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Argument: "Oceans are cooling."

John Adams once wrote, "Facts are stubborn things; and whatever may be our wishes, our inclinations, or the dictates of our passion, they cannot alter the state of facts and evidence." For decades, skeptics of global warming have ignored the facts and tried to spread false information. Their goal has been to confuse the average person and saturate the climate change dialogue with doubt. Skeptics have disregarded evidence of climate change and belittled the general consensus of the scientific community. A popular claim by climate change skeptics is that the oceans are cooling. This, they assert, indicates human-induced climate change cannot be occurring. This line of thinking is faulty in many regards and is not supported by scientific fact. Once the long-term attributes of ocean heat content are exposed and when other, non-oceanic global warming indicators are presented the veil of disguise will be lifted.

Because of the greenhouse effect, oceans warm. The greenhouse effect, which marks global warming, is the result of a heat imbalance between Earth's incoming and outgoing energy. The more greenhouse gases (methane and carbon dioxide) that are in the atmosphere, the warmer the higher altitudes in the troposphere become. Because of this warming, the place where outgoing radiation can escape to space is pushed to higher and cooler levels. Colder air cannot emit a great amount of radiation. However, incoming solar radiation is unchanged. The result is that the amount of energy entering the Earth is much greater than the amount of energy leaving the Earth. The oceans gain much of this additional heat.

In order for the allegations against ocean heat content to be appreciated, it is important to know the possible effects of a warmer climate on Earth's oceans. Climate change can disturb the food chain of the oceans (Cook, n.d.), increase thermal expansion (Ibid), and create a greater number of oceanic "dead zones," which are areas of low-oxygen where marine life cannot

flourish (Than 2009). Because the oceans store nearly 80% of Earth's energy, far more than the atmosphere, ocean heat is an essential component of climate change (Cook, n.d.).

Short-term and long-term trends are important distinctions in the investigation of climate change. Many skeptics “cherry pick” – they choose data from a short-period of time and claim that it is a trend. Their data may be true; however, short-term trends are far less important than the consequences of long-term data. For example, Roger Pielke Sr. stated, “Global warming, as diagnosed by upper ocean heat content has not been occurring since 2004” (Ibid). Pielke issued this statement in 2008. Four years is much too short a time frame for objective scientific study (Ibid). Traditionally, when long-term trends are examined they consist of at least thirty years worth of data (Ibid). By studying decades, rather than years, scientists can allow short-term climate change mechanisms, such as El Ninos or La Ninas, to pass. This allows for the long-term trend to show itself. For oceans, the long-term trend indicates that ocean heat content is increasing dramatically (Ibid).

Similarly, William DiPuccio, a denier of human-induced climate change, asserts that ocean heat content should increase monotonically (uninterruptedly) throughout the years (Ibid). He goes on to claim that the oceans have been cooling since 2003, which, according to his logic, violates the scientific theory behind global warming (Ibid). DiPuccio's theory is incorrect because ocean heat does not have to increase invariably. Short-term climate change mechanisms can affect Earth's ocean temperatures (Ibid). One must remember that short-term trends, such as variability in Earth's ocean temperatures over the course of a few years, are not indicative of the overall processes occurring.

Furthermore, DiPuccio's claim that Earth's oceans have been cooling since 2003 has been studied in detail. These studies can be accomplished because scientists are able to measure

water temperature at various oceanic depths. The “Argo” network is such a measurement system. “Argo” contains over 300 floats which are distributed worldwide and are used to measure oceanic temperature (Ibid). Raw Argo data was analyzed by two different studies – Willis 2008 and Leuliette 2009. However, these two reconstructions show vastly different trends (Ibid). Willis 2008 emphasized a cooling trend, while Leuliette 2009 illustrated a warming trend (Ibid). An independent investigation, Cazenave 2009, was conducted and two reconstructions were established. In order for the reconstructions to be understood, sea-level rise must come into play. Rises in sea-level are due to melting land ice and steric sea-level rise. Steric sea-level rise is facilitated by thermal expansion. Therefore, steric sea-level rise allows for measurement of the energy content of oceans. By each isolating the steric sea-level rise, the two reconstructions go about analyzing ocean heat in two different ways. Both of these reconstructions showed an increasing temperature trend (Ibid). DiPuccio’s theory of a cooling ocean since 2003 appears to be incorrect. He simply based his analysis on one study, which was later proved incorrect by other analyses (Ibid).

Although researchers have established that Earth’s oceans are warming, ocean temperature is not the sole determinant of global climate change. There are many other global conditions that indicate Earth is warming drastically and has been for some time. For example, ice is melting. Sea ice has decreased dramatically since 1953 and arctic ice has thinned about seven inches a year. Ninety percent of the world’s glaciers are retreating. Droughts are increasing due to a greater amount of evaporation. Rainfall is becoming more intense due to a greater amount of moisture in the air. There are more heat waves – 2005 and 2010 are tied as the warmest years on record; part of the warmest decade on record. Sea levels are rising – a 1-2

meter sea-level rise is estimated by 2100. The evidence in favor of global warming is overwhelming.

The skeptic claim that oceans are cooling and, therefore, global warming is not occurring is incorrect on multiple levels. First, oceans are clearly, dramatically, and indisputably warming. Second, the rise in ocean temperatures is only one of many indicators of a warmer climate. By believing (falsely) that oceans are cooling, one is not negating climate change; one is only negating an indicator of climate change.