Activity 8 – The Oceans as a Climate Buffer

How do the oceans protect us from even greater climate change?

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Implementation:

→ How close do you dare to hold the water-filled balloon over the candle? Approach the flame slowly!

→ Touch the balloon from below after some time. Has it warmed up a lot?

The water-filled balloon does not burst, although this fear may have arisen. Even when the balloon approaches the flame, it remains whole.

The balloon did not heat up noticeably or only minimally. At the point where the flame was closest to the balloon or touched it, an area of Rus was formed.

Evaluation:

→ Read the background text and explain your observations.

Water is a very effective heat accumulator: a given mass of water can absorb significantly more energy per Kelvin increase in temperature than, for example, the same mass of air. Thus, a kilogram of water heats up by 1K with an energy input of 4.2kJ. In addition, water can conduct heat very well. Water is an extremely effective heat accumulator! It can absorb a lot of energy without heating up much.

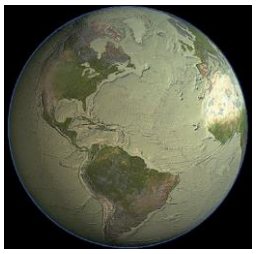
Thanks to the high thermal conductivity of water, the heat from the candle can be distributed quickly enough so that the surface of the balloon heats up only slowly. The water in the balloon also stores heat very well, which is why he balloon remains stable for a long time!

→ The man-made greenhouse effect adds extra energy to the atmosphere. Explain why without our oceans the impact would be even more drastic than it already is today. Which of these two Earths would have a higher surface temperature?

The man-made greenhouse effect adds energy to the Earth's climate system. Fortunately, about 73% of the earth's surface is covered with water.

Due to its large heat capacity, this water has stored approx. 93% of this additionally added energy - global warming is thus strongly buffered!

The left earth would have a higher surface temperature, because the dry surface (rock etc.) has a lower heat capacity than the right earth whose surface is mainly covered with water. That means with the same irradiation (energy supply) the left earth will register a larger energy increase.



Dry earth (Credits: Cook, Nieman, USGS)

Blue marble (Credits: NASA)