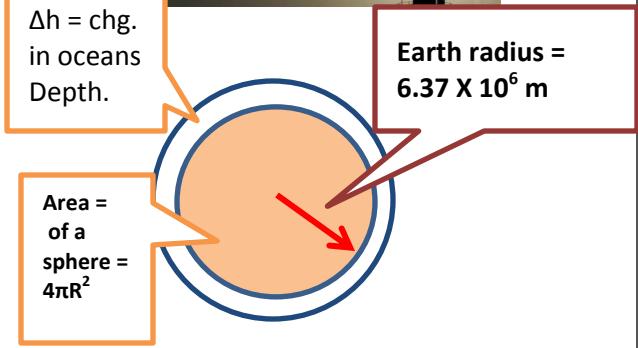


# EXPANSION DUE TO $\Delta T$

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## Climate Panel Cites Near Certainty on Warming



**INTRODUCTION:** Amount volume changes with temperature change( $\Delta t$ ) is :  $\Delta V = \beta V \Delta t$  ,  $V$  = original volume ,  $\Delta V$  = change in volume,  $\beta$  = coefficient of volume expansion of water =  $0.000214/\text{ }^\circ\text{C}$ . The earth is 71%(0.71) ocean. The purpose of this exercise is to show (as stated below) with a  $1^\circ\text{C}$  increase in sea temperature in 20<sup>th</sup> century the oceans did rise ~ 8 inches.

**QUESTIONS:** (a) Find area of earth surface?( $\text{m}^2$ ), (b)Oceans cover 71% of earth's surface area. Find this area ?(c)Surface air temperatures affect the first 1000 m of ocean depth( $h$ ). Find volume of this first 1000 m depth of all oceans?  $V = A_{\text{earth}}(0.71) h$  , (d) Find  $\Delta V$  of oceans due to a  $1^\circ\text{C}$  change in 20<sup>th</sup> century? (e) Find the depth change( $\Delta h$  in m.) of all oceans due to  $1^\circ\text{C}$  change? Note:  $\Delta V = \Delta h A$ , thus  $\Delta h = \Delta V/A$ , (f)Convert  $\Delta h$  in meters into inches(39.37"/m)?

**ANSWERS:** (a)  $5.1 \times 10^{14} \text{ m}^2$  (b)  $3.621 \times 10^{14} \text{ m}^2$ , (c)  $3.62 \times 10^{17}$  (d)  $7.75 \times 10^{13} \text{ m}^3$  , (e)  $0.214 \text{ m} = \Delta h$  , (f) ~ 8.42 inches, Wow!

An international panel of **scientists has found with near certainty that human activity is the cause of most of the temperature increases of recent decades**, and warns that sea levels could conceivably rise by more than three feet by the end of the century if emissions continue at a runaway pace. The scientists, whose findings are reported in a draft summary of the next big United Nations climate report, largely dismiss a recent slowdown in the pace of warming, which is often cited by climate change doubters, attributing it most likely to short-term factors.

"It is extremely likely that human influence on climate caused more than half of the observed increase in global average surface temperature from 1951 to 2010," the draft report says. "There is high confidence that this has warmed the ocean, melted snow and ice, raised global mean sea level and changed some climate extremes in the second half of the 20th century."

**The draft comes from the Intergovernmental Panel on Climate Change, a body of several hundred scientists that won the Nobel Peace Prize in 2007,**

Regarding the question of how much the planet could warm if carbon dioxide levels in the atmosphere doubled, the previous report largely ruled out any number below 3.6 degrees Fahrenheit. The new draft says the rise could be as low as 2.7 degrees, essentially restoring a scientific consensus that prevailed from 1979 to 2007. Warming the entire planet by 5 degrees Fahrenheit would add a stupendous amount of energy to the climate system. **Scientists say the increase would be greater over land and might exceed 10 degrees at the poles.**

They add that such an increase would lead to widespread melting of land ice, extreme heat waves, difficulty growing food and massive changes in plant and animal life, probably including a wave of extinctions. Regarding the likely rise in sea level over the coming century, the new report lays out several possibilities. In the most optimistic, the world's governments would prove far more successful at getting emissions under control than they have been in the recent past, helping to limit the total warming. In that circumstance, sea level could be expected to rise as little as 10 inches by the end of the century, the report found. That is a bit more than **the eight-inch increase in the 20th century**, which proved manageable even though it caused severe erosion along the world's shorelines. At the other extreme, the report considers a chain of events in which emissions continue to increase at a swift pace. Under those conditions, sea level could be expected to rise at least 21 inches by 2100 and might increase a bit more than three feet, the draft report said.