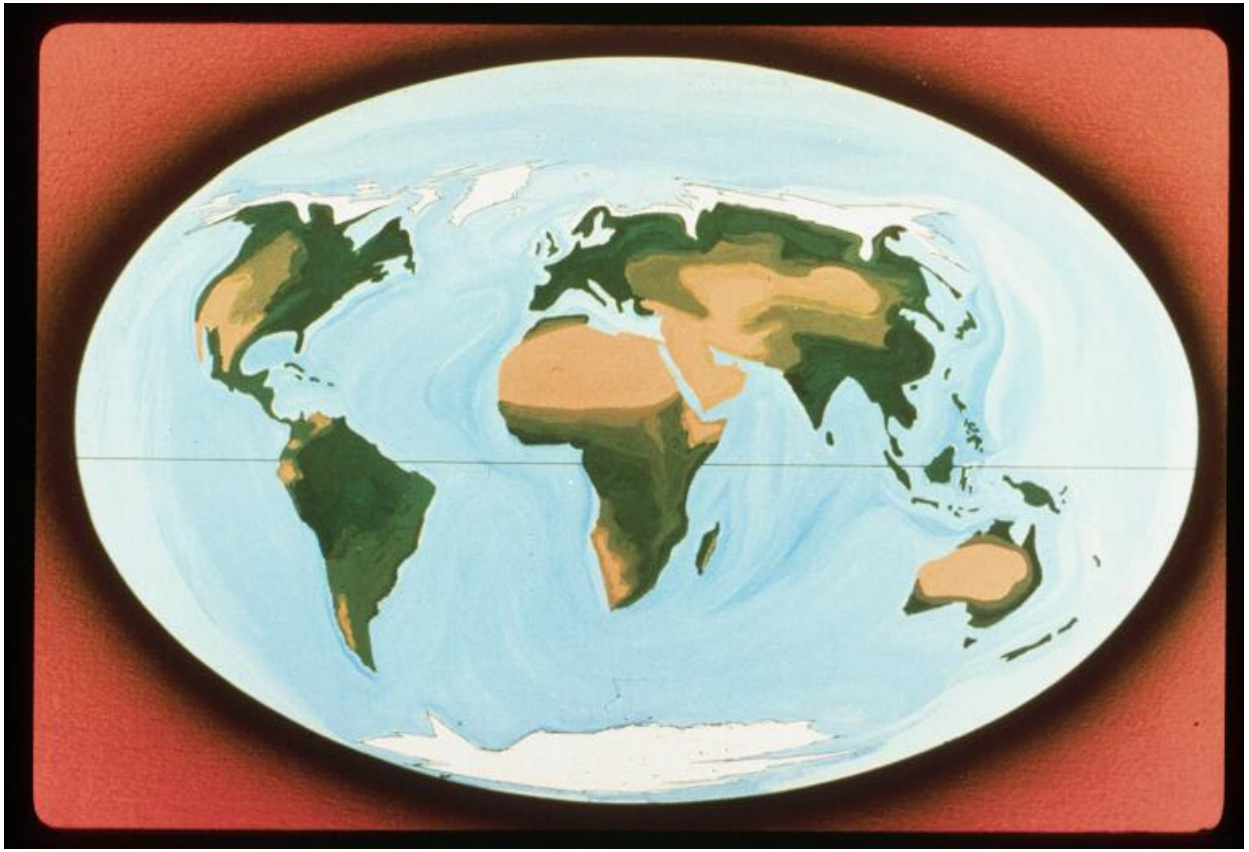
1 (4-6)



These region are called biomes. Some of these areas would be prairies, tropical rainforests, and deserts.

Alpine

Sub alpine

Plains

Foothills

Montane

High elevations

Colder

The temperature decreases 3 degrees per 1000-foot rise)
Shorter frost-free season (6 weeks)
Snow possible any month

More rain/snow

Average 40 inches in the Colorado alpine.

Low elevation

Warmer

Longer frost-free season

Colorado Springs - 21 weeks

Less Rain/snow

(average in Colorado Springs is 15.4 inches)

As elevation changes life zones and climates change.

End of Part 1

Part 2

One method you have just completed that identifies what climate a fossil plant would have lived in is called, “Floristic Method.”

A scientist compares the fossil leaf with a modern counterpart and determines what climate the modern leaf is lives in.

This helps the scientist to understand what enviroment the fossil leaf might have lived in.

Climatic environments of modern plant genera.

Floristic Method

These are fossil leaf types and their modern counterparts.

Subtropical

Dryopteris
Sequoia
Salix
Sapindus
Vauquelinia
Zizyphus
Cardiospermum
Rhus
Typha

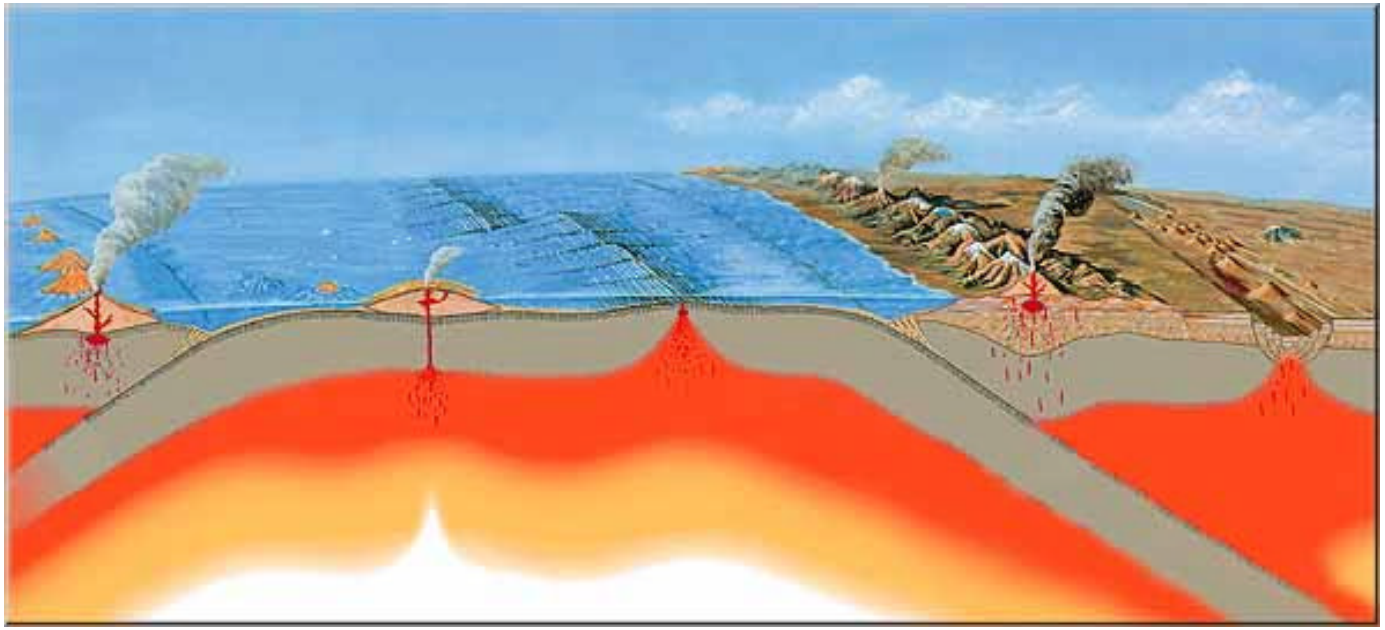
Warm Temperate

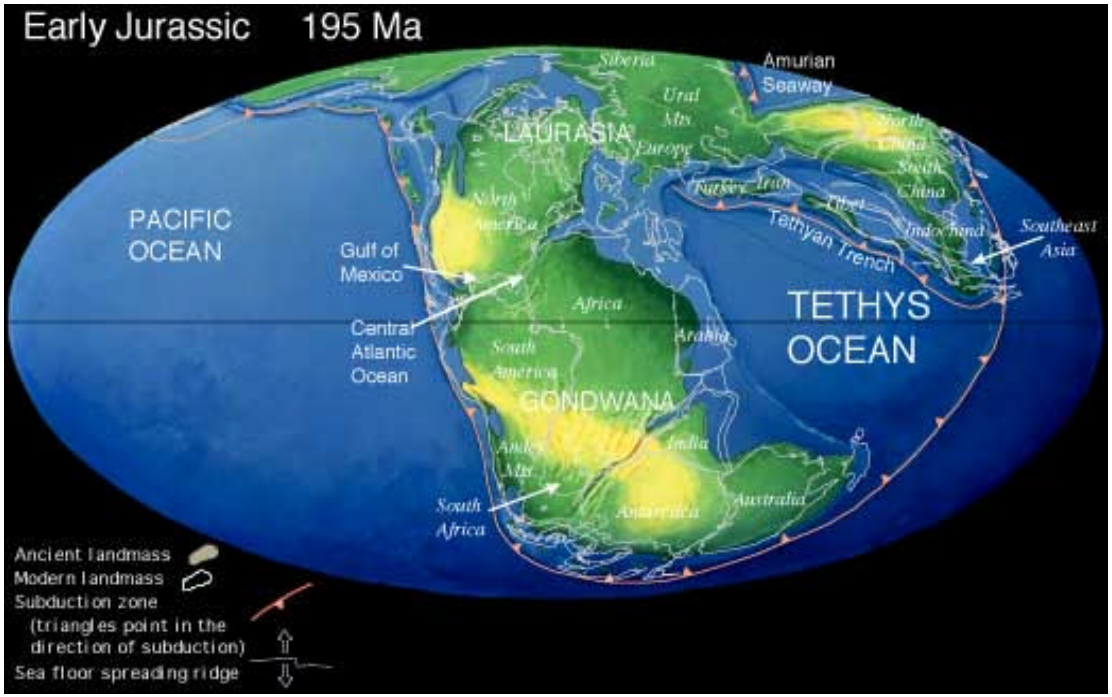
Pinus *Rosa*
Sequoia
Crataegus
Carya
Fagopsis *Acer*
Cercocarpus
Chamaecyparis
Cedrelospermum
Paracarpinus
Ulmus
Cardiospermum
Rhus *Salix*
Sapindus
Bursera
Quercus
Typha
Ulmus

Cool Temperate

Pinus
Cercocarpus
Populus
Chamaecyparis
Acer
Salix
Rosa

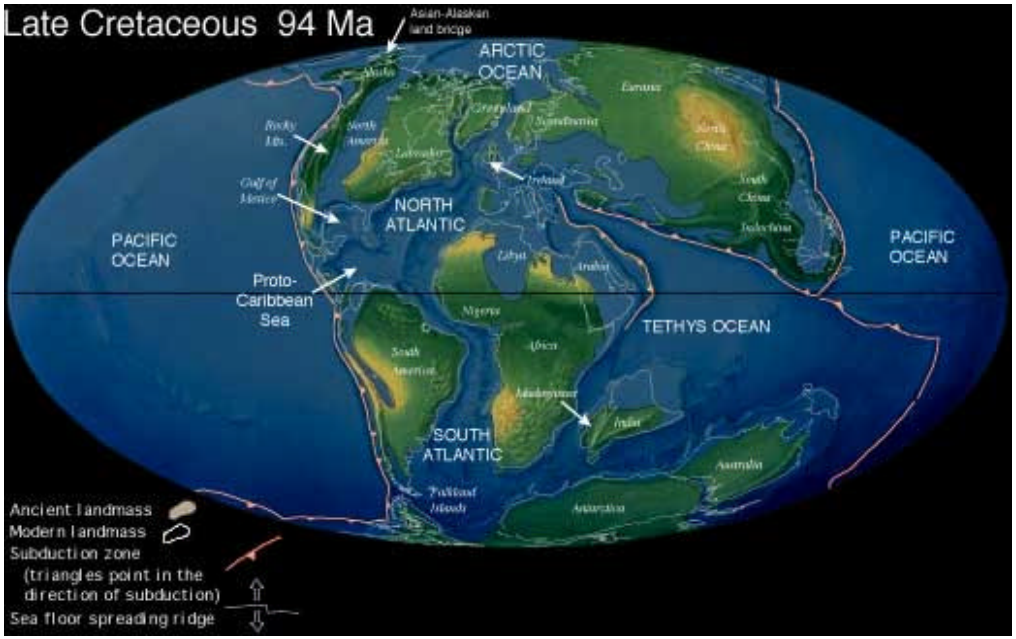
The earth's outer crust is in motion, this is call Plate Tectonics.



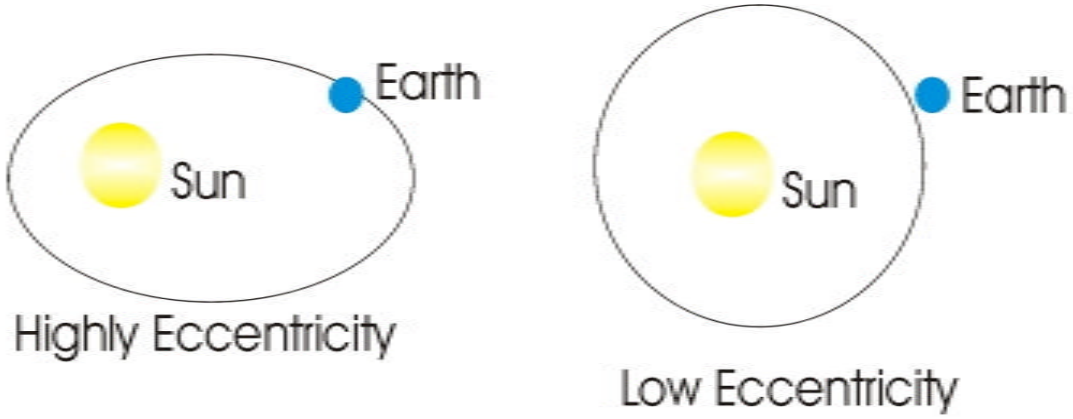


The continental plates shift and what was once close to the equator now moves north or south away from the equator.

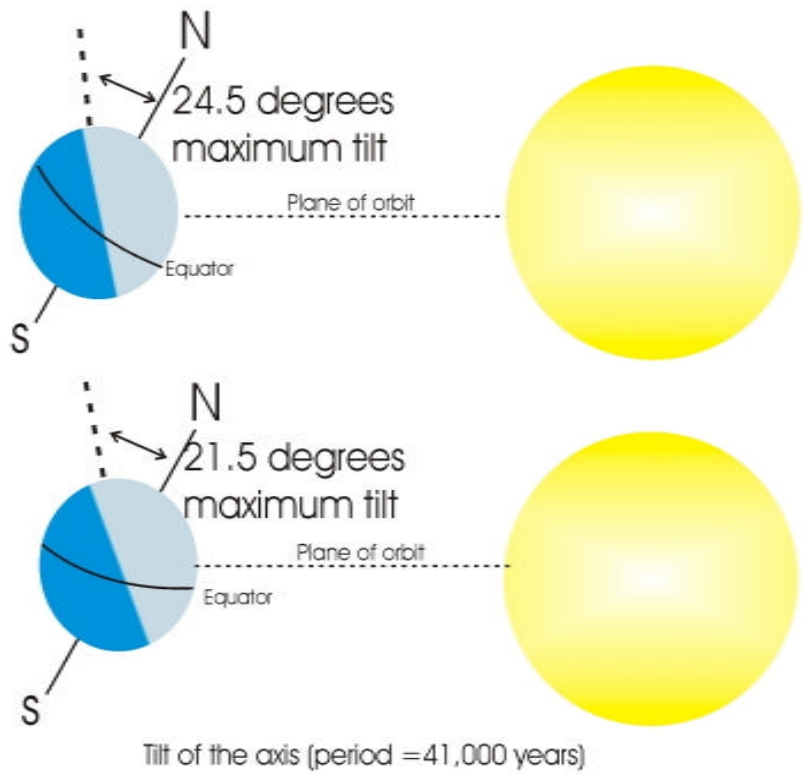
Notice how far North American has moved and changed over 100 million years.



Eccentricity (Period 400,000 and 100,000)

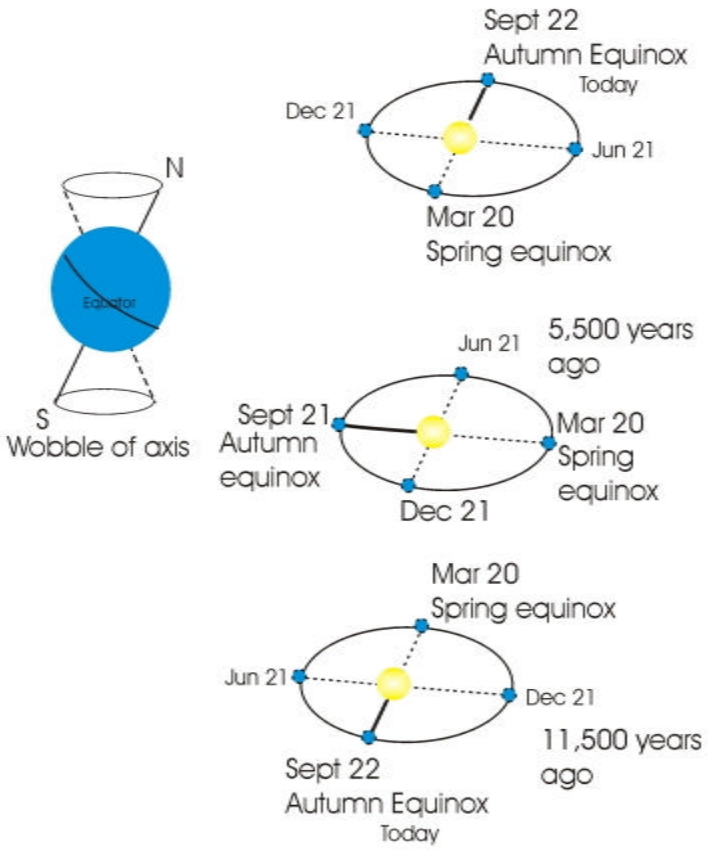


Our proximity to the sun can affect the climate change.



Tilt of the axis (period =41,000 years)

The tilt of the Earth's axis can affect climate change. The more moderate the fluxuation in season temperatures the more moderate the climate.

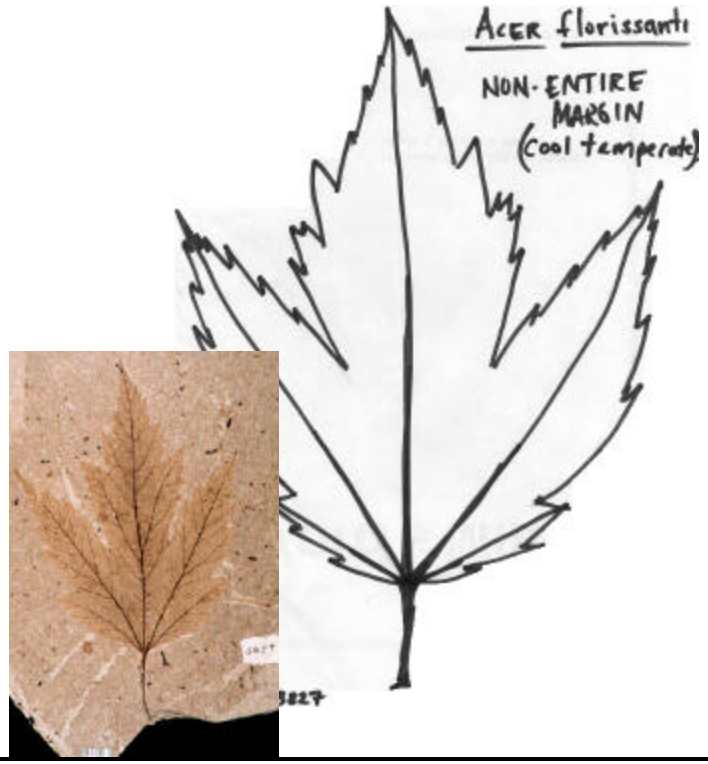


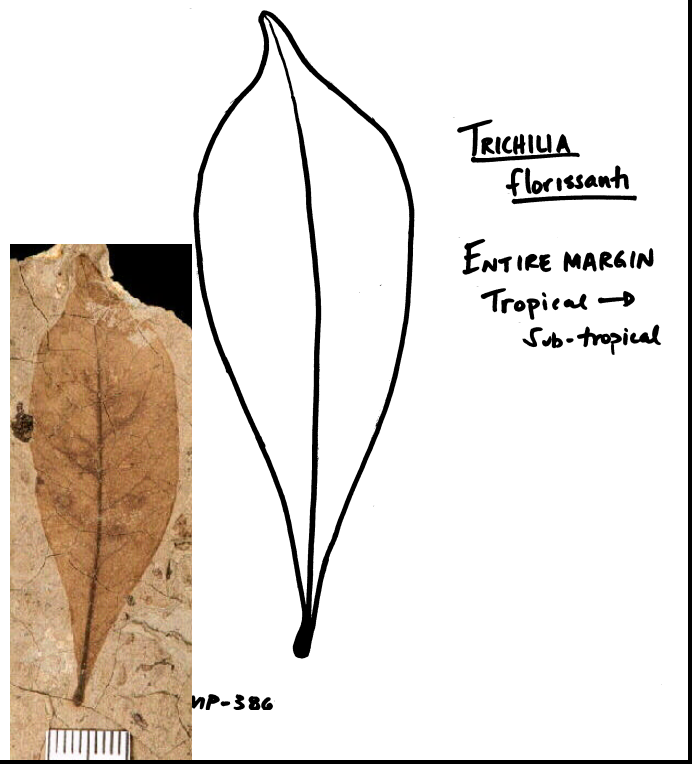
The poximity of the Earth to the Sun at the time of the equinox shifts every several thousand years. This can also affect the climate.

Some of the climates we see all over the world have different vegetation as they are positioned away from the equator.

The other method you have completed is called the "Physiognomic Method." It uses plant characteristics to determine the climate in which they live.

The **physiognomic method** describes common characteristics of leaves and forests found in each climate type.





Hypotheses

What do you determine the current climate to be at Florissant?

Now compare that to the climate 34-35 million years ago, why has it changed?

Break out into groups and form a hypothesis.

Part 3

So what is the answer???

The Floristic Method

First data is collected on what specific plants are found in our modern climates. Then we identifying the closest of these modern species to the fossil leaf found at Florissant.

The problem with this is evolution.

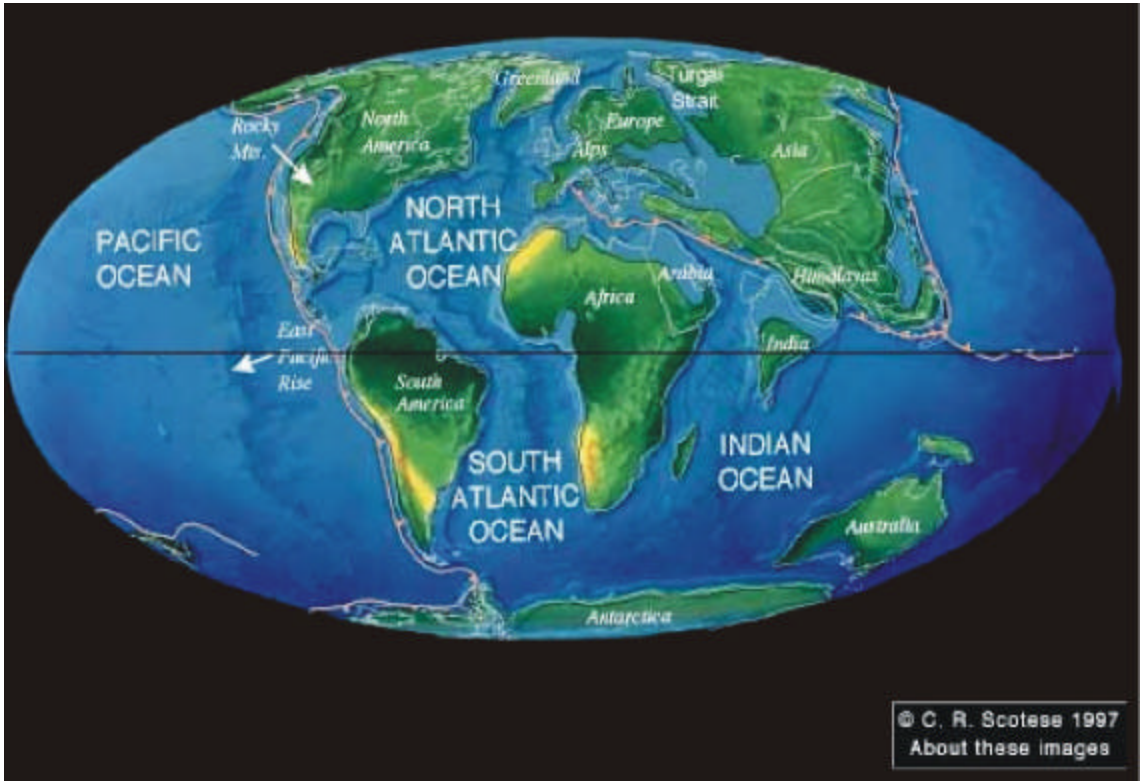
These plants could have adapted to new conditions and environments over time.

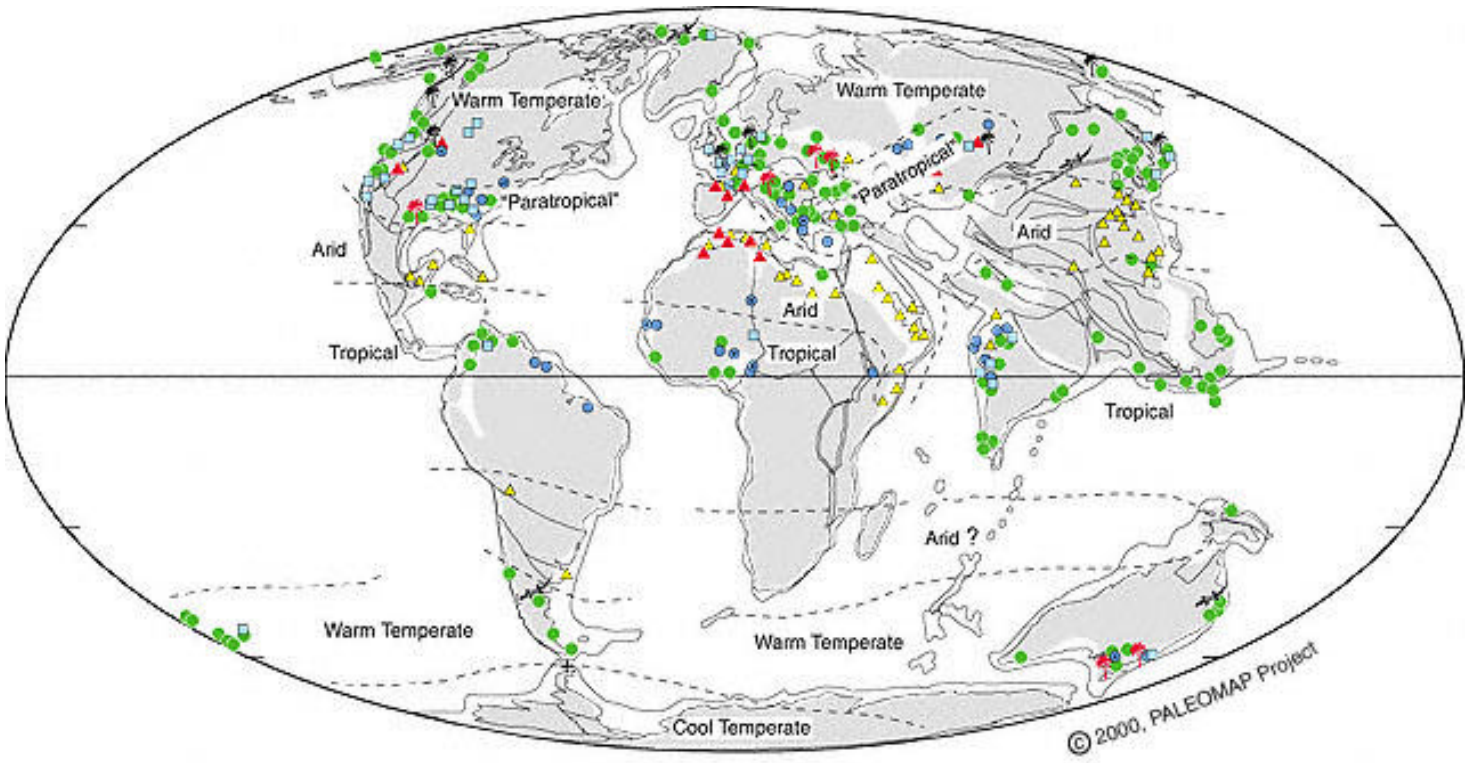
The Physiognomic Method

Dr. Herb Meyer, Florissant's paleontologist, along with Dr. Jack Wolfe and Dr. Kate Gregory have used this method to determine the paleoclimate at Florissant.

Presently this is most widely excepted method of determining Florissant's climate.

Was Florissant closer to the equator?

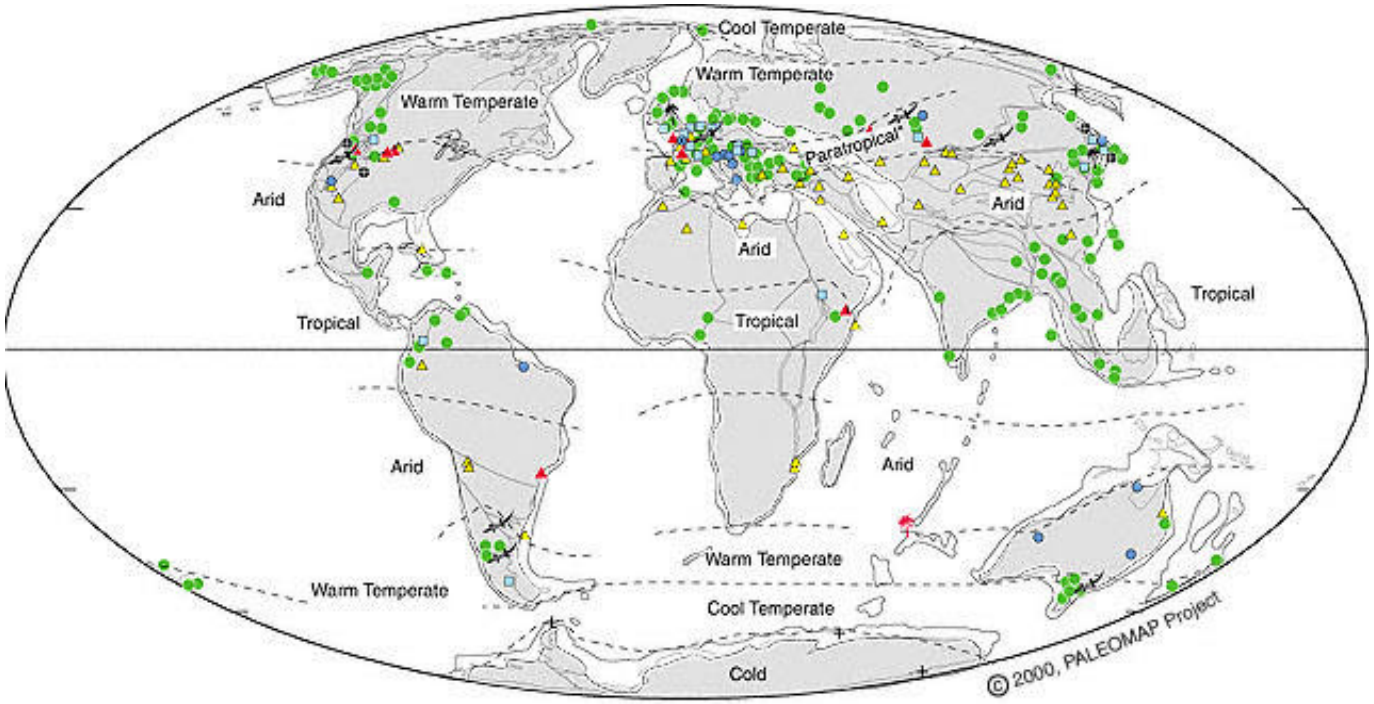




Lower Eocene

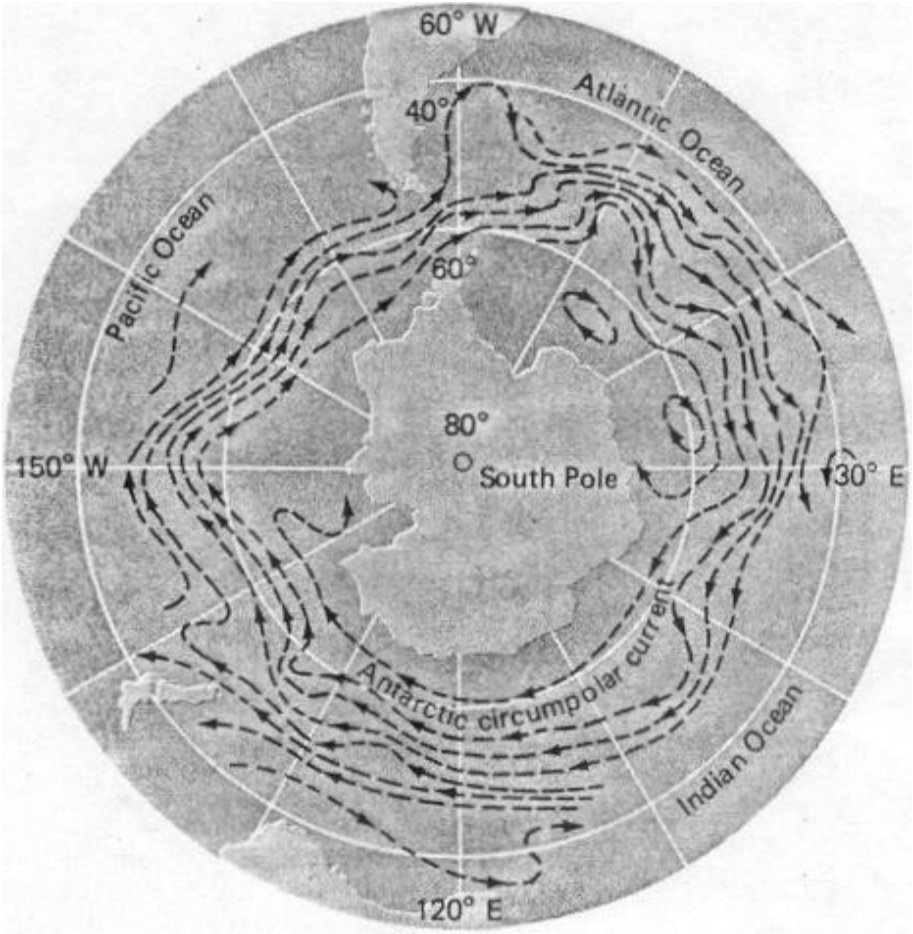
50 mya

Notice Central America is below sea level and the proximity of Australia and South America to Antarctica.



Oligocene
30mya

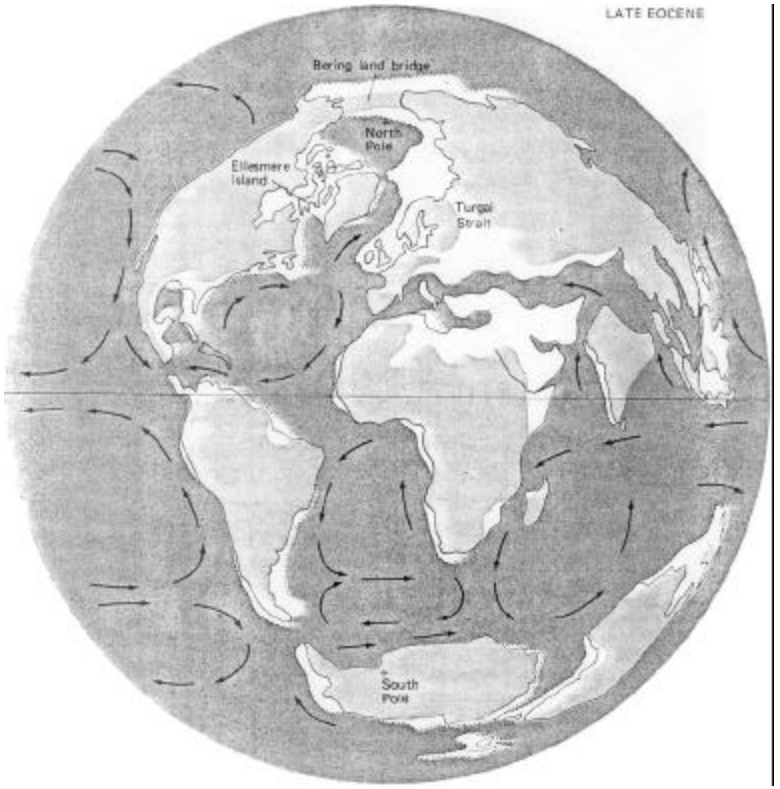
Notice the shift of Australia and South America. Central America is now rising above sea level.



Convection current increased cooling around Antarctica. The ice sheet grew. As it grew the ocean surrounding it became colder.

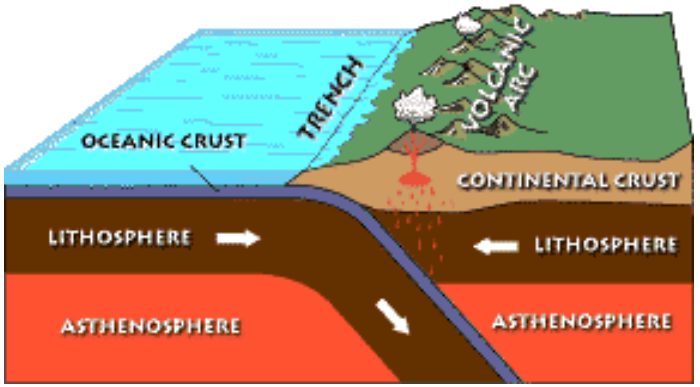
At the end of the Eocene about the time that Florissant fossils were beginning to form, ocean and air currents circulated in a different pattern.

Once South American and Australia broke away from Antartica and Central America was above sea level, the Pacific currents flowed south. They picked up cold Antartic water and air to bring up into the Northern Atlantic.



Was Florissant's elevation lower, could account for the vegetation changes.

Dr. Emmet Evanoff, hypothesized in 1997 that the region has been uplifted since the Eocene and proposes that the uplift began only 5 million years ago.



His technique of evaluation is based on sedimentary deposits in stream beds to calculate the relative age of tilting and canyon cutting.

	Paleo-Temp (Modern 4 C)	**Technique for Temp.**	**Elevation** (Currently 2600m)	**Technique for Elev.**
Harry MacGinitie (1953) Compared fossil plants to the habitat of their closest living relatives, he predicted a low paleo-elevation.	>18 degrees C	***Floristic*** Closest living relative	305-915 meters	Qualitative analysis using closest living relatives and current habitat.
Dr. Herb Meyer (1986) Studied fossil leaf structures to predict past climate and elevation.	About 14 degrees C	***Physiognomic*** First to apply plant features to the problem of paleo-elevation at Florissant.	2450 meters	Compared Florissant flora with co-eval sea level flora and calculated elevation using an inferred lapse rate.
Dr. Jack Wolfe (1992) Studied fossil leaves to calculate past temperature and elevation.	12 degrees C	***Physiognomic*** Compared leaf structures at Florissant with current leaf structures to est. temp.	2700-2900 meters	Compared fossils from Florissant with sea level fossils and calculated elevation using lapse rate.

Dr. Kate Gregory (1994) Studied fossil leaves and sequoia stumps to calculate past temp, and believes Florissant has not been uplifted since Eocene	10.7 degrees C	***Physiognomic*** Plant features and *sequoia affinis* tree ring comparison.	2300-3300 meters	Compared paleo temps at Florissant with *co-eval* (same age) temps from sea level and calculated using a lapse rate.
Dr. Emmett Evanoff (1997) Hypothesized that the Florissant region has been uplifted since the Eocene.		*Uplift* – due to plate tectonics	Lower than present elevation. Proposes that uplift began only 5 million years ago.	Studied sediment deposition in stream beds to calculate relative age of tilting and canyon cutting.
Woodland High School Classes (2000) Hypothesized that the decrease in average temperature at Florissant since the Eocene could be caused by uplift.	"Warm Temperate" About 12 degrees C.	***Floristic*** Comparing fossil plants to closest living relative's habitat.	Lower than present elevation. Present elevation is 2600 meters.	Propose to study landscape for evidence of Uplift. This would be *geomorphic* evidence.