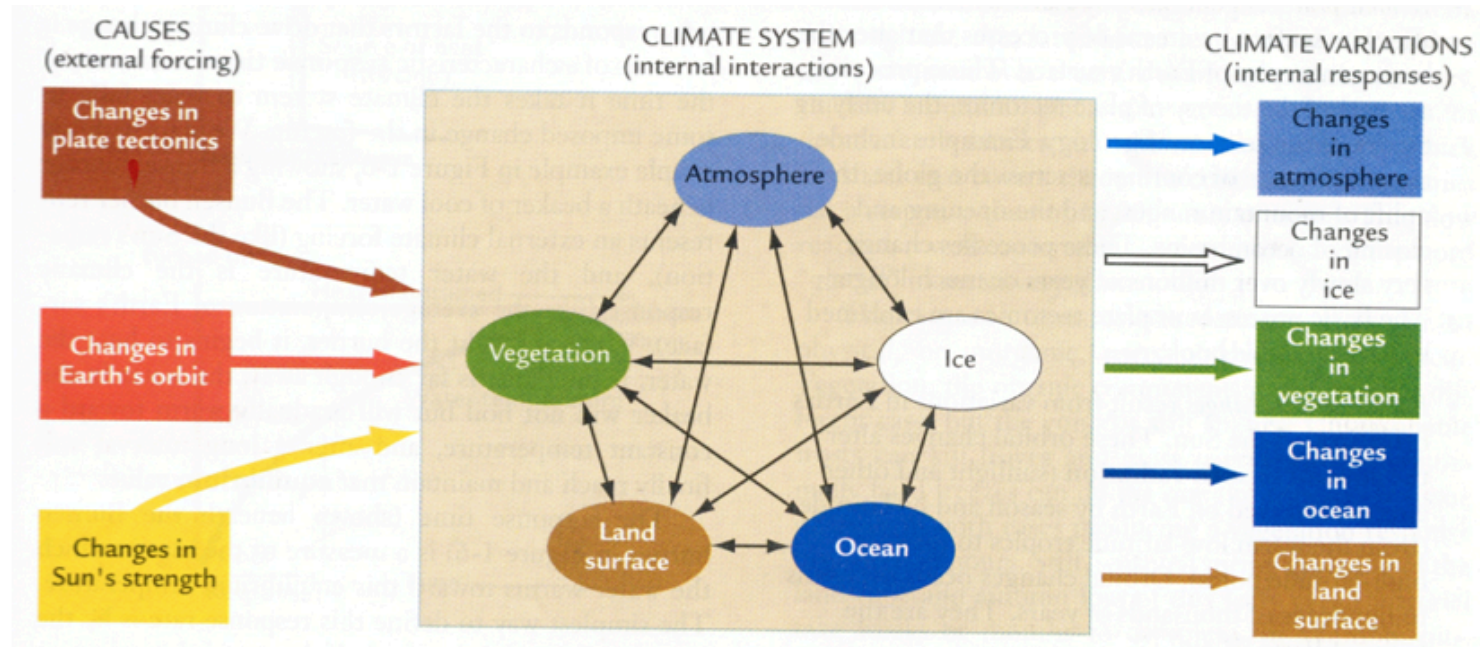


Exam Review

Causal Chains

Milankovitch Cycles... redux

# Causal Chains



## Change in External Forcing

- causes atmosphere to change .... How/effect?
- causes cryosphere (ice) to change.... How/effect?
- causes hydrosphere (ocean) to change.... How/effect?
- causes geosphere (land) to change.... How/effect?
- causes biosphere (vegetation) to change.... How/effect?

Greenhouse Gas => warmer

Melts ice => more liquid water

Sea level rise => reduce land area

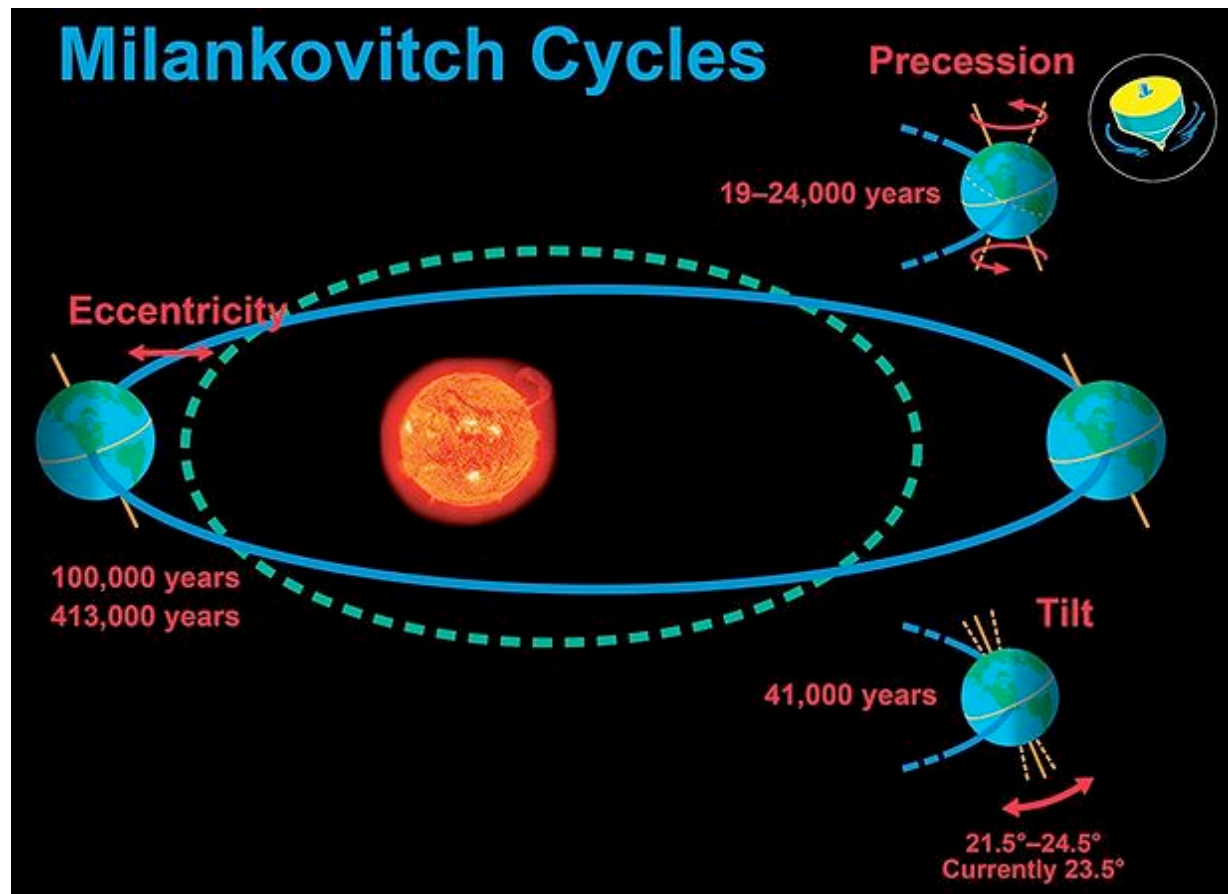
More land for plants => more plants

More plants => reduce CO<sub>2</sub> in air

# External Forcings – Changes in Earth's Orbit

## Orbital Patterns

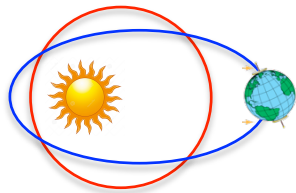
Eccentricity –	elliptical orbit	(100,000 & 400,000 years)
Obliquity –	variable tilt	(~40,000 years)
Precessions –	wobbly top	(~20,000 years)



## Heavenly Bodies Demonstration

# External Forcings – Changes in Earth's Orbit

Now 200 400 600 800 1000 kyr ago

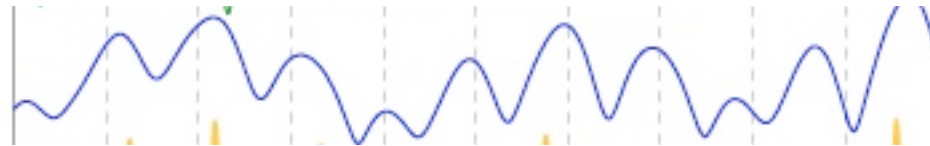
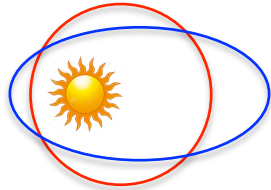


# External Forcings – Changes in Earth's Orbit

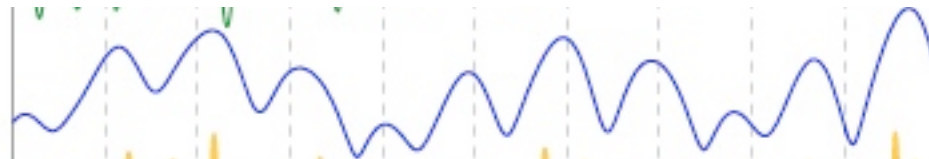
Now 200 400 600 800 1000 kyr ago

More  
Tilt

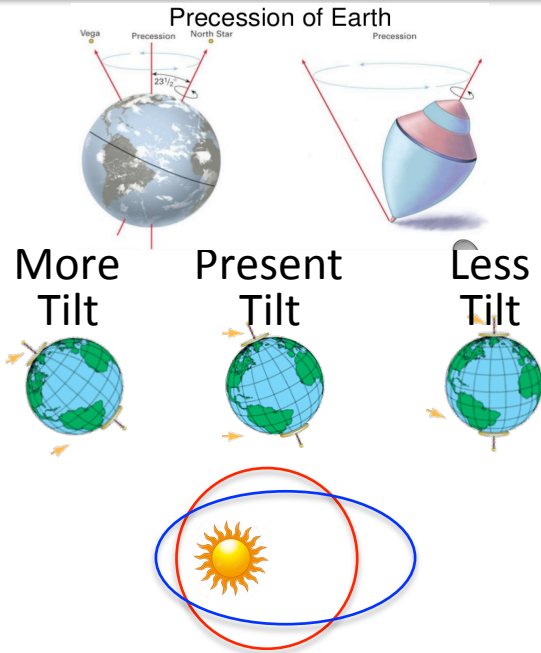
Present  
Tilt



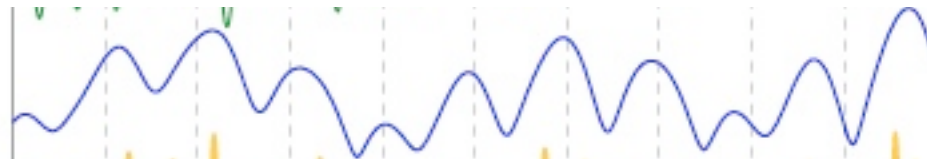
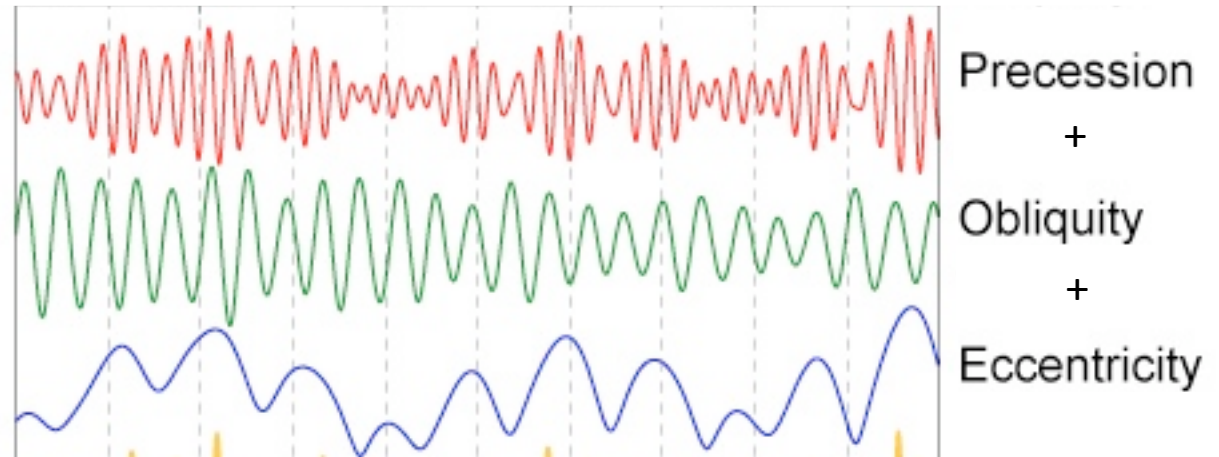
Eccentricity



# External Forcings – Changes in Earth's Orbit

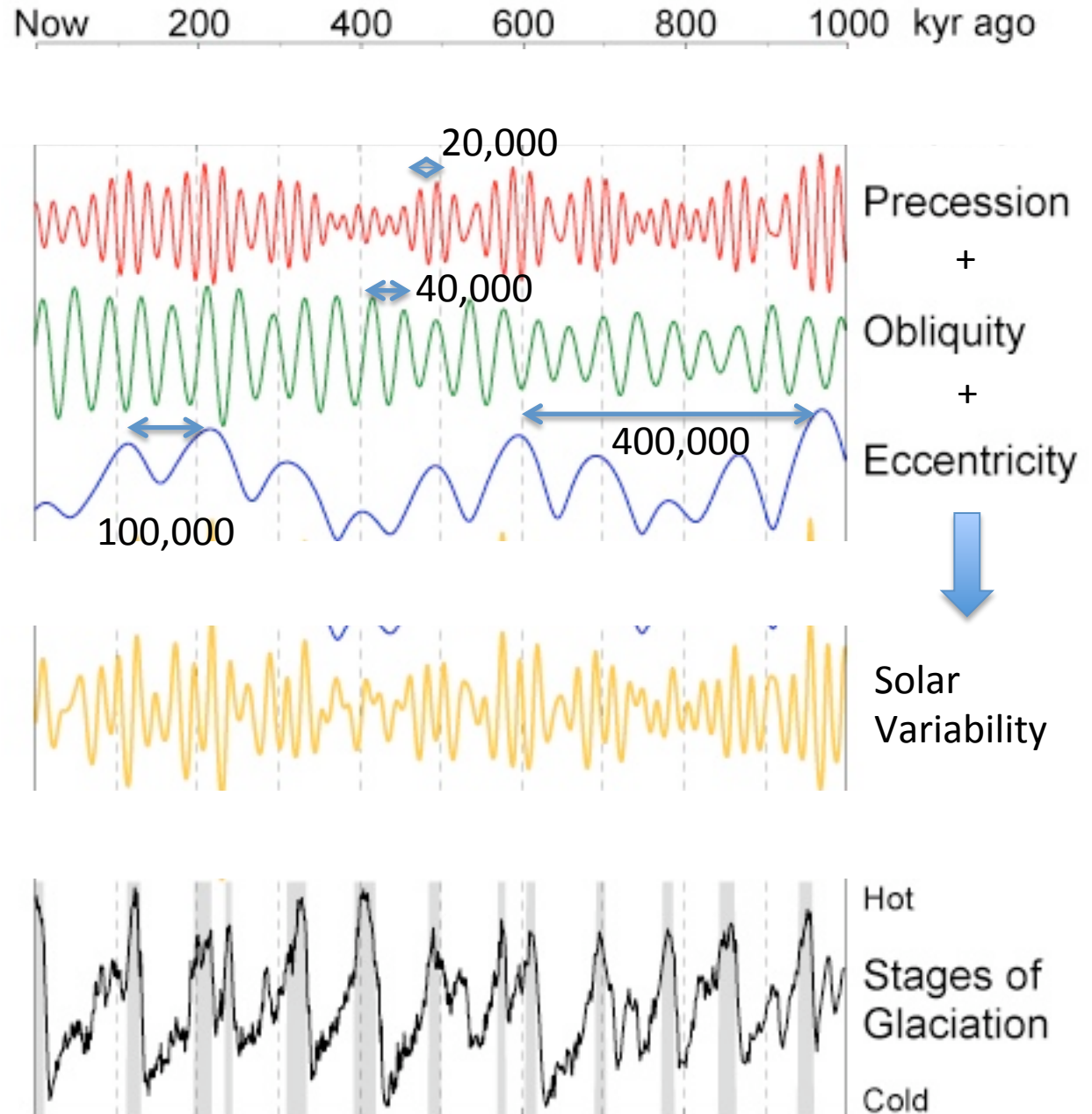
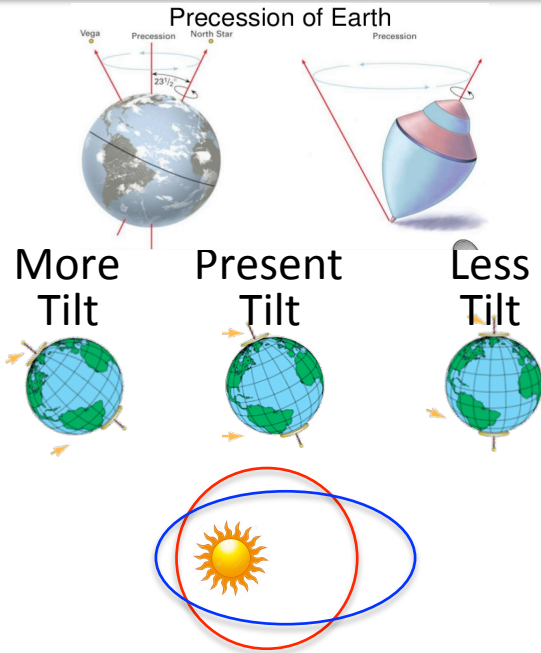


Now 200 400 600 800 1000 kyr ago





# External Forcings – Changes in Earth's Orbit

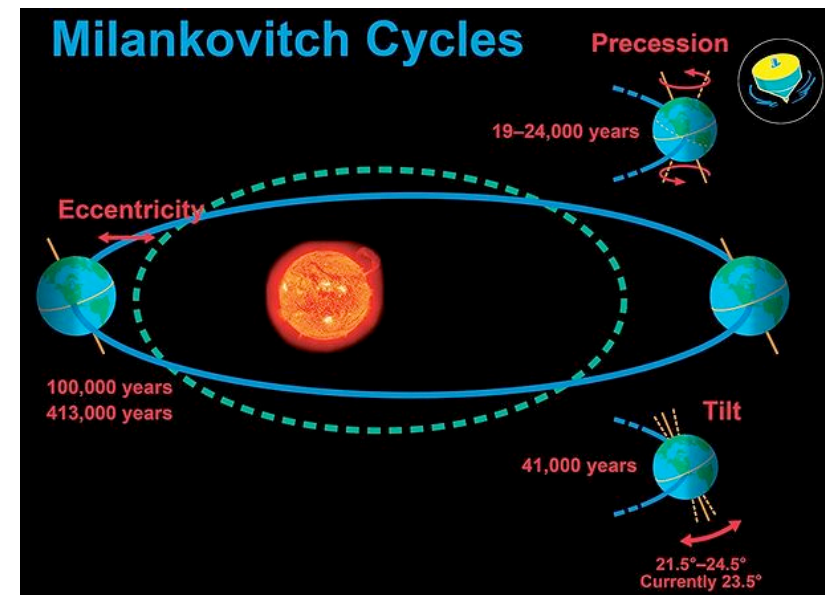




# External Forcings – Changes in Earth's Orbit

## Orbital Patterns

Eccentricity –	elliptical orbit	(100,000 & 400,000 years)
Obliquity –	variable tilt	(~40,000 years)
Precessions –	wobbly top	(~20,000 years)



## Think-Pair-Share

What will happen to global temperatures with no tilt of the Earth?