

## CLIMATE CHANGE 3

### NATURAL CONVECTION AND NOT JUST RADIATION IS A VITAL FACTOR IN UNDERSTANDING CLIMATE CHANGE

Considering the absorption and re-radiation of thermal energy from gaseous CO<sub>2</sub> in the atmosphere WITHOUT considering **NATURAL CONVECTION** is totally WRONG. [CO<sub>2</sub> ONLY affects radiation and NOT Natural Convection unless it is heated too].

It is well known that hot air with water vapour rises even when there is no wind! We have all heard of 'Thermals'! The bulk motion of the air carries with it energy. Greenhouse gases (*mainly* water vapour, but small amounts of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) certainly do absorb/re-radiate radiant energy closer to the earth's surface, but this cannot be considered in isolation without seriously factoring in bulk air motion (*Natural Convection*). But unlike a real man-made Greenhouse which has both walls and a roof, the atmosphere around the planet does not have these (maybe some local canopies of cloud and mountain valley walls in some areas). So it is most likely the Greenhouse Model is a weak or even a false analogy. The atmosphere is quite unlike a man-made Greenhouse where upward movements of warmer air are constrained by the walls and certainly eventually 'collide' with the Greenhouse roof. In fact those who have flown in modern planes clearly know that temperature goes down, not up, as the plane elevation increases (eg -50 °C at 10,000m is typical). The **figure below** shows that air temperature decreases with increasing elevation; not increases. Warm air rises, expands and cools. The universal gas laws prove it! As air descends it is heated as evidenced by the foehn wind on the leeward side of mountains. Also water vapour condenses to a liquid, and energy is released as well. Hence, from the very important and natural action of CONVECTION there is a significant bulk motion of air heated from 'hotter' earth or oceans **in addition** to any radiative effects of water vapour, CO<sub>2</sub> or other greenhouse gases. The so-called 'greenhouse model' must at best, be a very weak analogy or even wrong.

A greenhouse gas (*energy absorbing/emitting gas*) does not need a physical Greenhouse constraint/ effect. In other words, the RADIATION PART of greenhouse gas behaviour does NOT need an actual GREENHOUSE ROOF-WALL MODEL: so why do they use it? Surely the emphasis should be greenhouse GAS BEHAVIOUR (water vapour, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) with RADIANT ENERGY absorption/re-radiation to and from the gases. The 'house' concept only affects convection and that model is wrong!

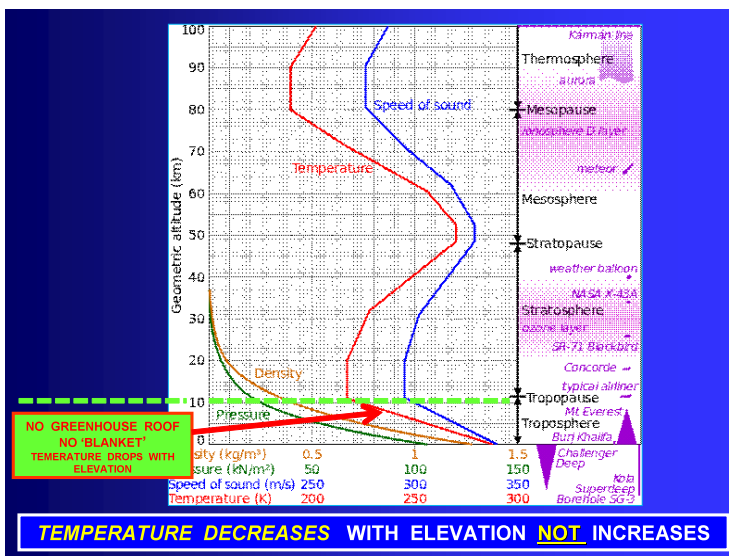
- The GREENHOUSE ANALOGY is a very, very poor analogy or model >>> there is NO ROOF and there are NO WALLS!
- For radiation, the energy absorption/re-radiation to and from greenhouse 'active' gases (water vapour, CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) is still valid!

Is there a BETTER MODEL? Perhaps YES! The Heat Pipe model!

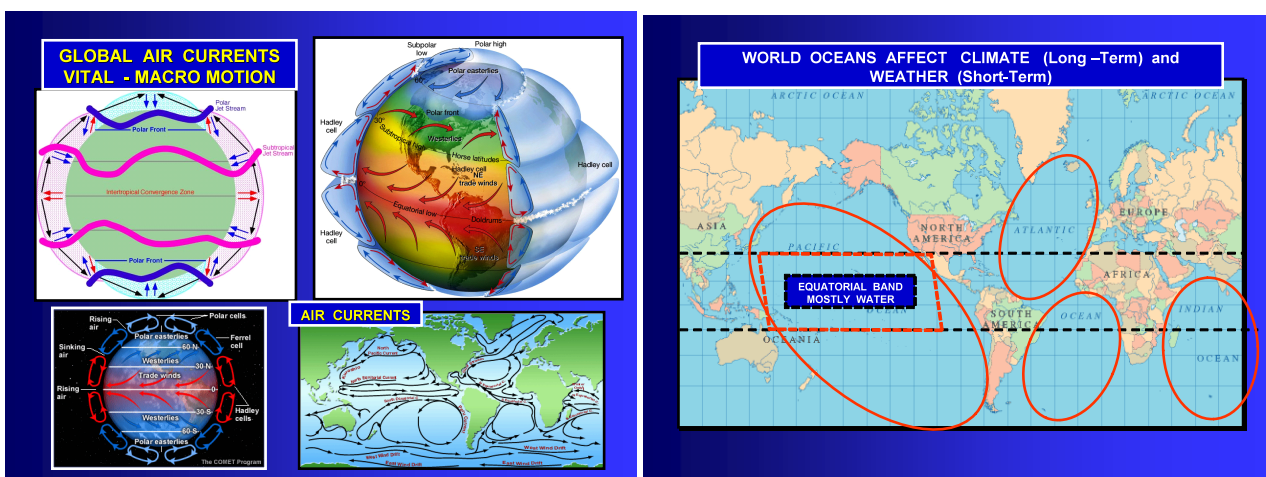
Principle: A heat pipe operates because energy at the lower part of the pipe vaporises a liquid in the pipe (such as water), and this condenses at the cooler top of the pipe, and the condensate runs back down to the bottom for reheating (some Solar Water Heaters use this principle). Water from the seas, lakes, rivers, trees, land etc .. is heated and water near the surfaces can evaporate, rise, condense (eg clouds) and then under favourable conditions, precipitate as rain or snow (or hail). Truly there are '*no pipe walls*' as in a conventional man-made Heat Pipe but these walls are not needed to make the analogy or model one to be seriously considered. Thermals exist! CELLS of hot air rise taking water

vapour with them! The KEY FACTOR here is that it does provide a better analogy for bulk atmospheric upward motion (*NATURAL CONVECTION*), and without 'walls'. Wind motion can support this action. These thermostatic heat cells may not be uniform as land (top surface layers) heats up and cools more quickly than adjacent water masses. Hence, we can envisage the 'heat pipe convection effect' as radiation from the sun heating up the earth's surfaces during the day which causes the up-flow of warmer air with subsequent expansion and cooling. [*Natural Convection is a MAJOR in Climate/Weather Change and its high significance is often overlooked while pundits attack anthropogenic CO<sub>2</sub>*]

The Figure below shows atmospheric temperature lowering up to the troposphere-stratosphere 'boundary' (some other complex actions are known to be the cause of this 'discontinuity' with soot and other compounds).



Macro-motion of the atmosphere as well as the ocean currents are really highly significant and must affect both long-term climate patterns and short-term weather patterns. Scientists who concentrate only on a minor greenhouse gas often distort the value of these other effects, especially when CO<sub>2</sub> is really a minor player as greenhouse gas!



From pictures on the Web

Professor Emeritus Geoffrey G Duffy  
DEng, PhD, BSc, ASTC Dip., FRS NZ, FICHEM, CEng