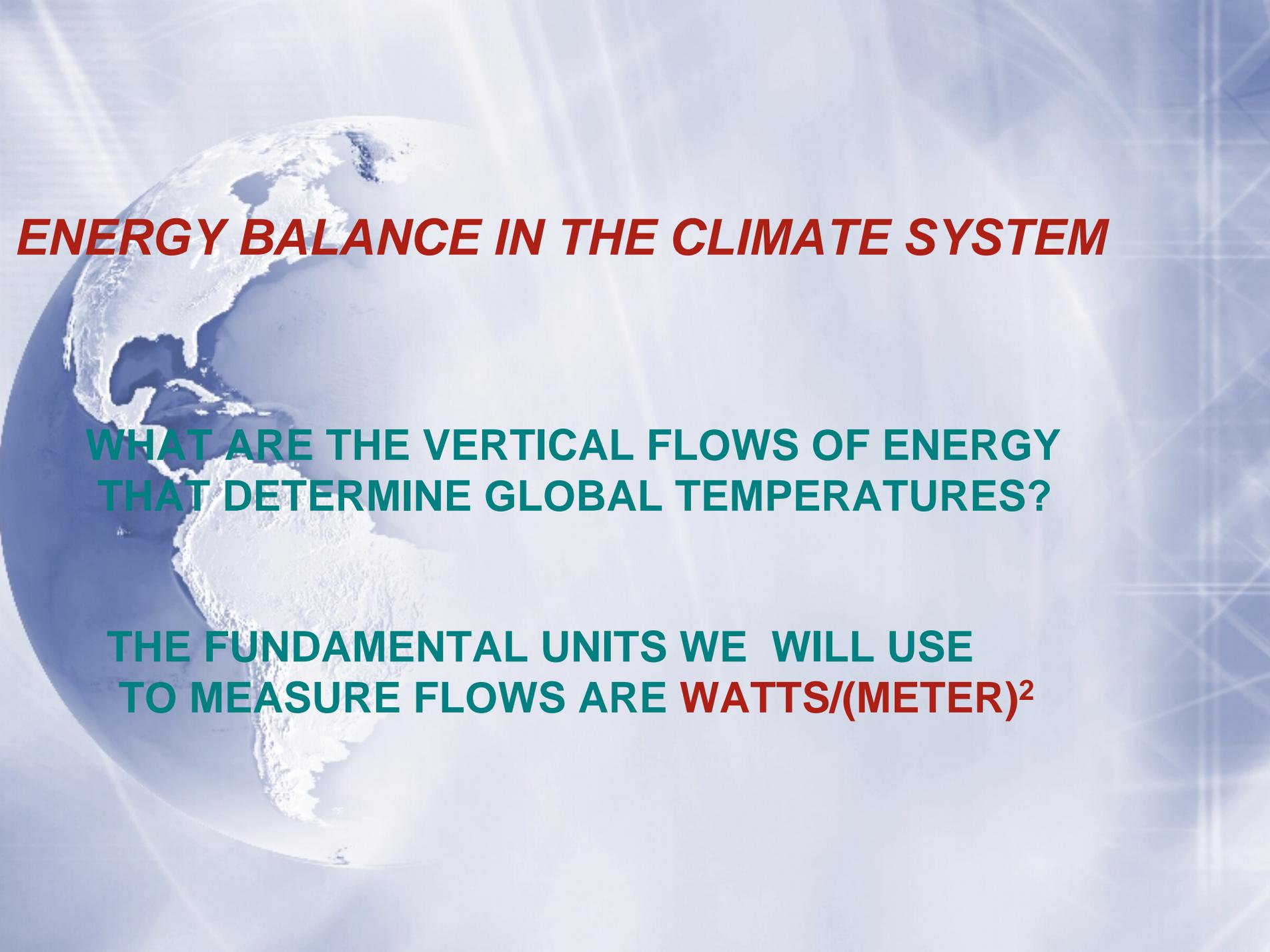


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12.815 Atmospheric Radiation
Fall 2008

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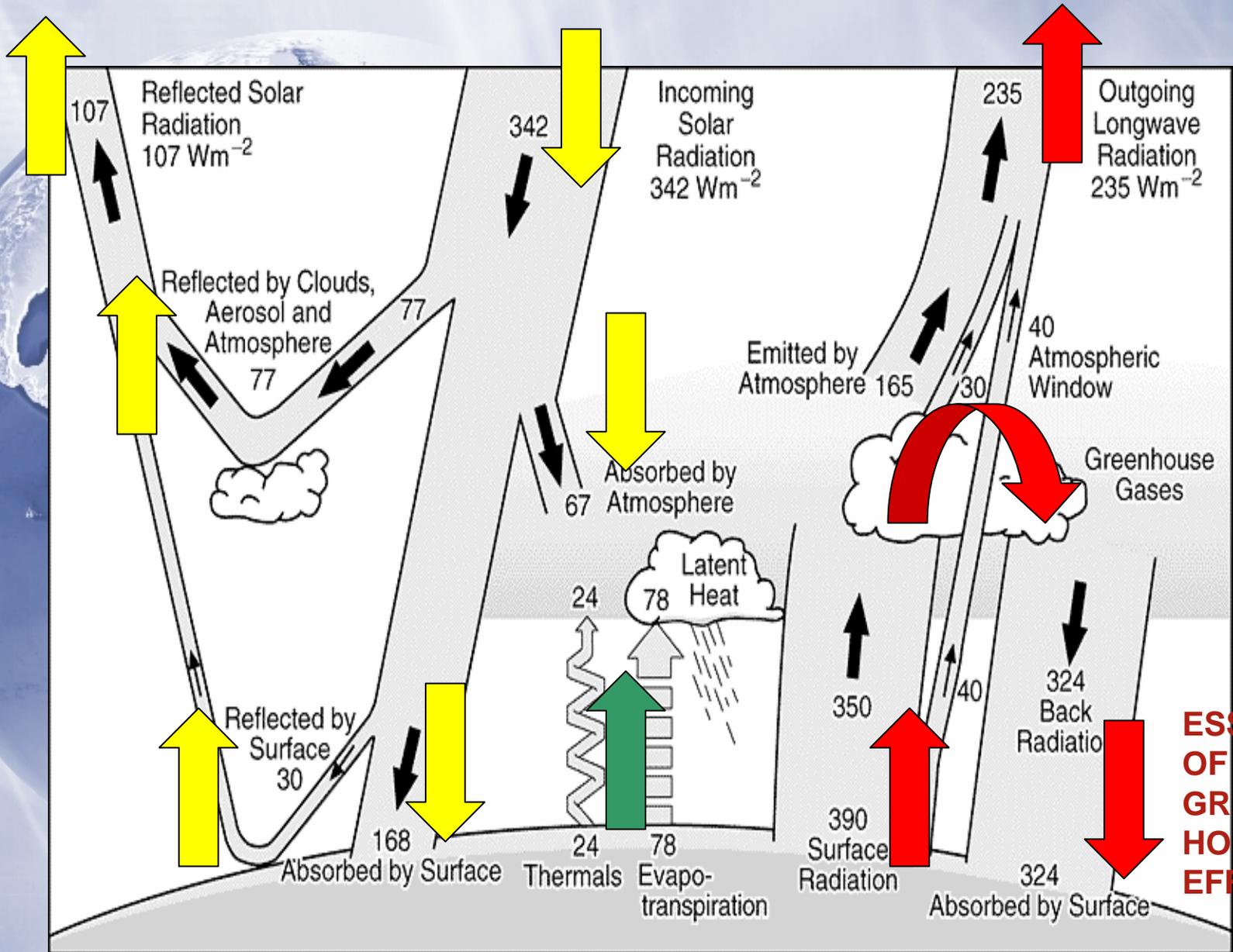


ENERGY BALANCE IN THE CLIMATE SYSTEM

WHAT ARE THE VERTICAL FLOWS OF ENERGY THAT DETERMINE GLOBAL TEMPERATURES?

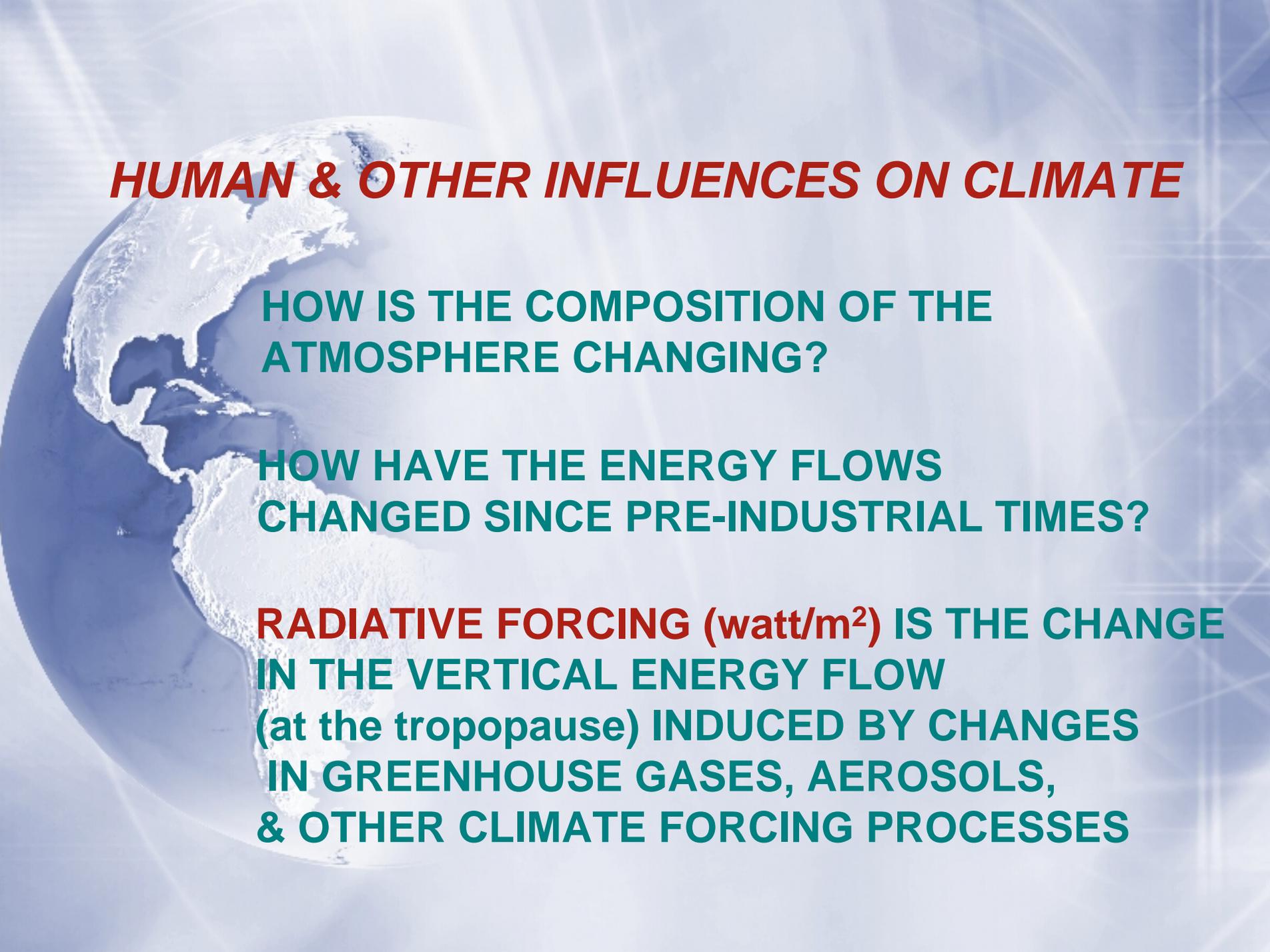
THE FUNDAMENTAL UNITS WE WILL USE TO MEASURE FLOWS ARE **WATTS/(METER)²**

ENERGY BALANCE IN THE CLIMATE SYSTEM



ESSENCE OF THE GREENHOUSE EFFECT

Image courtesy of IPCC.



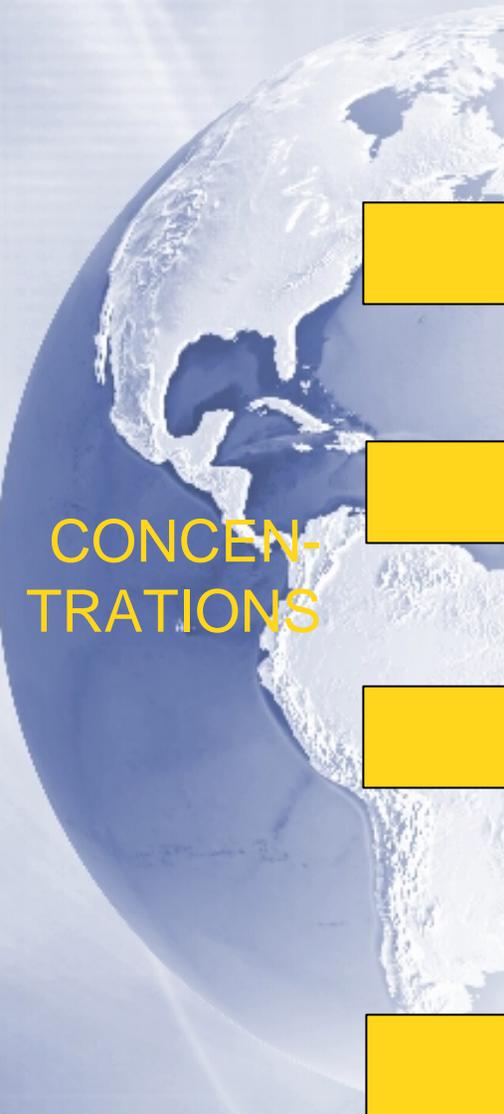
HUMAN & OTHER INFLUENCES ON CLIMATE

HOW IS THE COMPOSITION OF THE ATMOSPHERE CHANGING?

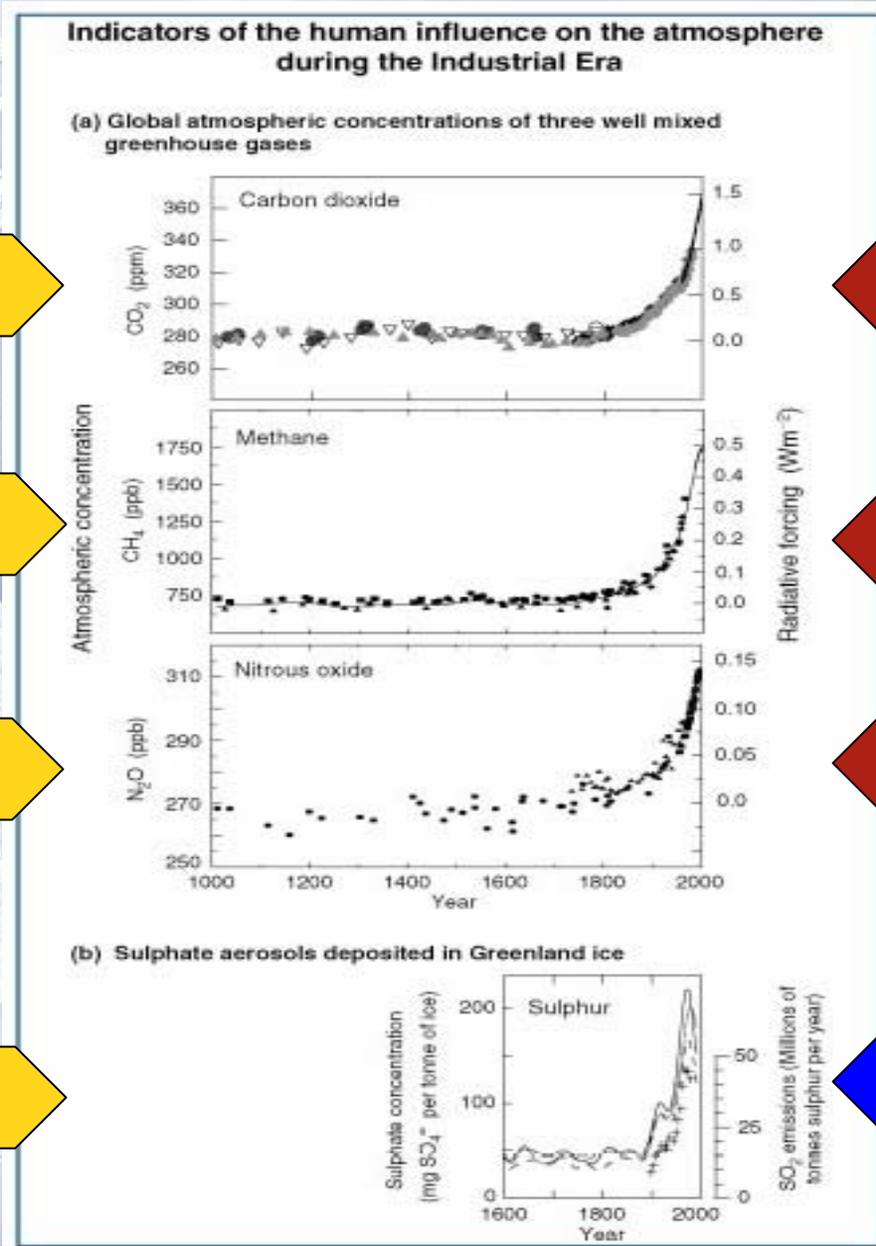
HOW HAVE THE ENERGY FLOWS CHANGED SINCE PRE-INDUSTRIAL TIMES?

RADIATIVE FORCING (watt/m^2) IS THE CHANGE IN THE VERTICAL ENERGY FLOW (at the tropopause) INDUCED BY CHANGES IN GREENHOUSE GASES, AEROSOLS, & OTHER CLIMATE FORCING PROCESSES

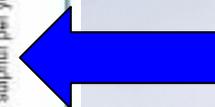
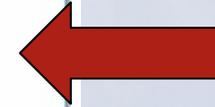
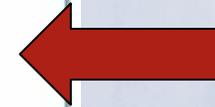
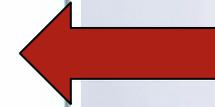
COMPOSITION CHANGES: PREINDUSTRIAL TO PRESENT



CONCENTRATIONS



RADIATIVE FORCING



EMISSIONS

Image courtesy of IPCC.

WHAT ARE THE MAJOR HUMAN & NATURAL ACTIVITIES FORCING CLIMATE CHANGE IN THE INDUSTRIAL ERA (1850-2000)?

Image removed due to copyright considerations.

THERMAL STRUCTURE OF THE ATMOSPHERE

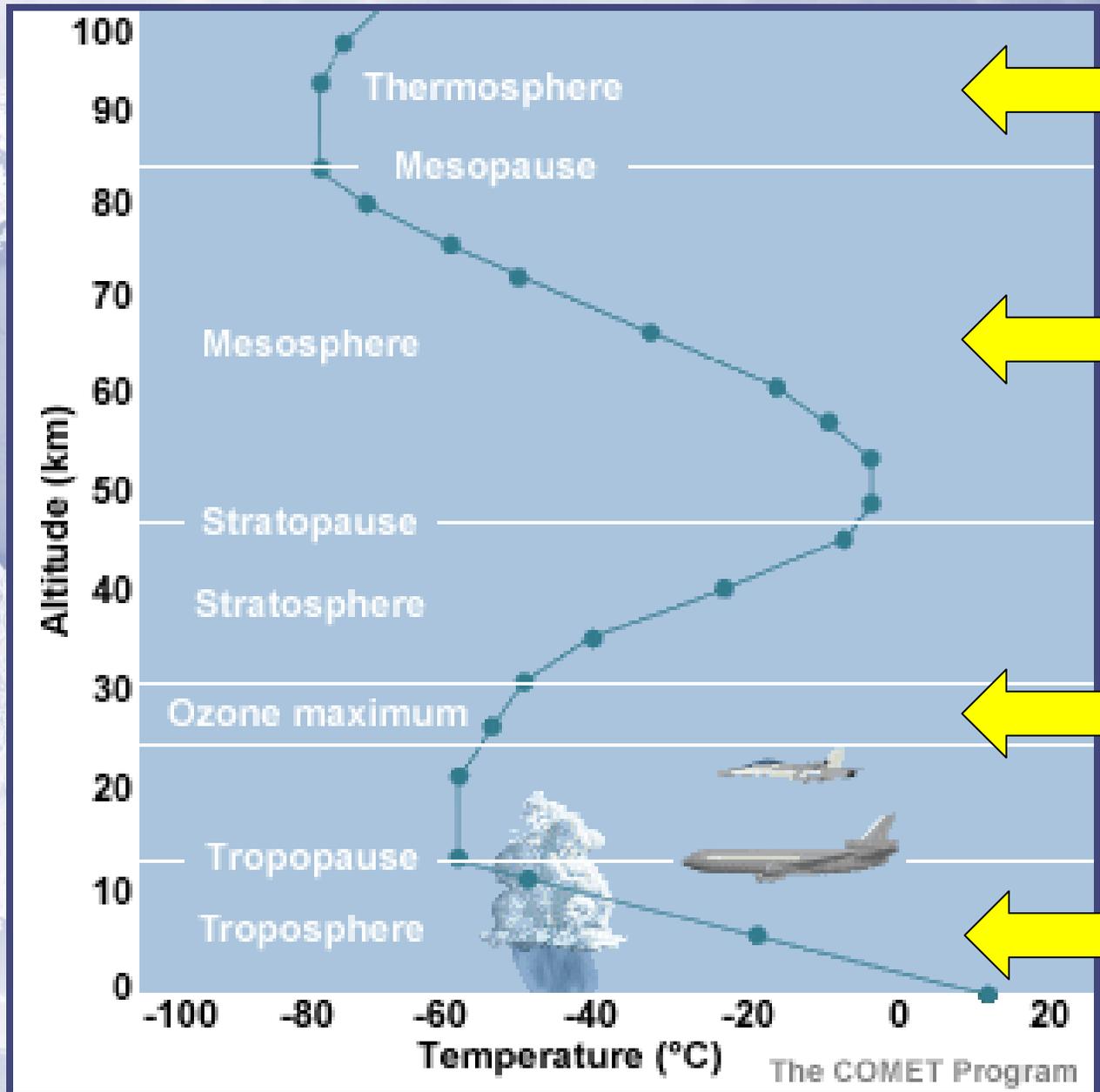


Image courtesy of IPCC.