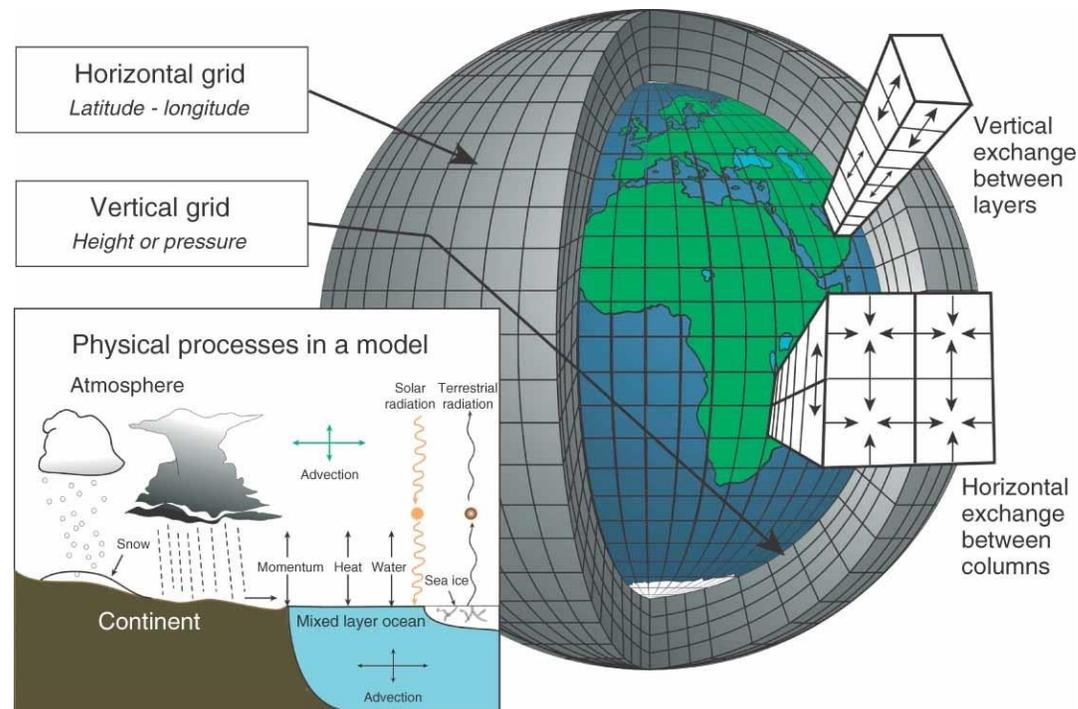


# Conclusiones prácticas de modelos climáticos



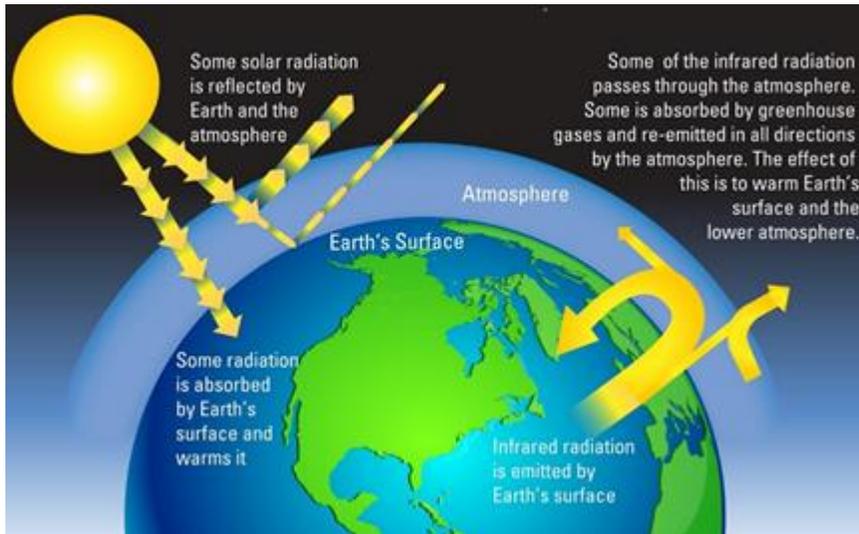
Esteban Rodríguez Guisado [erodriguezg@aemet.es](mailto:erodriguezg@aemet.es)  
Juan Carlos Sánchez Perrino [jsanchezp@aemet.es](mailto:jsanchezp@aemet.es)

# Sistema Climático

Equilibrio radiativo: radiación entrante vs saliente

Sin atmósfera -> 255K

Con atmósfera -> 288K

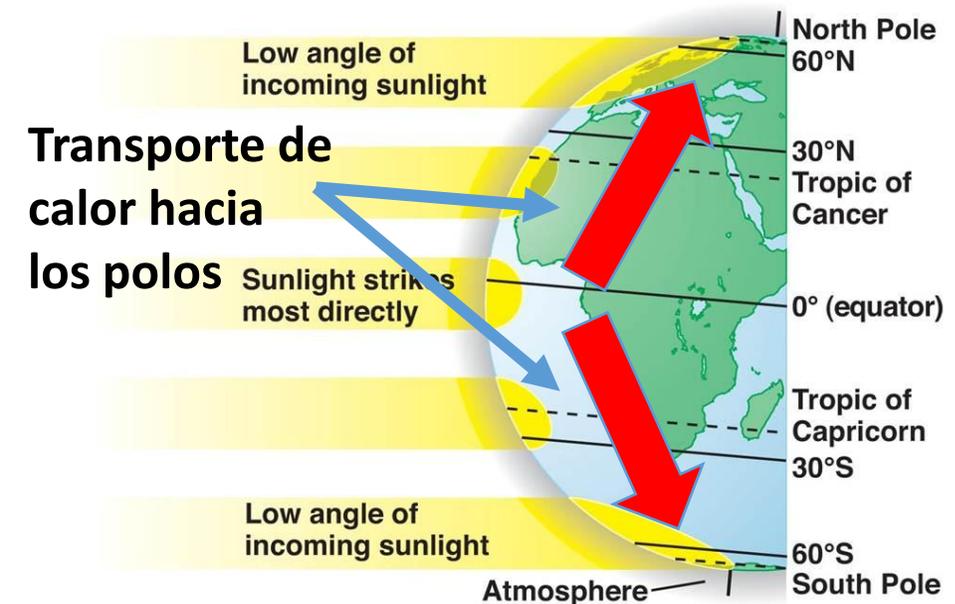
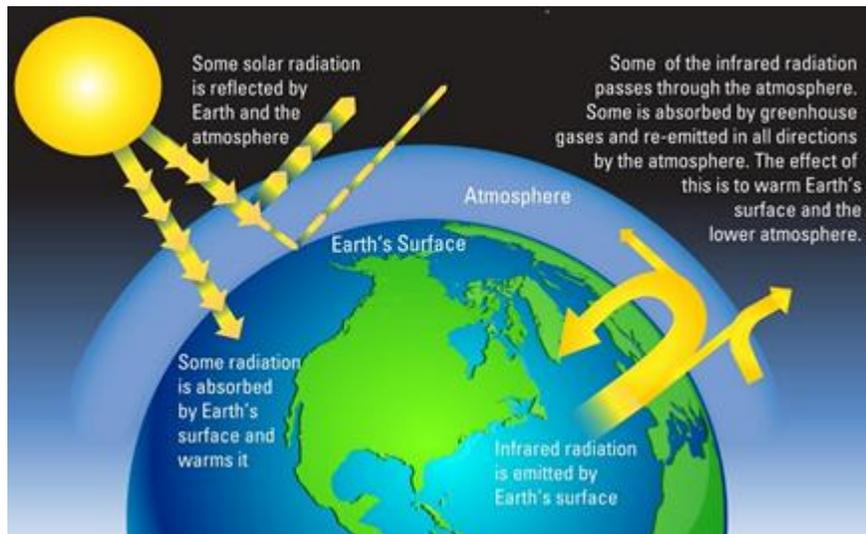


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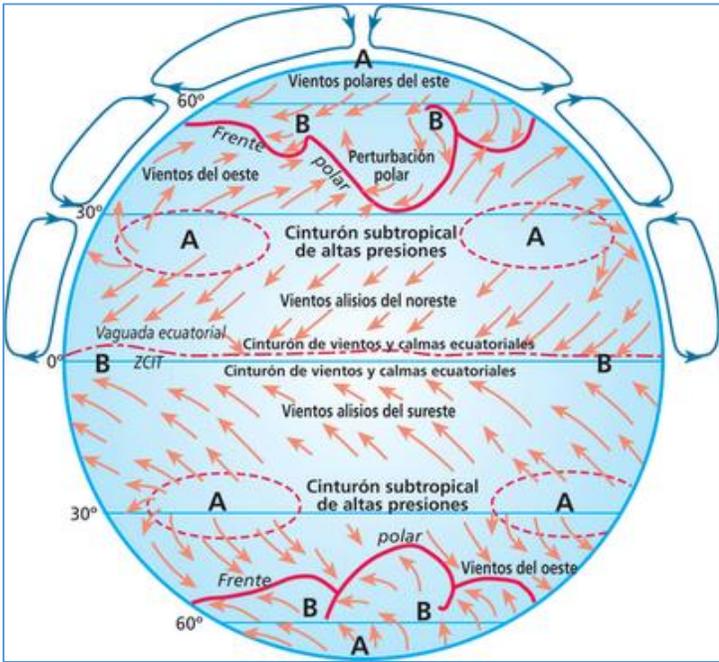
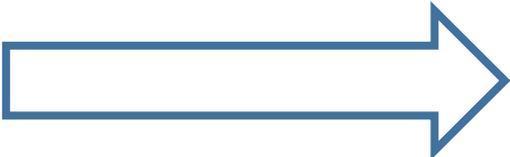
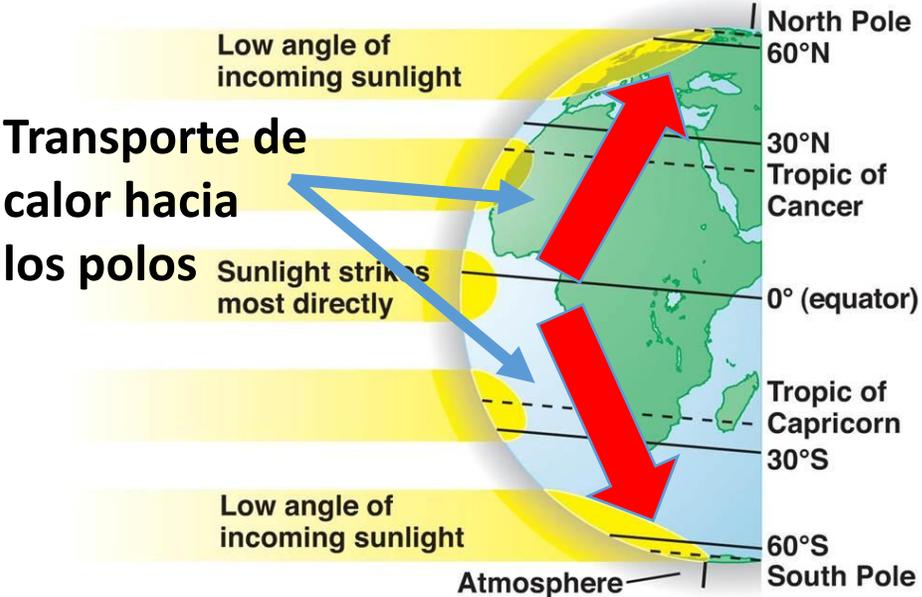
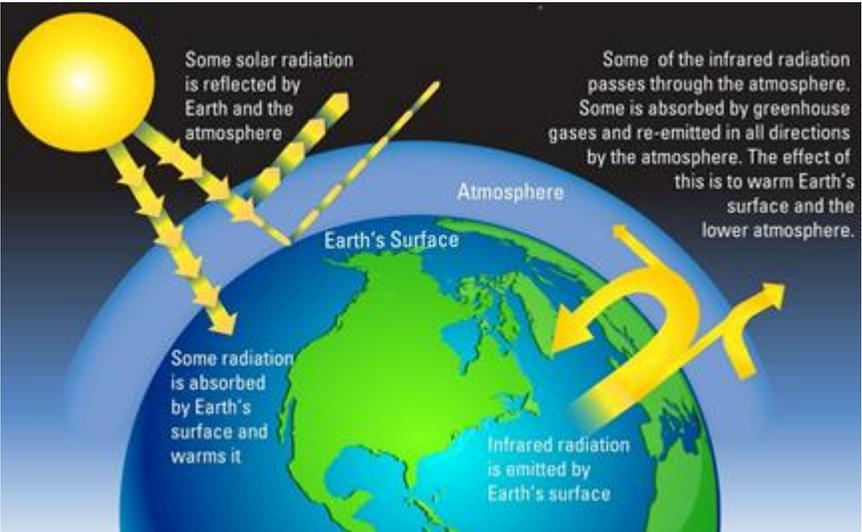


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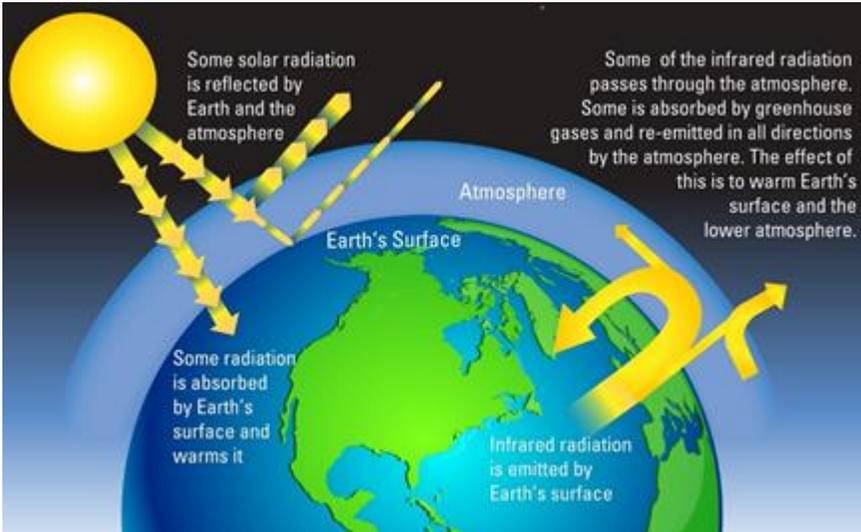


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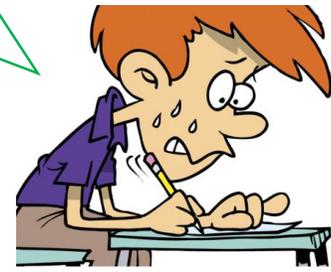
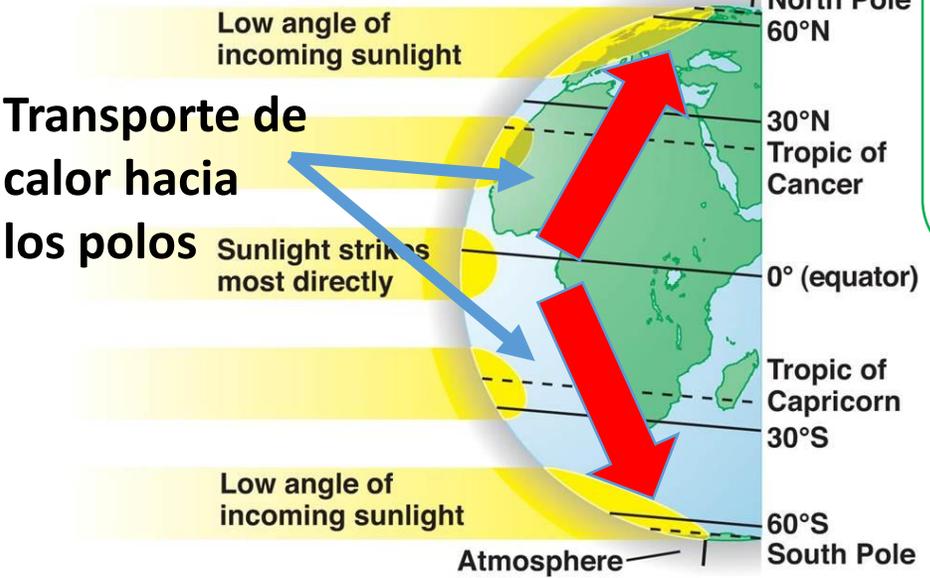
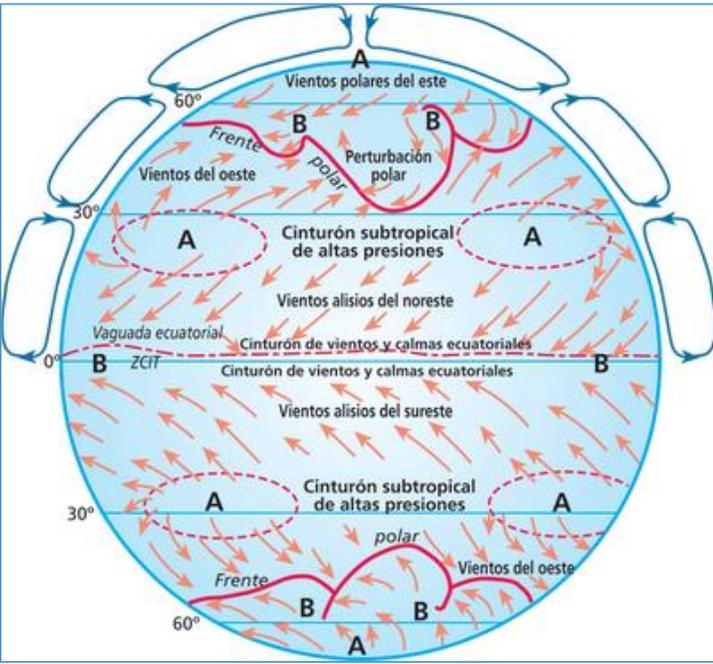


$$\frac{DV}{Dt} + f\mathbf{k} \otimes \mathbf{V} = -\nabla\Phi$$

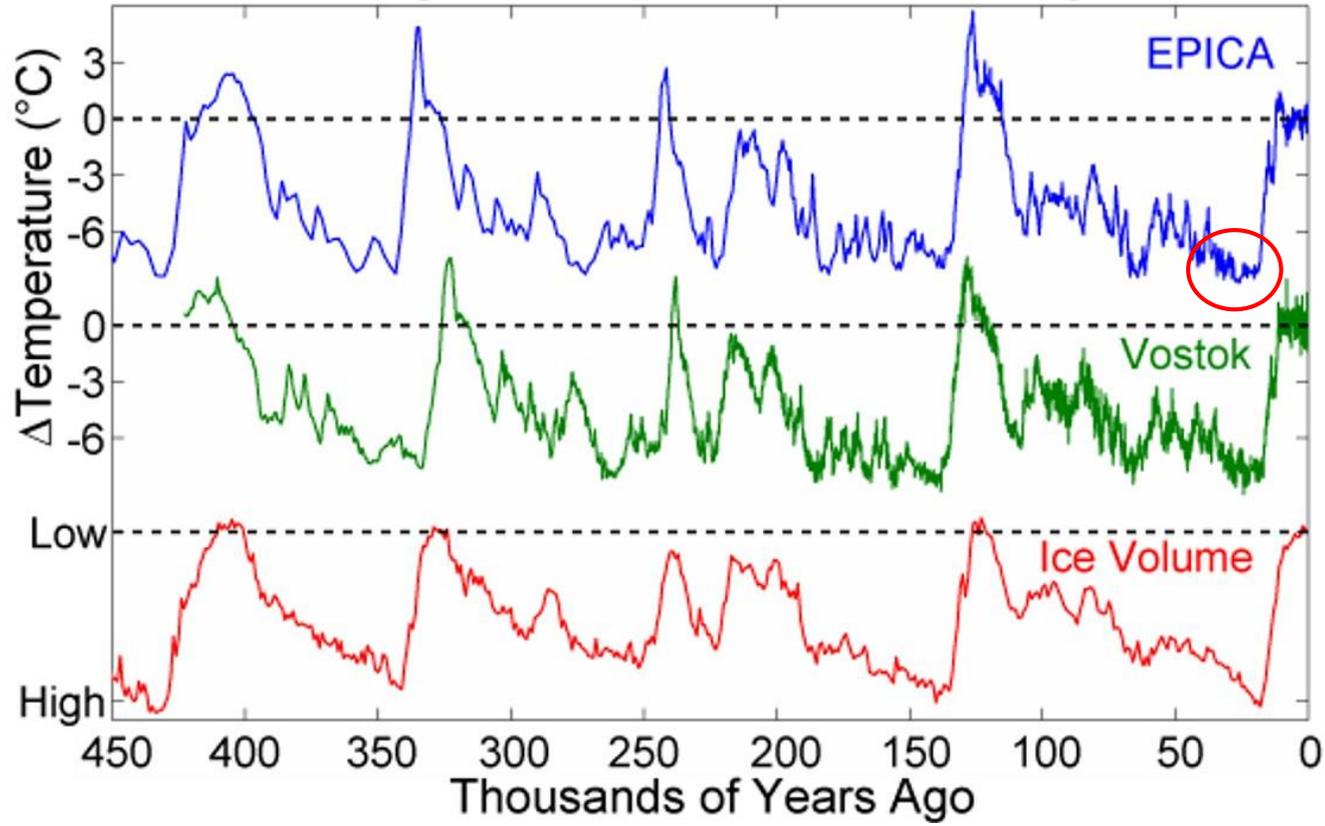
$$\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)_p + \frac{\partial \omega}{\partial p} = \nabla \cdot \mathbf{V} + \frac{\partial \omega}{\partial p} = 0$$

$$\frac{\partial T}{\partial t} + u \frac{\partial T}{\partial x} + v \frac{\partial T}{\partial y} - S_p \omega = \frac{\partial T}{\partial t} + \mathbf{V} \cdot \nabla T - S_p \omega = \frac{J}{c_p}$$

$$\frac{\partial \Phi}{\partial p} = -\alpha = -\frac{RT}{p}; S_p \equiv -T \frac{\partial \ln \theta}{\partial p}$$

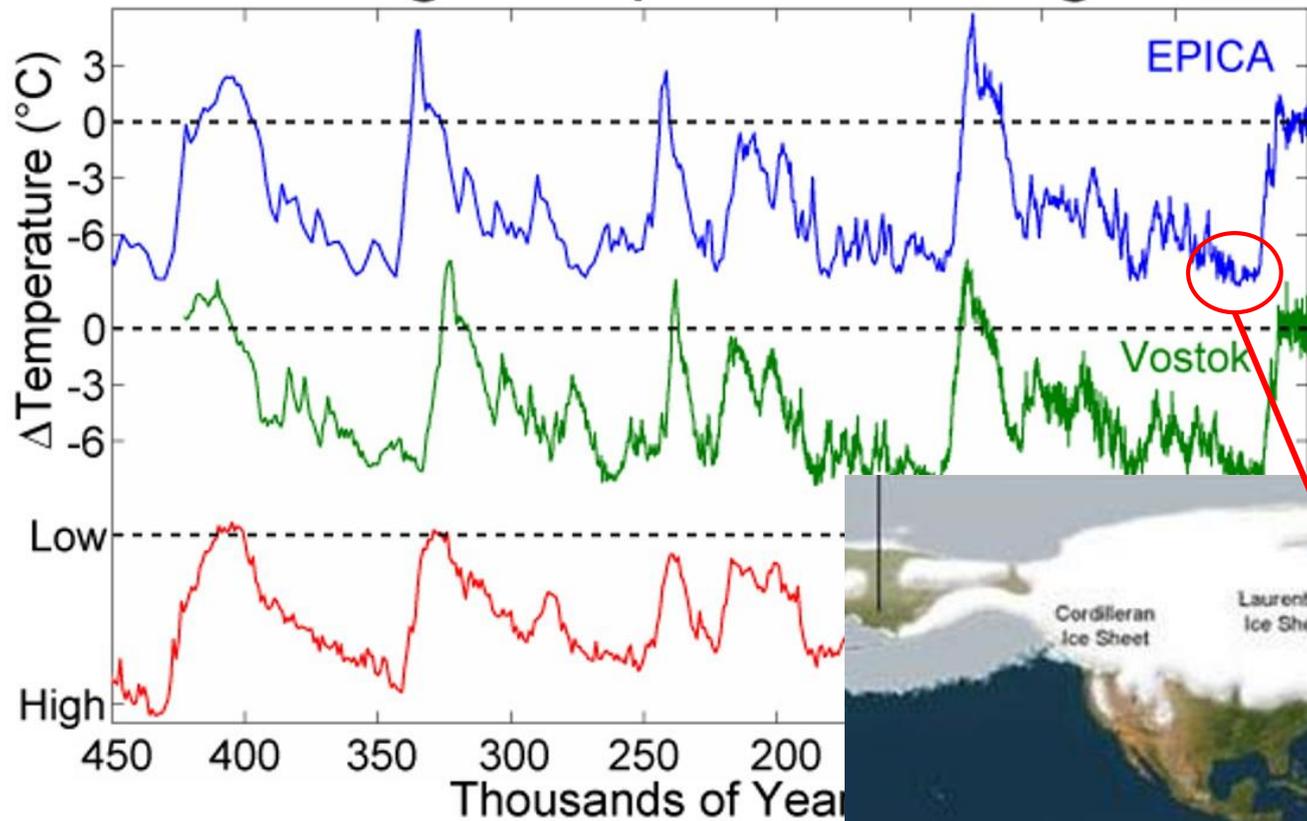


# Ice Age Temperature Changes

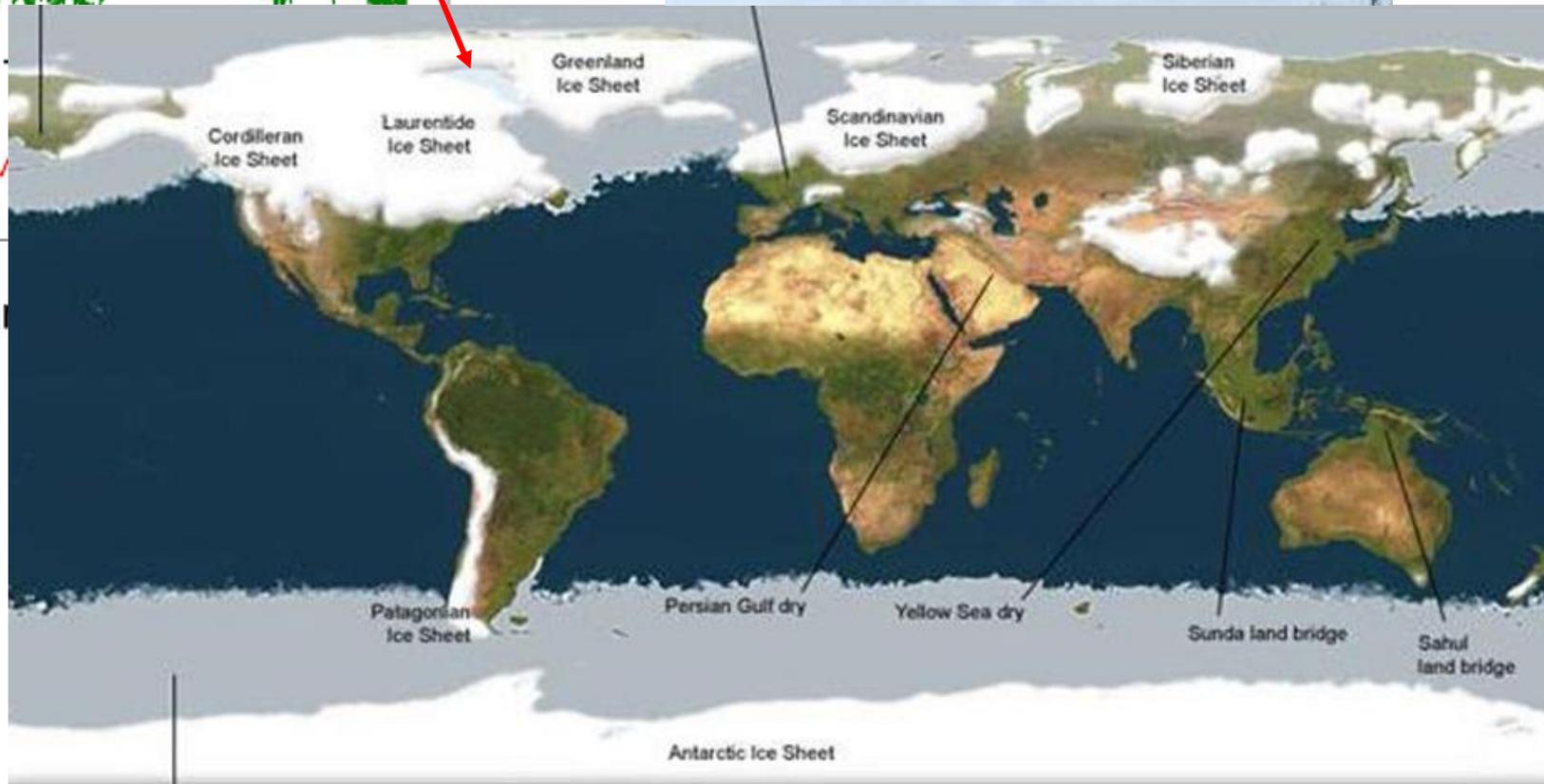


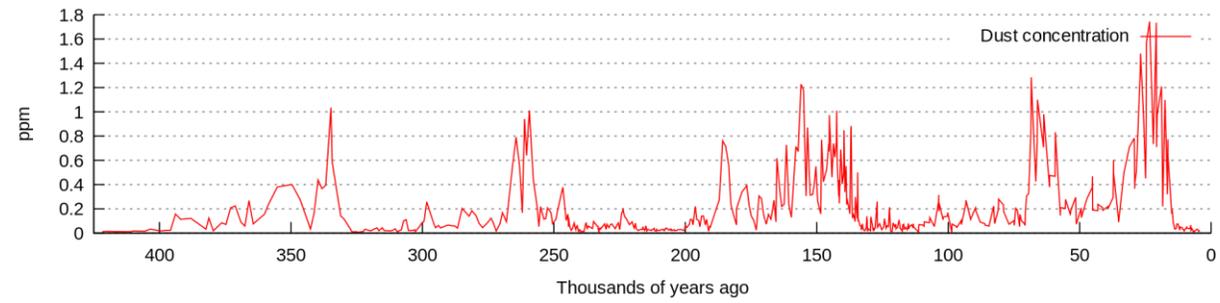
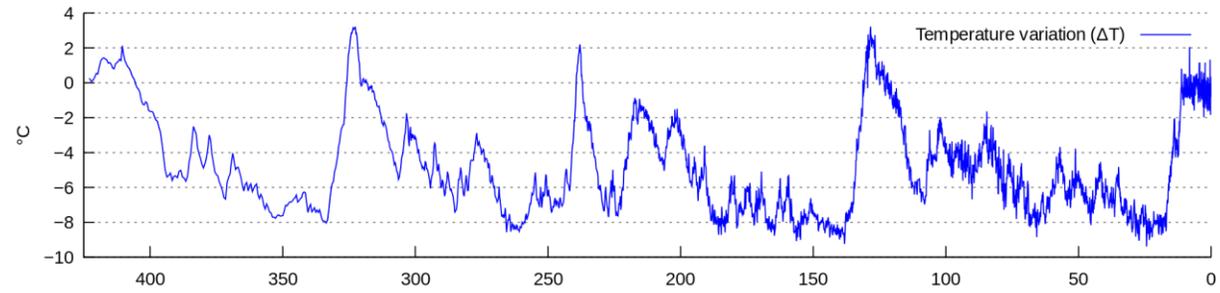
Equilibrio??

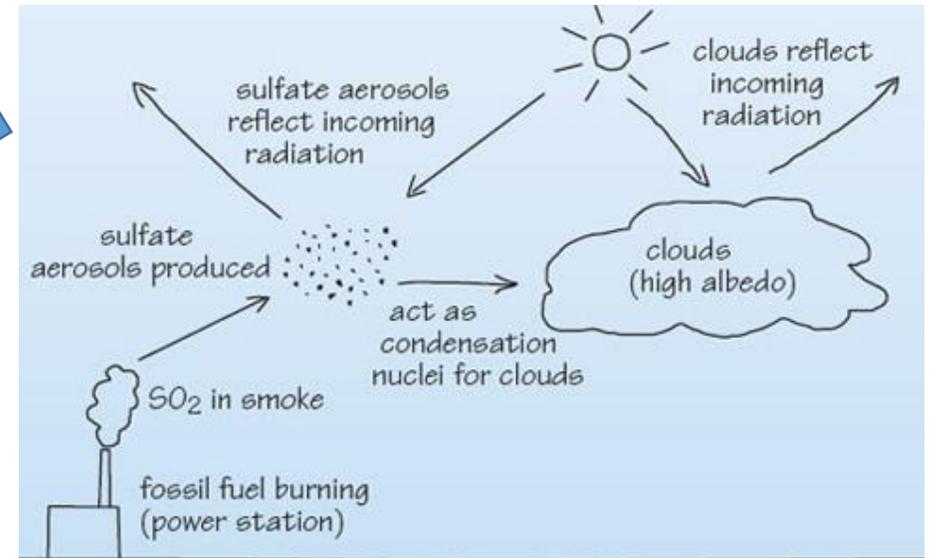
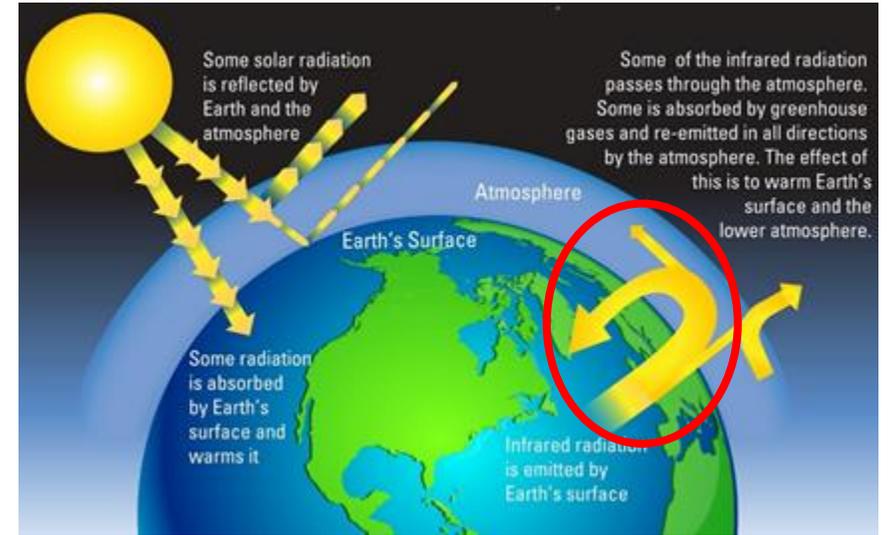
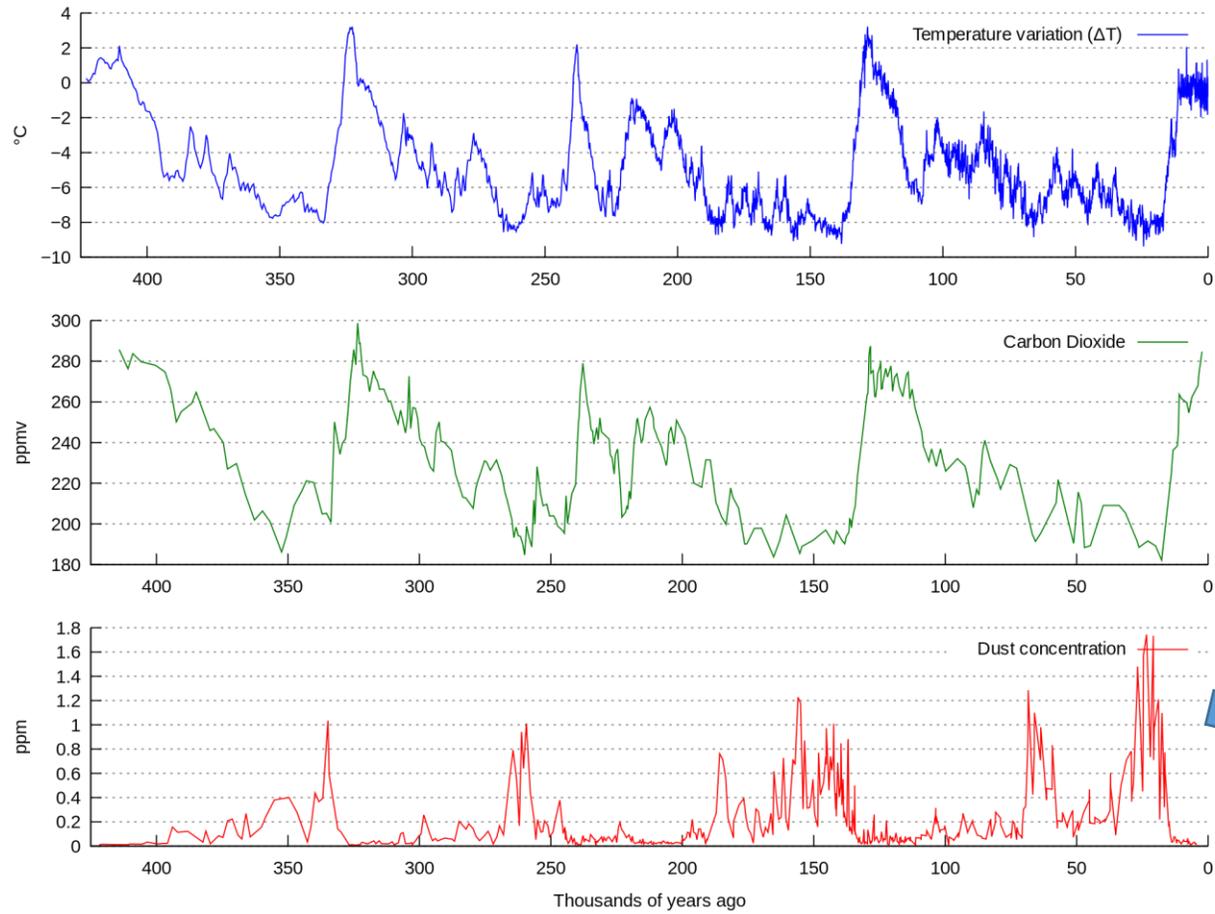
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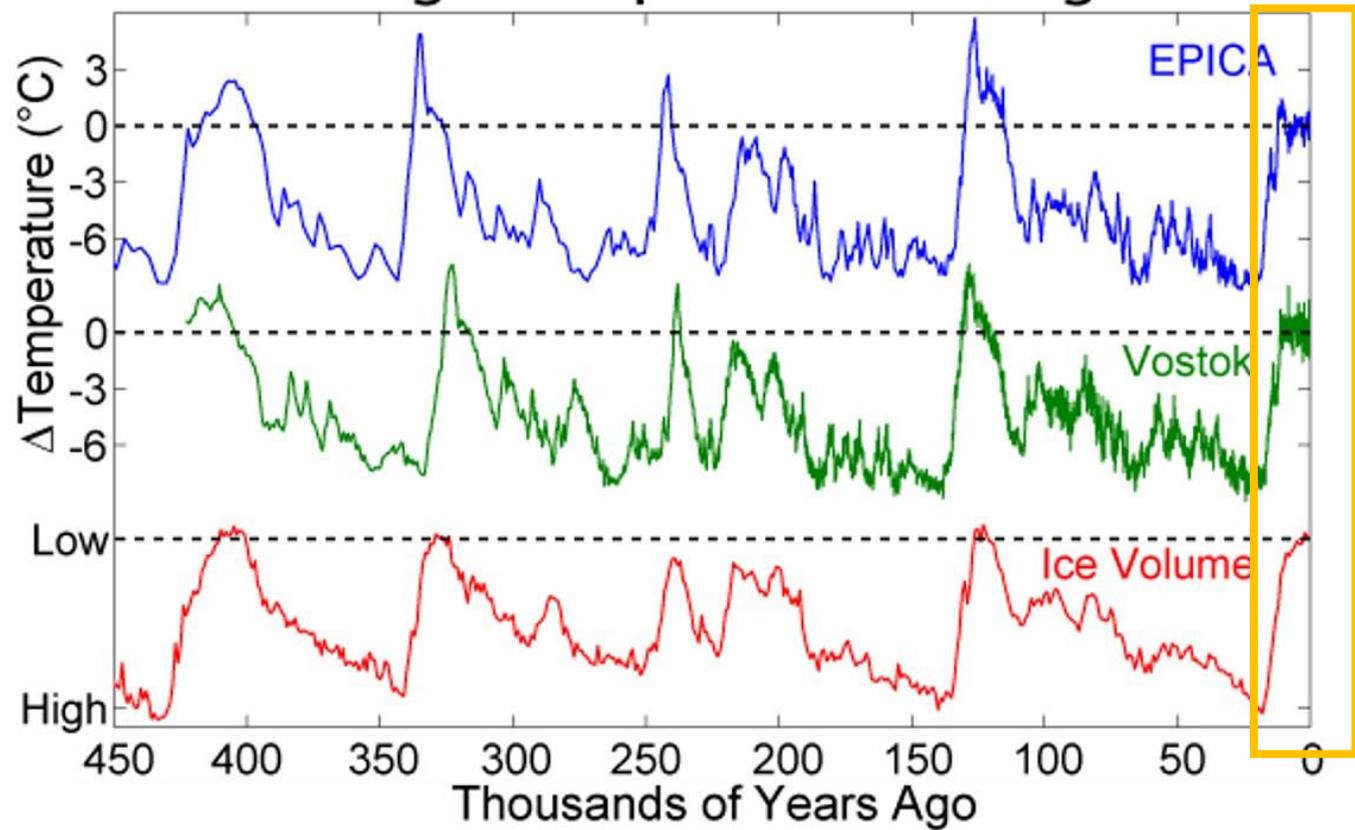
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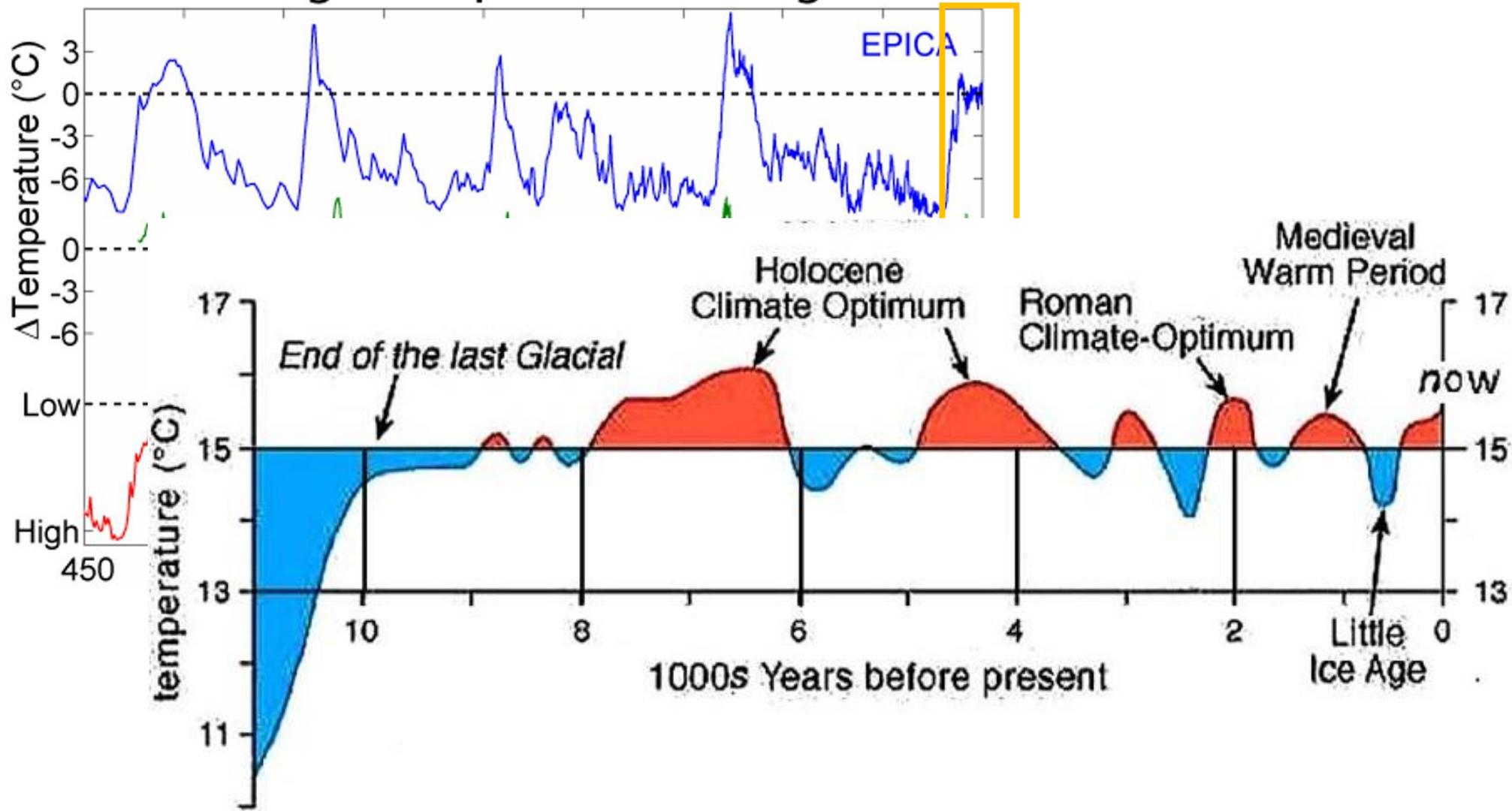




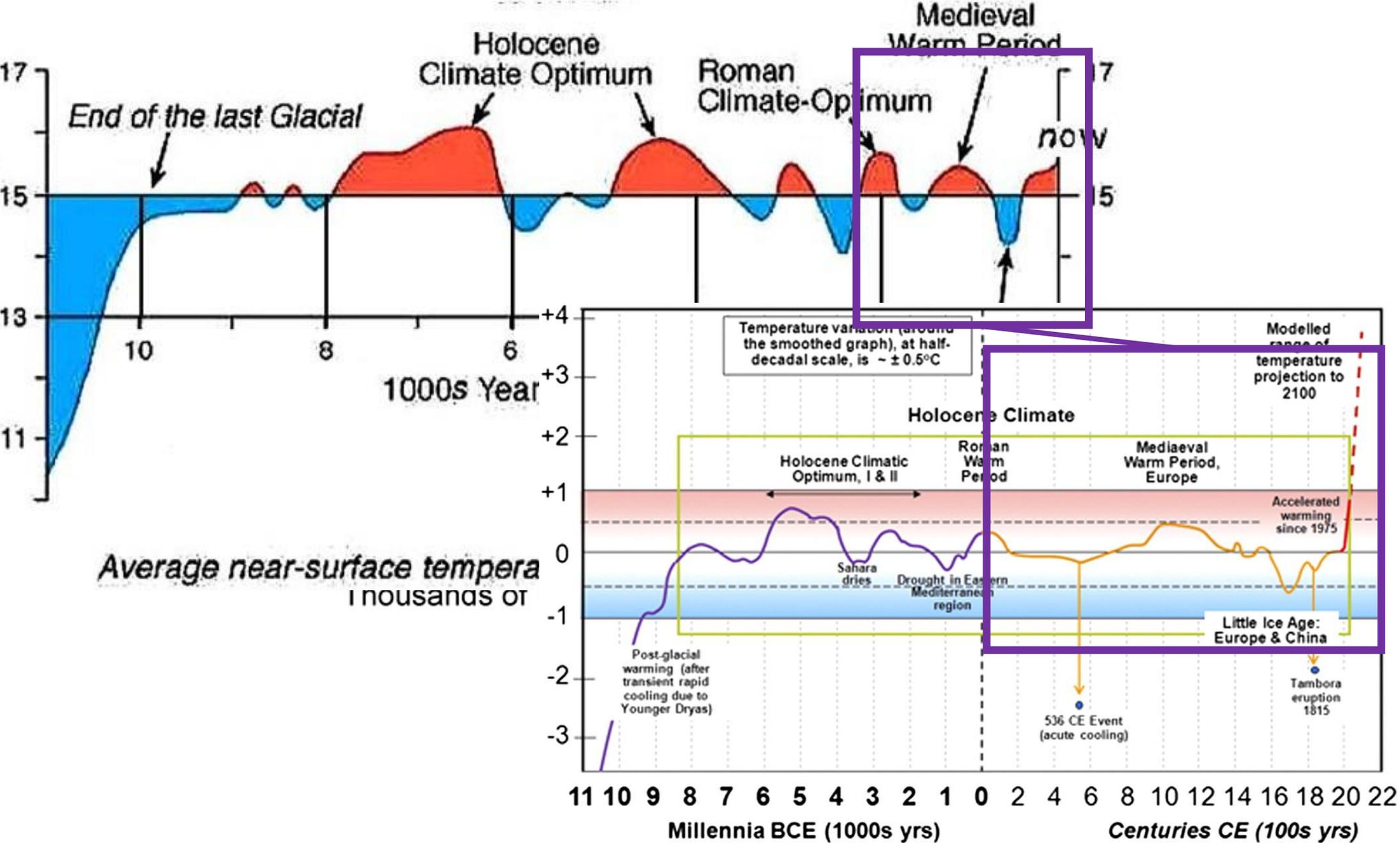
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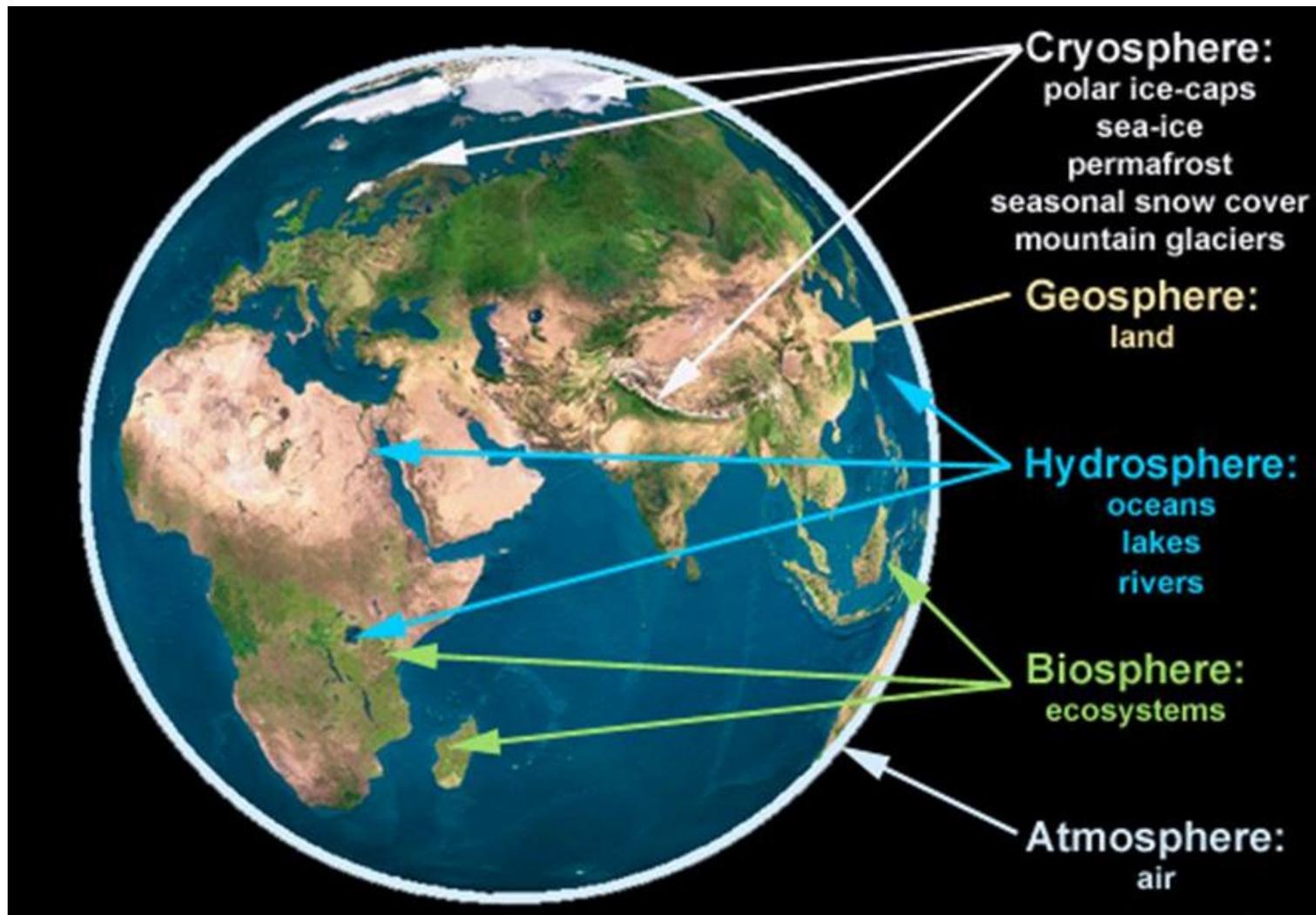
# Ice Age Temperature Changes



*Average near-surface temperatures during the past 11,000 years*

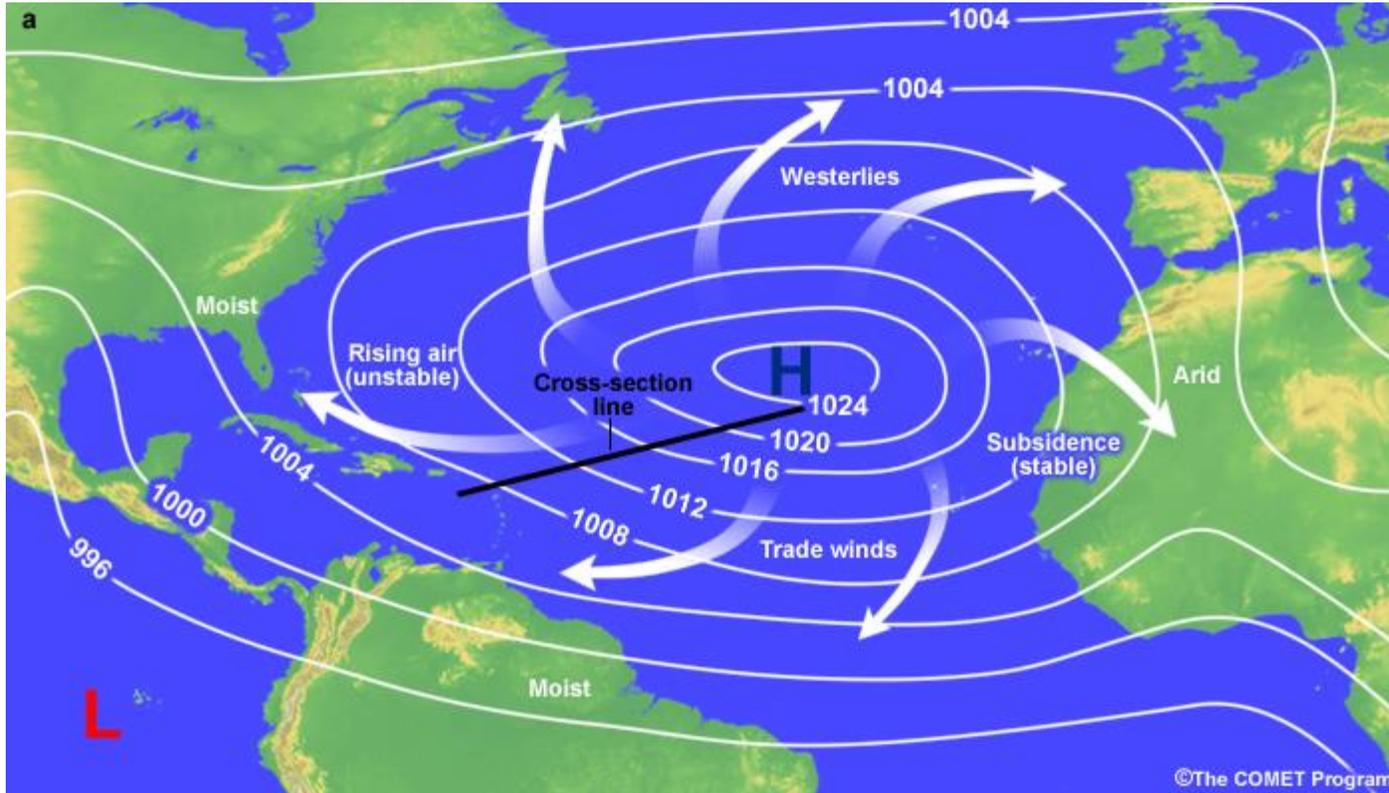


# Sistema Climático: componentes



Escalas temporales y comportamientos muy diferentes, pero relacionados entre sí. Procesos altamente no lineales

## Concepto de retroalimentación o feedback



Forzamiento radiativo +



Temperatura del mar sube



La alta subtropical se debilita



Disminuye la intensidad del viento y la evaporación



# EL HIELO ÁRTICO DESAPARECE

La temperatura aumenta

Hielo Ártico se derrite

El hielo desaparece, las aguas más oscuras absorben más calor.

Yes Magazine



## EL HIELO ÁRTICO DESAPARECE

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Yes Magazine

## Northern Hemisphere

Ice Age & Glacial

Ice Age & Interglacial

No Ice Age or Glacial



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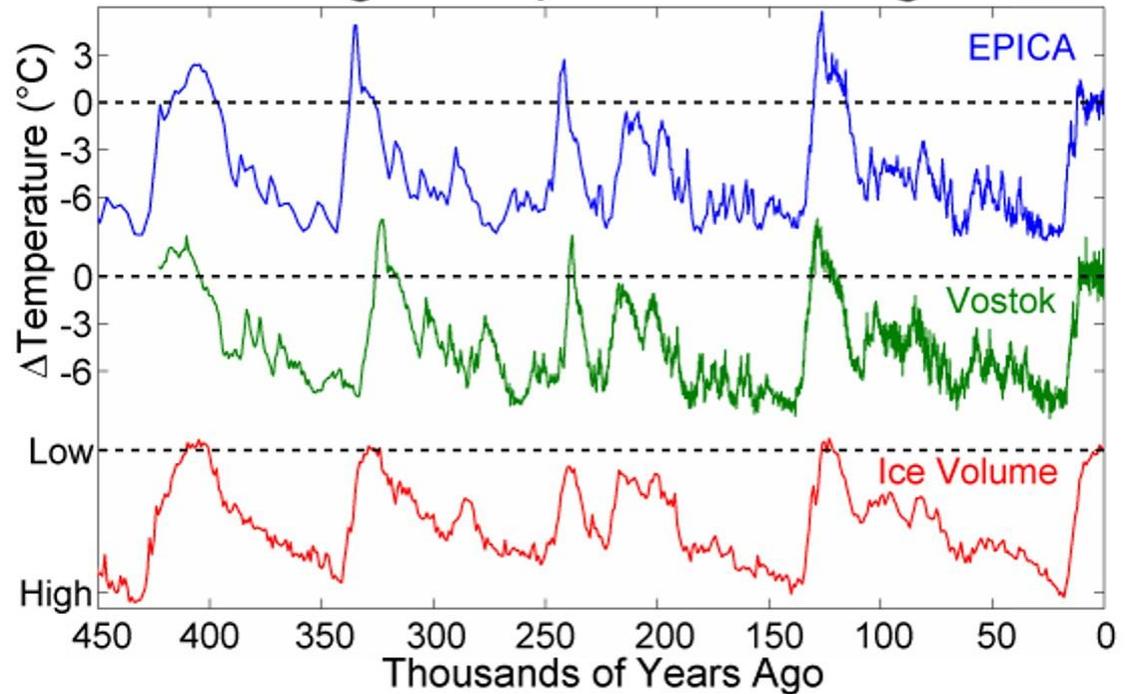
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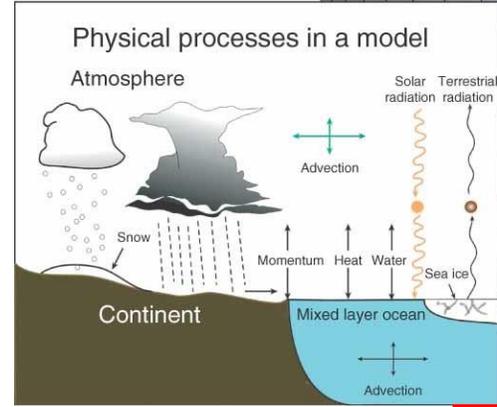
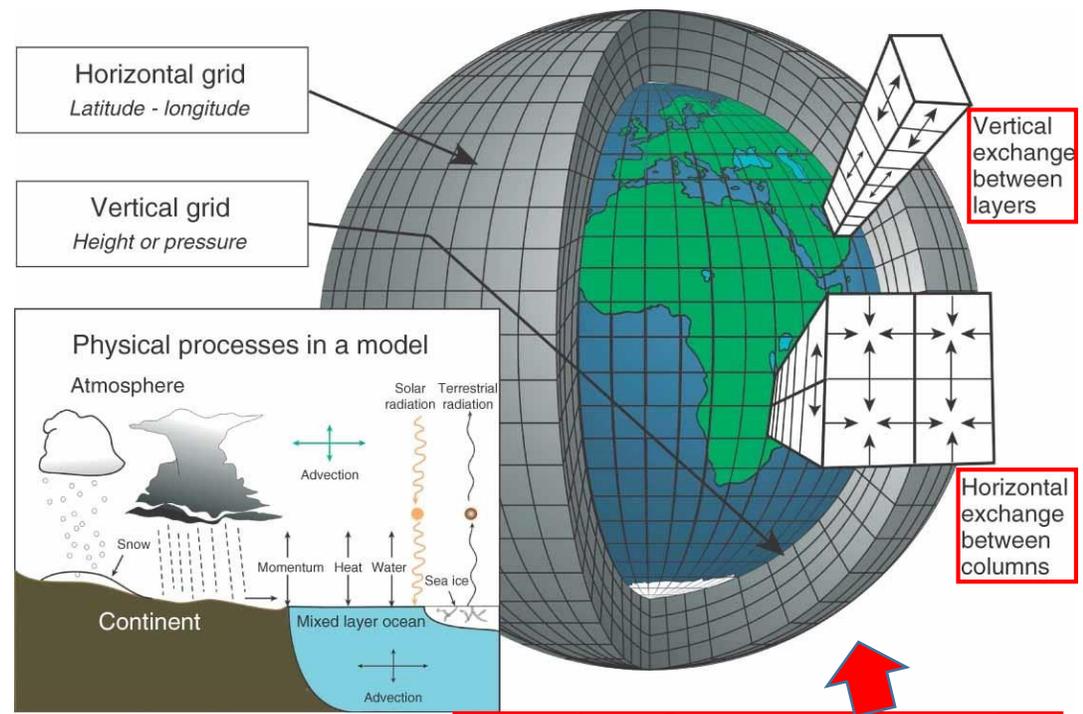
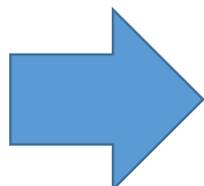


# Ice Age Temperature Changes





Infinity-Imagined.tumblr.com



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