Heat Capacity comparison of CO2 in the atmosphere versus the top layer of oceans water

Energy **E** = Cp . ΔT . m

ΔT = Temperature difference

m = mass = ρ . V

V = Volume = Surface (S) x height (h)

Carbon Dioxide			at 15 °C		Water			at 15 °C	
CO2	Specific Heat	Cp	0.83	kJ / kg °K	H2O	Specific Heat	Cp	4.19	kJ / kg °K
	Density	ρ	1.85	kg / m^3		Density	ρ	1000	kg / m^3
Average Relative Density in Troposhere (ISA)			0.546						
CO2 Fraction of atmosphere		%	0.04%		Water Fraction of Earth's Surface		%	71%	

Energy it takes to increase all CO2 in atmosphere by 1 deg: = Energy aborbed by certain depth of the top layer of oceans

$$E_{(\Delta T=1)} = \% \cdot Cp \cdot \rho \cdot S \cdot h$$

h = average height of troposhere = 13 km

h = d = height (depth) of layer of oceans surfaces

4.4 . S = $E_{(\Delta T=1)}$ = S . d . 2966.5

=> d = 0.0015 m

1.5 mm

The real energy transmitter: Latent Heat

			at 15 °C
Heat of Vaporization *	ΔH_{vap}	**2465** kJ / kg

** the amount of energy that must be added to a liquid **to** evaporatte **a given quantity into a gas***

H2O	Specific Heat	Cp	**4.19** kJ / kg °K
CO2	Specific Heat	Cp	**0.83** kJ / kg °K

Earth's Surface

Land:	148,940,000 km^2	29%	
Water:	361,132,000 km^2	71%	
	510,072,000 km^2		

Average height of Troposphere: 13 km

6.63E+18 m^3 Volume of Troposhere

Specific heat of air: 1 kJ / kg K

Average Relative Density in Troposhere (ISA) 0.546033

ρ_o = 1.225 kg / m^3

To heat whole Troposhere by 1 deg: **$E_{(\Delta T=1)} = Cp \cdot \rho \cdot V$**

E =	4.4E+18 kJ
in 100 years	4.4E+16 kJ
per Day	1.2E+14 kJ

Compare with Latent Heat transfers within atmosphere from what we know about thunderstorms:

Wikipedia: Thunderstorms

In a typical thunderstorm, approximately 5×10^8 kg of water vapor are lifted, and the amount of energy released when this condenses is 10^15 joules.

This is on the same order of magnitude of energy released within a tropical cyclone, and more energy than that released during the atomic bomb blast at Hiroshima, Japan in 1945.

Thunderstorms occur throughout the world, even in the polar regions, with the greatest frequency in tropical rainforest areas, where they may occur nearly daily. At any given time, approximately 2,000 thunderstorms are occurring on Earth.

Life cycle: Developing, Mature and Dissipating stage
Each of these three stages take an average of 30 minutes

What is that Energy wise:

	10^15 J	
	2000	at any time
At any given time	2 x 10^15 kJ	
	2E+15 kJ	in average 1.5 hours
	3.2E+16 kJ per day	

What does it take to heat the troposhere by 1 deg in 100 years:

1.2E+14 kJ per day

Factor: **263** for what we know about thunderstorms

This is just Thunderstoms. In every raincloud latent heat is transferred

Latent Heat that is daily transferrred in the atmosphere is hundreds time bigger than the energy required to cause recent climate change.

Common sense: It is very probable that water is responsible for imbalances in the Earth's Energy balance due to its role in variations in the meridional energy transport.