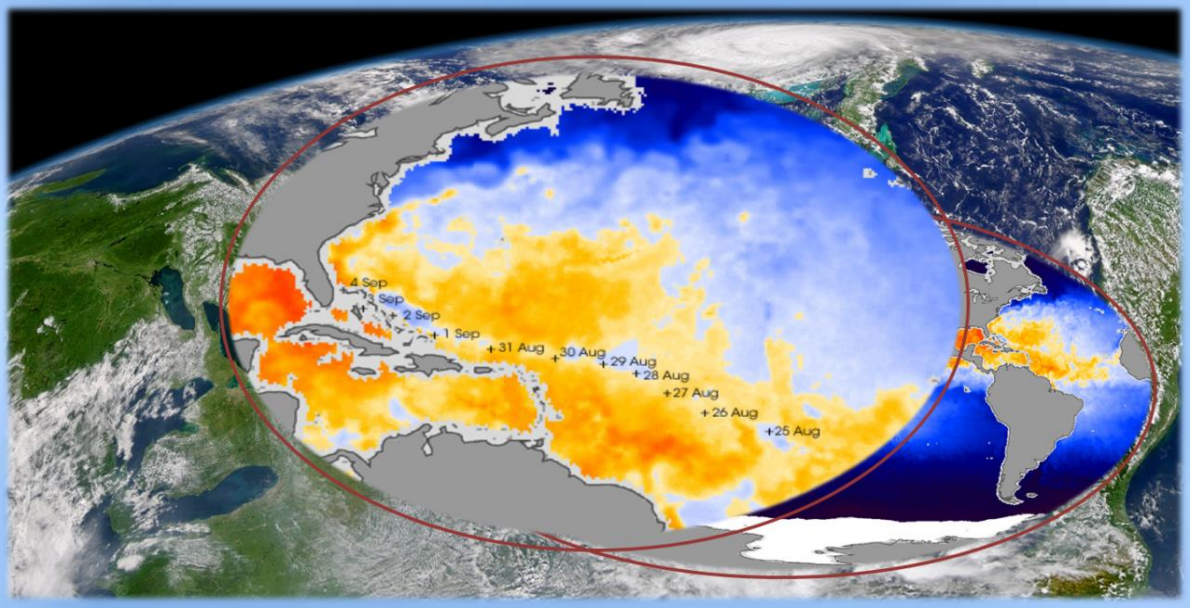

The track of Hurricane Frances (2004)

On the study of climate and oceanography

Surface temperature T of a planet, such as Earth, is given by the formula: $T = 273\left(\frac{(1-A)L}{D^2}\right)^{1/4}$.

Here A is the albedo (reflectivity) of a planet, L is a star's luminosity in multiples of the sun's power, and D is the distance between the planet and a star in astronomical units (AU), where the distance from the earth to the sun is 1 AU. Hence, Earth is located 1.0 AU from the sun, for which $L = 1.0$. The resulting temperature is in units of kelvin (K), such that $0°\text{C}$ is 273 K and absolute zero is defined as 0 K.

For Earth, given that the average reflectivity is 0.4, we see that

$$T = 273\left(\frac{(1-0.4)1}{1^2}\right)^{1/4} = 273(0.6)^{1/4} = 240 \text{ K}.$$

If we convert kelvin to degrees Celsius by $T_\text{C} = T_\text{K} - 273$, notice that $240 - 273 = -33°\text{C}$.

Remark: Earth's equilibrium temperature is much lower than the freezing point of water, $0°\text{C}$. Invariably, without the trace gases of carbon dioxide and to a lesser extent water vapor and methane providing 'greenhouse heating', our planet would be unlivable even with an atmosphere!

Source: 'How Hot is that Planet?' at spacemath.gsfc.nasa.gov.

Students who choose this topic for their essay need to consider design elements linked to a biblical worldview together with the relational aspects between climate (i.e., greenhouse heating) and oceanic-derived storms (i.e., the hurricane as a heat engine).

- ✓ **For the contest:** With the minimal use of scientific jargon, describe how greenhouse heating and hurricane heat engines relate to the heating and cooling of our planet. As part of your essay, also discuss God's design evident today in this patterned relationship between greenhouse heating and hurricane heat engines.

Creation Science Writing Contest