

# HEAT-TEMPERATURE-GLOBAL WARMING Unit 20

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& New York Times , January 19,2017 by Justin Gillis , Dedicated to my good neighbor environmentalist, Jon.

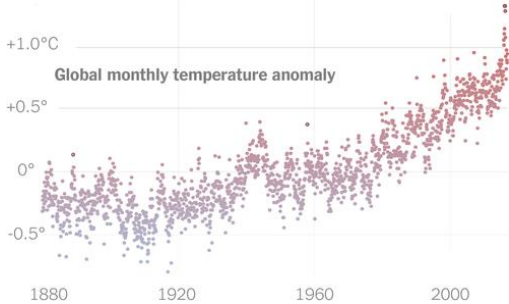
## Earth Sets a Temperature Record for the Third Straight Year: + 0.5 F degrees/3 yrs.



Ice in the Arctic Ocean's Chukchi Sea region.  
"What's going on in the Arctic is impressive;

**INTRODUCTION:** Purpose of this application is to verify the 1/2 F degree increase in earth's average temperature over three years is equivalent to energy released by 400,000 Hiroshima Atomic Bombs per day(see article below). Heat is absorbed by Atmosphere(first 1000 meters) and oceans(first 70 meters of depth. See <http://CisePhysics.homestead.com/files/halfDegreeWarmer2.pdf> for proof of using 70 m. depth.). Earth's radius is 3959 miles = R, specific heat of air is  $C_{AIR} = 1000 \text{ J/kg. } ^\circ\text{C}$ ,  $C_{H_2O} = 4186 \text{ J/kg. } ^\circ\text{C}$ , earth's Oceans cover 70% of earth. Heat =  $Q = C m \Delta t$ , density of air =  $\rho_{AIR} = 1.225 \text{ kg./m.}^3$ ,  $\rho_{H_2O} = 1000 \text{ kg./m.}^3$ , area of a sphere =  $A = 4\pi r^2$ , volume of shell surface =  $A h = V$ , mile = 1609 meters., density= $\rho = m/V$ , Hiroshima bomb =  $63 \times 10^{12} \text{ Joules}$   
**QUESTIONS:** (a) Convert earth radius to meters?, (b)Find area of earth surface?  
(c)Find volume of first 1000 m. of earth's surface?,(d)Find mass of earth's first 1000 m.?

Marking another milestone for a changing planet, scientists reported on Wednesday that the Earth reached its highest temperature on record in 2016, trouncing a record set only a year earlier, which beat one set in 2014. It is the first time in the modern era of global warming data that temperatures have blown past the previous record three years in a row. In reality, the Earth is heating up, a point long beyond serious scientific dispute, but one becoming more evident as the records keep falling. Temperatures are heading toward levels that many experts believe will pose a profound threat to both the natural world and to human civilization. How 2016 Became Earth's Hottest Year on Record 2016 is the hottest year on the historical record and the third consecutive record-breaking year, scientists say.



**ANSWERS(con.):** (g)  $m_{OCEANS} = 2.5 \times 10^{20} \text{ kg}$   
(h)  $Q_{OCEANS} = 2.9174 \times 10^{22} \text{ J}$ , (i)  $2.847 \times 10^{22} \text{ J}$   
(j)  $(4 \times 10^5)(63 \times 10^{12})(365 \text{ days/yr.})(3 \text{ yrs.}) =$   
 $\sim 2.76 \times 10^{22} \text{ J}$ , (k) (i) & (j) **close...GREAT!**

**QUESTIONS(con.):** (e) Find amount of heat  $Q_{AIR}$  needed to increase first 1000 m. of earth's surface  $0.5 \text{ F}^\circ$  ( $0.278 \text{ C}^\circ$ )? (f) Find volume of first 70 m. of earth's oceans(note:  $V = (0.70) A h$ )? (g) Find mass of first 70 m. of oceans? (h) Find amount of heat  $Q_{OCEAN}$  needed to increase top 70 m of oceans? **Note: due to high specific heat of water, ocean temperature increase was  $0.278 \text{ C}^\circ$  in three years 2013 – 2016.**  
**Source: International Panel on Climate Change[IPCC].** (i) Find total heat  $Q = Q_{AIR} + Q_{OCEANS}$  absorbed?, (j) Find energy(J) released by 400,000 atomic bombs per day for three years(365 days/year)?,(k) Is heat gained by air and oceans with  $0.5 \text{ F}^\circ$  increase equivalent to 400,000 bombs/day for tree years?  
**ANSWERS:** (a)  $R = 6.37 \times 10^6 \text{ m.}$ , (b) $5.1034 \times 10^{14} \text{ m.}^2$ ,(c)  $5.1034 \times 10^{17} \text{ m.}^3$   
(d)  $m_{AIR} = 6.25 \times 10^{17} \text{ kg.}$ , (e)  $Q_{AIR} = 0.0174 \times 10^{22} \text{ J}$ , (f)  $V_{OCEANS} = 2.5 \times 10^{17} \text{ m.}^3$

The finding that a record had been set for the third year in a row was released on Wednesday by three government agencies, two of them American and one British, that track measurements made by ships, buoys and land-based weather stations. **(((NASA's calculations suggested that the planet had warmed by well over a half-degree Fahrenheit from 2013 to 2016.)))** That is a huge change for the surface of an entire planet to undergo in just three years, and it appears to be the largest temperature increase over a three-year period in the NASA record, which begins in 1880. The three record-setting years in a row undercut longstanding claims by a handful of contrarian scientists that global warming stopped after 1998. That argument was never backed by good statistical evidence, but it was highlighted repeatedly in Congress and on the presidential campaign trail in 2016. **(((When the heat buildup in the ocean is taken into account, global temperatures are rising relentlessly. Scientists have calculated that the heat accumulating throughout the Earth because of human emissions is roughly equal to the energy that would be released by 400,000 Hiroshima atomic bombs exploding across the planet every day)))**.