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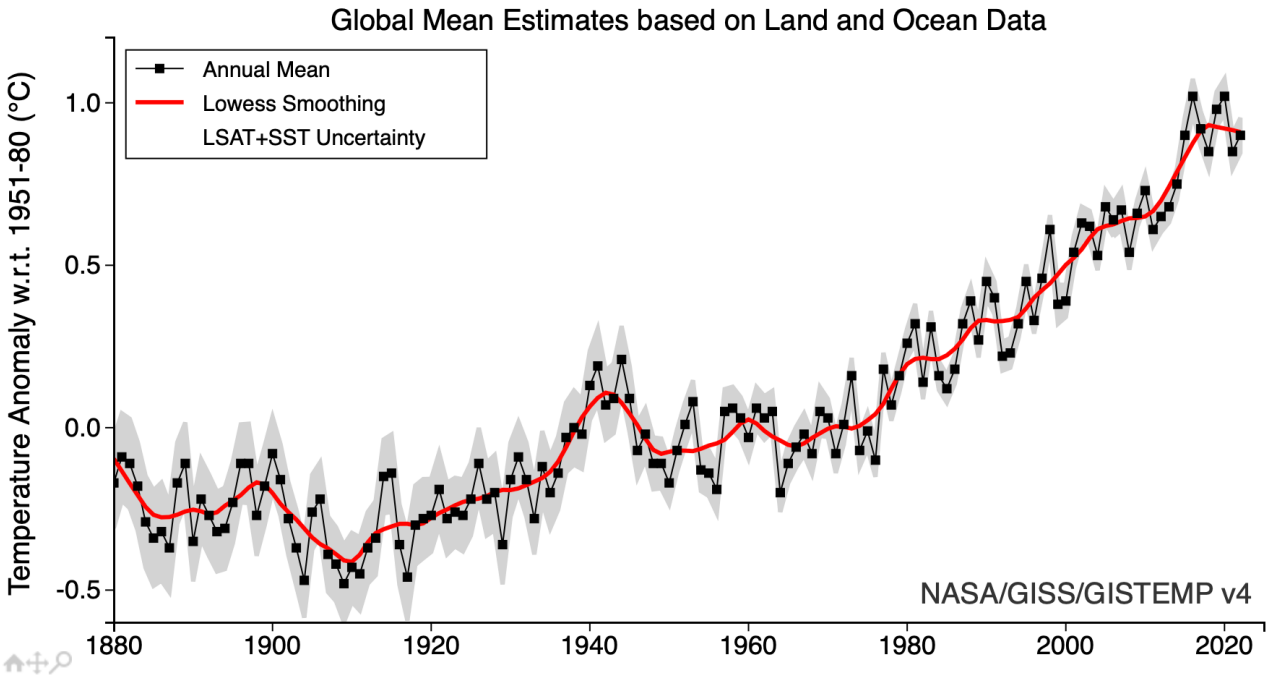
Readers of Sense and Sensibility might remember when Marianne Dashwood was ill, the doctor told her worried family her fever "had a putrid tendency", which worried them more. This inexplicable judgement makes no sense to us because we since figured out that fevers have causes, and you need to know the cause before you can fix the illness. A lot of climate myths are like this - they are cooked up over symptoms (like glacier retreat, or snow in summer, or something else) which can look as if the warming of the Earth is not relentless after all. But no myth can survive once we look for causes. And to a physicist, the climate problem has one big cause - the planetary energy imbalance.



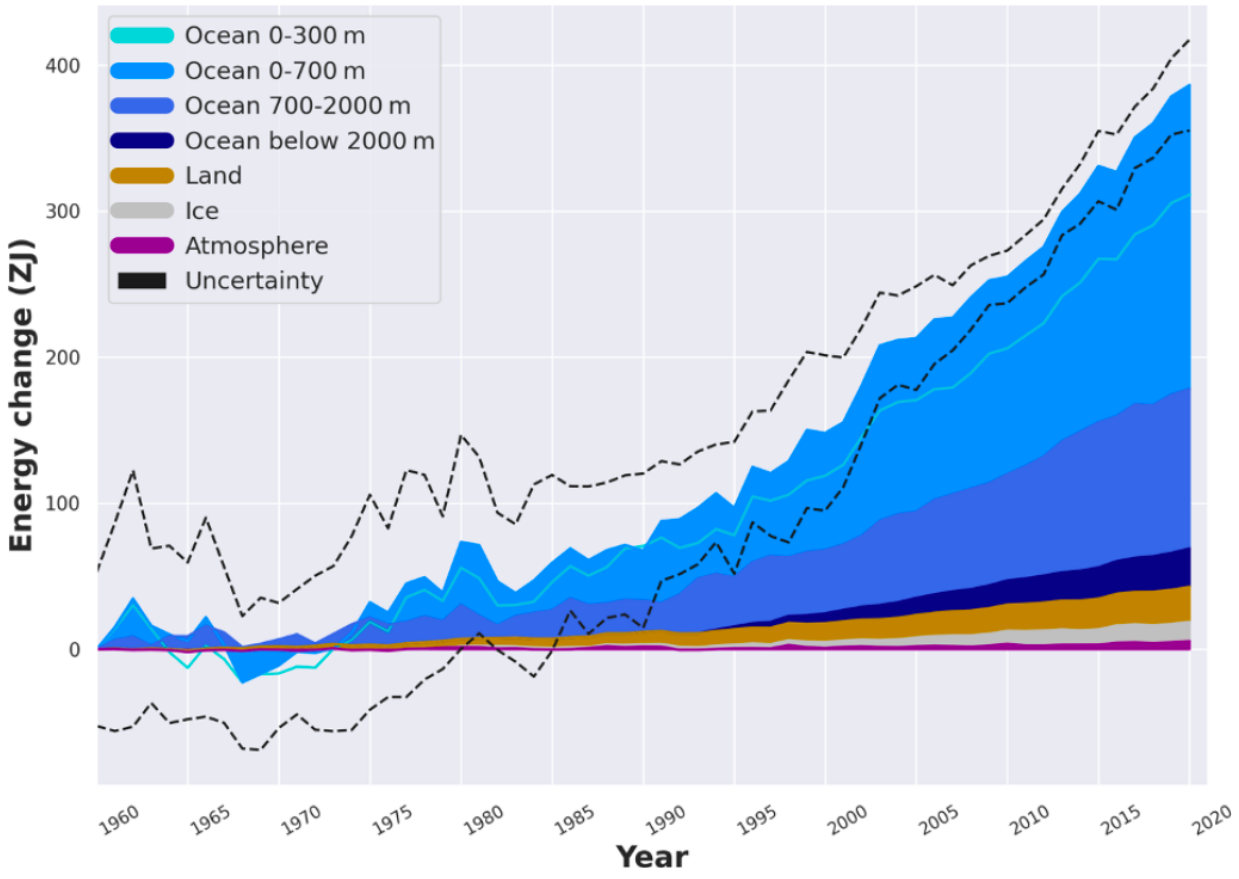
A record of global near-surface air temperature like this one, is jagged (each little black square is one year's average) because our planet's fever, measured this way is affected by all sorts of things - El Ninos, droughts, ocean currents, wind changes, even occasional volcanoes. So it might appear as though the rising red line (the trend) could level off at any time - something which has been claimed before. The fact that this temperature has many causes tells us that it is a symptom of something else - something more fundamental, which we ought to be able to discover in Earth's 'physiology'.

The Earth has an energy income. If you got outside the space station and held up a piece of cardboard facing the Sun, you could measure it. 1360 Watts of power fall on each square metre of cardboard continuously. This is a tiny bit of the Sun's enormous output, but it is what keeps the Earth nice and warm. It's the only thing. And it is reliable. On timescales that matter to us, it is almost constant, and has been for ages. If it were not there, Earth's surface would be the same temperature as space - minus 270

degrees. As it is, our surface (averaged everywhere, day and night, summer and winter) is 15 degrees, and life flourishes.

If you are cold and turn on the radiator, after a while you feel warm. Why? Because heat arriving at your surface (skin) is absorbed - which just means heat travels to your skin and then belongs to you, not the radiator. As a result, two things happen: your surface temperature rises; and you radiate more heat away than you did before. This is simply the way things work in the physical world - if you stay a while in front of the radiator, your temperature will rise for a time, then stop at a new comfortable one. You are both taking in more, and releasing more heat than you did before. You are in a new energy equilibrium, or balance, with a new surface temperature.

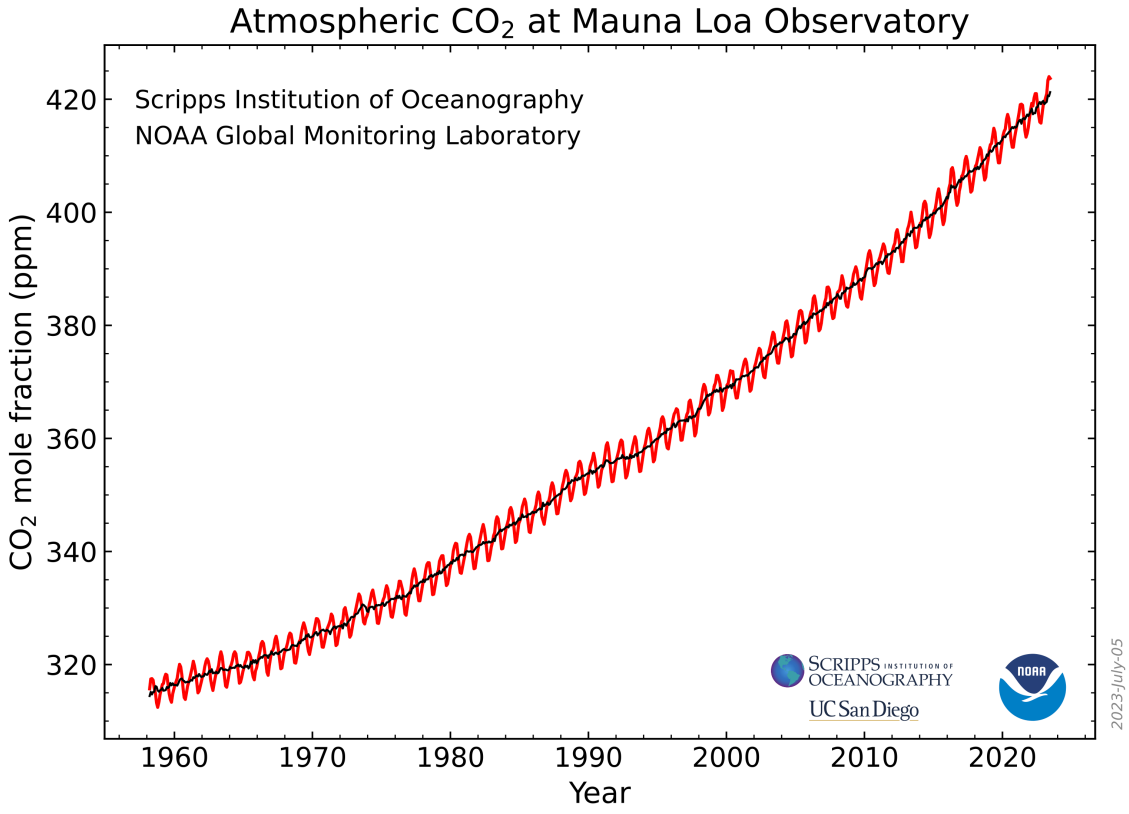
The Earth is the same. Normally, it is in a state of energy equilibrium, or very close to it. That is, the planet sends energy away to space in the same amount as its 1360 Watts per square metre of income. But now it is not normal. There's a difference of around 1 Watt between income and output. Doesn't sound like much? Well, consider this: it is the energy of 10 trillion 50 Watt light bulbs burning all the time. It is twenty times as much as all the energy used by human beings. It is as if we were boiling 25 trillion litres of water and tipping it into the ocean - every day. Speaking of the ocean - most of the heat added to Earth goes in there. That's why we don't notice it as much as we might. And it's probably why we can easily mistake symptoms for causes. Take a look at this interesting picture. You mightn't see it right away, but you are looking at Earth's energy imbalance.



This was published by Karina von Schuckmann and her colleagues earlier this year. It's an up to date estimate of that energy imbalance. The scale on the left is how much energy has been added to the Earth's surface since 1960 (that's why the horizontal line is marked zero). The numbers are 'zettajoules', which is 1,000,000,000,000,000,000,000 Joules - a lot of energy. The blue parts are the ocean, where most of the heat ends up. The brown bit is land - about 6%; grey bit is ice - about 4%, and the purple bit at the bottom is the air. That's the bit that impresses us most because that's where we live, and where we put our thermometers … but it only takes up 1% of all that enormous heat gain. It is as if your radiator were somehow heating up the floor and walls and furniture, giving you a skimpy 1%.

You might be wondering, if this is so, why the ocean isn't much hotter. That is because water and air behave very differently when you add heat to them. Air warms much more than water. The ocean is like a vast heat reservoir for the Earth, holding lots of heat without getting hot. It's just the way water is. It's the reason it's cooler at Redland Bay than Ipswich, and why a cooling dip feels good. On the other hand … it also means the ocean is a huge radiator. Sooner or later, stored heat down in the ocean comes to the surface again. Then it can pass into the air. That will be happening for centuries now. Heat can be sort of invisible, but it never goes away.

You will notice the record of Earth's heat gain is not jagged like the air temperature. That's because the planet's energy imbalance has just one cause - rising atmospheric greenhouse gases. And that trend is not jagged either. It is relentless, as you can see below. CO_2 concentration in the air peaks each year in May, and drops until September before rising again, but each and every year is higher than the one before.



If you begin to sweat in front of the radiator, you turn it off. After that, you will pass through a downward trend of energy equilibrium with your environment (the room air) as the heat leaks out of your room through the windows, and your skin slowly loses heat. The Earth is the same. Nothing can stop the surface warming while we are in a state of positive energy imbalance, adding heat all the time. Nothing at all. To treat this fever, we must remove its cause. That is all we have to do, and it is everything. Anything else is fluff.

By the way, if you're wondering how we know the number of zettajoules in the ocean, you might have noticed the dotted lines on the diagram are closer together this century than the last. That's because the oceans are now monitored continuously by a fleet of several thousand automated buoys, distributed over pretty much the entire global ocean. They take measurements of temperature and salinity, and other things at all depths to create a physical 'profile' of the ocean so it's possible to calculate the quantity of heat stored there. The accuracy of this procedure is given by those dotted lines.

You can hear endless variants of the myth that global warming is like a big weather phenomenon, all making the same mistake - 'net-zero 2050', 'carbon sequestration', 'emissions offsets', 'balancing climate and economy', 'geo-engineering', and so on. All of them are ways to avoid the awkward fact that Earth is retaining more heat than it can get rid of, for the time being, and it cannot stop warming until we fix the cause. A cause that can be expressed in a half-dozen words, and which anyone can understand; and whose remedy is also straightforward, feasible, affordable, and vastly advantageous. So when you hear folks talking about other treatments for the Earth's putrid fever, tell them the cause and the treatment are well known. And there are no alternatives. None.