

CLIMATE CHANGE 6

CARBON DIOXIDE CO₂ and WATER H₂O CONTRASTED

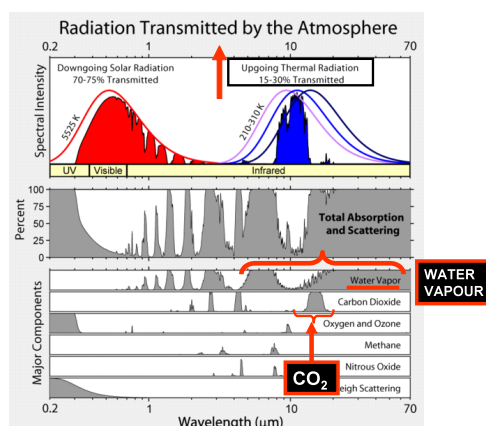
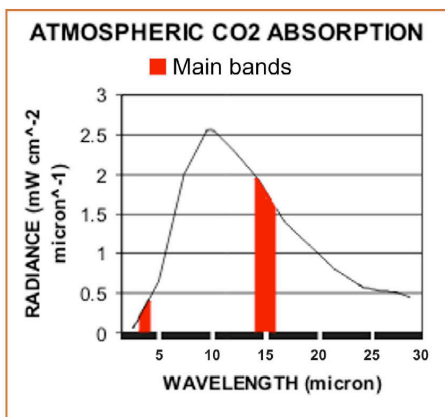
Showing Water has by nature a much bigger effect on Climate and Weather changes than CO₂ ever could

CO₂ ONLY affects radiant energy near the ground and only a small amount is man-made

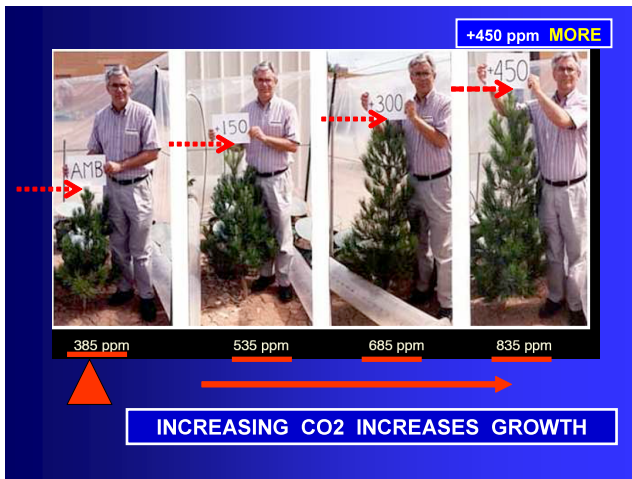
Water H₂O affects MORE than the radiant energy near the ground – H₂O forms **Clouds** (Evaporation and condensation unlike CO₂), and **Oceans** store 1,000 times more energy than the atmosphere.

CARBON DIOXIDE CO₂

- CO₂ is *NOT* a pollutant or a toxin [*Carbon MONOXIDE CO is the toxin*]
- CO₂ in the atmosphere is vital for *LIFE* – we would die without it !
- Crops, trees, plants convert CO₂ into sugars, cellulose, fruit, vegetables and more
- Leaf 'factories' convert CO₂ into C compounds and O₂
- Marine plankton uptakes and converts CO₂
- Humans *exhale* 1 kg CO₂ per day (*there is close to 7 Billion humans on Earth*)
- *NOT* all CO₂ in the atmosphere is man-made – most is naturally produced
- Ruminating animals put out more greenhouse gases than all the cars, buses, trucks and other vehicles in the world
- The *main* sources of anthropogenic greenhouse gases are Fossil Fuels: coal, oil, gas, and the burning of trees and other crop wastes
- CO₂ absorbs radiant energy over a **LIMITED NARROW BAND** [see Graph below], but water vapour H₂O covers the **same band and more** [see Graph below],
- **CO₂ is ONLY a GAS** in the atmosphere unlike water which can also change phase (evaporates and condenses) to give a big ADDITIVE effect to the atmosphere
- For every 1,000,000 molecules of atmosphere, *only* 10,000 are greenhouse gas molecules; 9,500 of the 10,000 are water molecules. Of the remaining 500, **ONLY** about 350 are CO₂ and less than 20% of the CO₂ molecules are man-made (*conservative*), say 70 molecules per 1,000,000 at most. 70 in 1 million is 0.007% or *1 molecule in 14,300!!* Can that be the culprit in Climate Change when water is 0.95%, or 1 molecule in 105??
- Whenever CO₂ is in the atmosphere, water is also there in *larger* quantities at the same time! CO₂ is *ONLY* a radiant energy absorber/emitter. Water H₂O is more! It can form clouds whereas CO₂ does not, and therefore H₂O is far more *active* in climate variation. Examining CO₂ without factoring in the larger effect of H₂O *simultaneously* must be wrong!



Increasing CO₂ concentration increases crop yields as shown!



SUMMARY: CARBON DIOXIDE CO₂

- Atmospheric CO₂ is a low - concentration greenhouse gas
- Most CO₂ is from NATURAL causes
- CO₂ can only absorb / emit radiant energy
- Water vapour H₂O matches CO₂ BUT can ALSO form CLOUDS which have a larger effect than simply unclustered CO₂ molecules in isolation
- Incomplete combustion (dust, particulates, pollutant compounds) are more significant in overall atmospheric effects than CO₂

WATER VAPOUR H₂O

Water is UNIQUE and unlike CO₂:

- WATER: The most abundant compound on the Earth's surface and a universal solvent. Makes up over 60% of the human body. It is in all plants, animals, cells etc ..
- WATER: H₂O is the **ONLY** fluid that **FLOATS ON ITSELF** when it **FREEZES** on the surface. [*If it did not float it would sink and crush the creatures (fish, sharks, whales) in the Oceans. Marine life flourishes in water below the ice.*]
- WATER: Largest % greenhouse gas effect [about 35% - 65% (clear sky), 65% - 85% (cloudy sky)]
- WATER: Water vapour concentrations in the atmosphere depend on temperature and location [< 0.2% in very cold climates to 3% by mass at high Humidity in the tropics > 30 °C]
- WATER: Oceans absorb 1,000 times more heat than the atmosphere, and **BUFFER** more than 80% of the large heat fluctuations (and hence temperature), thereby moderating Climate Change greatly – this is a key factor missed when only isolating the pet subject of CO₂
- WATER: Liquid water has the highest surface tension (*skin*) of all natural liquids that affects droplet formation, cloud structures, ocean surfaces, waves, evaporation rates, etc
- WATER: H₂O molecules are polar (*H* slightly +ve; *O* slightly -ve) so adjacent water molecules 'attract' each other, particularly as the temperature is lowered [*Liquid water can also ionise slightly H₃O⁺ hydronium ions, and OH hydroxyl ions.*]. Hydrogen bonding gives some unique features unlike CO₂: H₂O second highest specific heat capacity [*only ammonia*is greater*]: H₂O has a very high heat of vaporisation (2,257 kJ/kg at its boiling point), and **ENERGY TRANSFERS** are very important in atmospheric changes (*shows up as temperature differences which are directly related to atmospheric mean temperature*)
- **The 'Structure' and 'Behaviour' of H₂O molecules have LARGE buffering effects that moderate the Earth's Climate and Weather as they affect both evaporation from the**

seas and condensation in cloud formation: CO₂ acts ONLY as a gas and forms NO clouds

- WATER: The specific enthalpy of fusion (at freezing) is very high (333.6 kJ/kg at 0°C) [*only ammonia* is higher*], and this confers resistance to melting on the ice. [*Density decrease at freezing – about 9%*]
- WATER: Water Vapour–Liquid Water–Ice COEXIST at the equilibrium Triple Point. It is *amazing* that it occurs near 0°C (*By comparison, the Triple Point of CO₂ is -56.5°C so it strongly differs from Water and has no effect in our system*), as this has some unique effects in phase transitions near the poles (eg solid ice to vapour *direct*, with no liquid water for example).
- WATER: Water has a freezing point of 0°C and a boiling point of 100°C due to its unique molecular polar structure. We live because of that!!
- The *nearest* molecule to Water with an Atomic Weight of 18 is Ammonia with an Atomic Weight of 17. In *direct contrast* its freezing point of -33°C and a boiling point of -77°C are far different. Just as well water is THE MOST ABUNDANT COMPOUND on the EARTH'S SURFACE

SUMMARY: WATER H₂O

- Atmospheric H₂O is the HIGHEST concentration greenhouse gas
- H₂O has the LARGEST greenhouse-gas effect
- Water vapour H₂O more than *matches* CO₂ for the ability to absorb radiant energy, but is *more* effective over a broader range
- Water can phase-change (evaporate/condense) to form CLOUDS which have a larger effect than simply CO₂ as gas molecules in isolation
- Water can phase-change (evaporate/condense) at oceans, lakes and rivers --- CO₂ cannot
- Water has unique 'thermodynamic' properties affecting *energy transfer* in Climate/Weather actions that CO₂ does not have

CONCLUSION:

1. CLIMATE CHANGE RESULTS DIRECTLY FROM ENERGY MOVEMENTS FROM THE SUN, THE EARTH, THE OCEANS and THE ATMOSPHERE
2. WATER AS A VAPOUR *and* a LIQUID IS THE LARGEST GREENHOUSE 'GAS' – BUT IT CAN DO FAR MORE THAN CO₂
3. CO₂ IS A GAS ONLY IN THE ATMOSPHERE: IT AFFECTS ONLY ELECTRO-MAGNETIC ENERGY ABSORPTION / EMISSION NEAR THE EARTH'S SURFACE
4. H₂O PHASE-CHANGES IN THE ATMOSPHERE – CO₂ DOES NOT
5. EVAPORATION/CONDENSATION PHASE CHANGES OCCUR AT SEA LEVEL AND IN CLOUD FORMATION - CO₂ IS ONLY A GAS AND DOES NOT CONDENSE
6. OCEANS ABSORB 1,000 TIMES MORE HEAT THAN THE ATMOSPHERE
7. OCEANS *BUFFER* MORE THAN 80% OF THE LARGE HEAT/TEMPERATURE FLUCTUATIONS THAT MODERATE CLIMATE/WEATHER CHANGES

IF THE WATER and WATER VAPOUR CONCENTRATION IS 20 TIMES HIGHER THAN CO₂ IN THE ATMOSPHERE, AND MOST CO₂ IS NATURALLY MADE – WHY BLAME THE SMALLER AMOUNT OF ANTHROPOGENIC CO₂ ON CLIMATE CHANGE ??

IN FACT - CO₂ DOES NOT EXIST BY ITSELF, and CANNOT BE EXAMINED IN ISOLATION WITHOUT CONSIDERING WATER SIMULTANEOUSLY