**According to Google’s fantastic Earth Null school global sea temperature anomaly chart, the tell-tale El Nino hot streak running across the South Pacific from South America towards Indonesia is now very definitely in evidence, as are sea-surface temperature anomalies in places like the North Pacific, AND North Atlantic that, according to very learned scholars like Dr Jennifer Francis of the Woods Hole Research Centre, are “off the scale”**

**I’m not going to go back over the details of what El Nino is and how it affects seasonal global weather patterns, because I already did that in this video.**

**What I am going to do though, is have a look at a very recent peer reviewed scientific research paper that suggests the warming of subarctic waters is now blending so effectively with the ARCTIC Ocean in the north that the thermal boundaries are becoming very blurred indeed. And THAT is having much more than a seasonal effect on our planetary systems.**

**Hello and welcome to Just Have a Think**

**Unlike the vast wilderness of Antarctica at the southern tip of our planet, which is essentially a land mass covered in ice, surrounded by water, and unlike the polar seas in the Southern Hemisphere, which are widely exposed to the global oceans, the northern extremity of the globe is an ocean of water surrounded by land masses –specifically the continents of Asia, Europe, and North America. The Arctic Ocean in the north is only connected to Subarctic seas through a few narrow straits. Movements through these straits carry solid and liquid water mass, heat, salt, and nutrients that link the Arctic with the rest of the globe, affecting climate and marine ecosystems. The authors of this latest paper out to get an understanding of how those fluctuations have changed over time, which meant trawling back though a pretty-formidable back-catalogue of painstakingly thorough historical observation data and splicing that together with today’s most sophisticated ocean systems modelling software. Rather them than me! What they discovered were radical changes in the inflows and outflows of the Arctic Ocean during the twenty-tens compared to earlier periods, with profound implications for the overall balance of the entire globally interconnected ocean circulation system.**

**Over here on the Pacific side the only way into the Arctic Ocean is through the Bering Strait. At just eighty-five kilometres, or fifty-three miles wide, and barely fifty metres deep, it is extremely restrictive, with a Pacific inflow of only about one Sverdrup. Now you might think I made that word up just to confuse you, but I promise you a Sverdrup is a proper unit of measurement! It’s used to quantify the volume of water transported in seas and oceans and it’s named after a Norwegian oceanographer called Harald Sverdrup. One Sverdrup equals a flow rate of one million cubic metres per second, which might sound like a lot, but in the context of global ocean flow rates, is actually quite minimal. By way of comparison, the Gulf Stream has a typical flow rate of about thirty Sverdrups, and one of the world’s strongest currents, The Antarctic Circumpolar Current, or ACC can range from a hundred to a hundred and eighty Sverdrups. Nevertheless, the authors of the paper tell us that the Bering Strait is an important source of freshwater into the Arctic Ocean. It also carries heat into the region in the warmer seasons, causing seasonal sea ice melt in the western Arctic. And crucially, it moves large amounts of nutrients into Arctic waters, essential for marine ecosystems in the region. That Pacific water can travel right across the Arctic and eventually have an influence on the North Atlantic and the famous Atlantic Meridional Overturning Circulation, or AMOC.**

**The Arctic Ocean also gets freshwater from snow, rain and river runoff as well as from poleward moisture transport in the atmosphere as part of the global water cycle. That freshwater influx is largely counterbalanced by freshwater outflows into the North Atlantic through the three-hundred-kilometre wide and six-hundred- and-forty-metre deep Davis Strait on the south-western side of Greenland and the five-hundred-kilometre wide, two-thousand-six-hundred metre deep Fram Strait, over here on Greenland’s north-eastern tip. Meanwhile, even further East, the Arctic Ocean receives warm, salty water plus more nutrients and plankton via the southern Barents Sea Opening, the EASTERN Fram Strait and the Norwegian Sea.**

**The researchers found that Pacific inflow temperatures in the Bering Strait and the Atlantic inflow temperature in the Fram Strait have all now hit record highs. The BARENTS Sea has for some time also been equalising with the much warmer Atlantic waters.**

**Observational data from monitoring stations in the region show that this ocean heat convergence from lower latitudes, and the tendency for the water cycle to blend the Arctic with Subarctic waters, were both significantly stronger between two-thousand and twenty-twenty than they were between nineteen-eighty and two-thousand.**

**The team employed an array of powerful computer modelling systems to predict how these trends are likely to play out in the future. Those models are carefully calibrated by first being tasked to predict historical ocean and weather patterns. Those so-called ‘hindcast’ predictions are then compared with real-world historical observational data to make sure the results are robust and accurate.**

**Then the clock is set in a forward direction so that the models can start extrapolating current trends into the future. The general convention in this kind of modelling is to assume continued atmospheric warming in line with the worst-case scenario set out by the Intergovernmental Panel on Climate Change. It’s something we’ve looked at many times on this channel. It’s called 6:06 Shared Socioeconomic Pathway, or SSP, 585 and it’s based on an assumed increase in the so-called radiative forcing in our atmosphere, which is essentially the extra warming caused by greenhouse gas emissions, measured in watts per square metre, as an average across the entire planet’s atmosphere. According to the folks at the US National Oceanic and Atmospheric Administration, or NOAA, that radiative forcing has already increased from one-point-eight watts per square metre in nineteen-seventy-nine to three-point-four watts per square metre in twenty-twenty-two. SSP585 projects a further increase to eight-point-five watts per square metre by the end of the century. That is very much the worst -case scenario, but there’s not much point looking at the best-case scenario is there, because, let’s face it, we’re not even close to getting ourselves onto that trajectory. So, following the age-old cliché of ‘hope for the best but plan for the worst’ – SSP585 it is, which by the way is also the scenario used by the world’s largest insurance companies, and why many of them are now severely restricting the types and levels of risk they’re prepared to underwrite. But that’s another story for another time.**

**What the modelling found was that the rapidly warming waters of the Pacific and Atlantic will continue to move huge amounts of heat into the Arctic Ocean. The mean Arctic Ocean temperature is projected to increase in the coming years by one-point-five-five degrees Celsius compared to the nineteen-eighty to two-thousand average, with the Atlantic Water layer warming by about three degrees Celsius. The papers authors tell us that’s roughly twice the global mean warming in waters in the same depth range. That warming is changing the distribution and abundance of various wildlife species, from microscopic organisms to large marine mammals. It’s not just Netflix documentary favourites like polar bears and seals that are getting battered, the heat is also screwing up the timing and success rates of so-called primary productivity, which are all the tiny sea critters forming the basis of a marine food chain that ultimately ends with human beings. And then there’s the disruption in migratory patterns of many species of birds, fish, and mammals that are permanently altering the dynamics and biodiversity of the Arctic region.**

**So, all very interesting and everything, but why does it matter? I mean the Arctic is a long way away, isn’t it..? unless you live in Canada, or Alaska, or maybe Siberia, or the top end of Scandin…anyway, for most people the Arctic is a long way away, so why should we be bothered?**

**Well, I suppose there’s the continent sized areas of permafrost that the extra Arctic heat is now rapidly thawing out, releasing large amounts of methane into the atmosphere, which is threatening to add a very unwanted turbo boost to global temperatures.**

**8:44 And then there’s the fact that warmer Arctic waters are fundamentally changing atmospheric circulation patterns like the 8:49 jet stream, which is already getting wavier and lazier 8:53 as the temperature differential between the middle of the planet 8:56 and the top of the planet decreases. 8:58 That’s contributing to the record-breaking heatwaves, droughts, floods, and freezes that are happening on an almost annual basis on every inhabited continent on the planet. 9:10 According to the World Bank, about eighty percent of the global population most at risk from crop failures and hunger from climate change are in Sub-Saharan Africa, South Asia, and Southeast Asia, where farming families are disproportionally poor and vulnerable, but the American Association for the Advancement of Science, or triple ‘A’ ‘S’, recently highlighted the plight of farmers in the United States as well, pointing out that in many regions they’re also being decimated by floods and freezes on top of droughts, rangeland wildfires, and shifting distributions of pests and diseases that are impacting crops and livestock.**

**Similar problems are also afflicting massively populated countries like India and China, and even here in our relatively cold, wet and windy little island in the Atlantic, almost fifty percent of the food we consume is imported either from Europe, which is the fastest warming continent on the planet, or equatorial regions that are already plenty hot enough and losing crop yields on a regular basis –so we Brits are not immune to the global effects of a warming Arctic either.**

**Our scientists tell us we’ve now reached a tipping point that effectively makes that ongoing warming an unstoppable process, which means there’s no great value in looking for ways to metaphorically put the genie back in the bottle.**

**So, what should we do then?**

**Well, here’s a few nuggets of wisdom from a recent United Nations summit…**

**“Climate change can only be dealt with by unparalleled levels of global cooperation. It will compel countries to question economic models, invent new industries and recognize the moral responsibility that wealthy nations have to the rest of the world, placing a value on nature that “goes far beyond money”.**

**“Immediate actions are needed to protect countries from increasingly frequent and severe climate effects.  Developed countries must keep their pledge to channel a hundred billion dollars annually to the global South. They have already missed the deadline of 2020.”**

**All of that is what we SHOULD be doing. It’s just a pity it’s not what we actually currently ARE doing, eh? So, as I’ve said many times on this channel, if the people representing us will not change, then it’s up to us to change the people who represent us.**

**That’s it for this week. Thanks, as always to our Patreon supporters, who literally keep this channel up and running and keep ads and sponsorship messages out of all these videos. And an extra special thanks to the folks whose names are scrolling up the screen beside me here, all of whom celebrate an anniversary of Patreon support in July.**

**If you feel you could contribute to that, then why not head over to Patreon dot com forward slash just have a think to find out about all the exclusive stuff you can access there.**

**And if you feel you’d like to support me right here on YouTube then you can demonstrate that absolutely for free by subscribing and hitting that like button. It’s dead easy to do that. You just need to click down there or on that icon there. And you would have my eternal gratitude!**

**As always, thanks very much for watching! Have a great week, and remember to just have a think. See you next week.**