**Way back in nineteen fifty, the residents of Sydney Australia were having a pretty damp year. In fact, they were having their wettest year on record with almost two-point-two metres or about seven feet of water landing on the city over the course of twelve months.**

**That remarkable record remained unbeaten throughout the rest of the twentieth century and all the way up to this year.**

**In twenty-twenty-two Sydney reached the seven-foot mark by the start of October, with three months of the year still to go, and apparently there’s plenty more rain on the way. So, according to the people who know about weather down there, the record won’t just be beaten, it’ll be obliterated. And it’s not just Sydney either. A large part of Australia has experienced above average rainfall this year, resulting in some pretty catastrophic flooding in many areas.**

**Australians living through these relentless inundations will no doubt be aware of the major influence that La Nina is having on the weather, compounded by two other systems, known as the Indian Ocean Dipole and the Southern Annular Mode, all of which have coincided rather unkindly to produce what could be regarded as the perfect storm.**

**These are all completely natural meteorological events that come and go on a cyclical basis though, so I guess our friends in Oz have just been unlucky this year, right?**

**Well, maybe not. This is the third La Nina year in a row. That’s never happened before in this century, and it’s only happened four times since nineteen hundred. The general meteorological consensus seems to be that the chances of yet another La Nina next year are pretty low, and climate models tend to suggest that it’s La Nina’s better known brother, El Nino that will become the more dominant phase in future.**

**But now a new research paper has been published that compares those models to actual historical recorded observations. And it draws a very different conclusion!**

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

**The consequences of La Nina are not confined to Australia. They impact most parts of the planet in one way or another including North and South America and even over here in Europe. We’ll come to those very significant impacts a bit later in the video, but let’s first take a look at that confluence of meteorological events battering Australia right now.**

**La Niña is part of the El Niño Southern Oscillation or ENSO system which refers to atmospheric pressure changes between the east and west tropical Pacific. La Niña sits at the opposite end of the spectrum from El Niño, with a Neutral phase in the middle.**

**In normal conditions, trade winds blow from east to west, pushing warm waters towards Asia. The warm moist air bubbles up on the Asian side bringing wet weather to that part of the world before returning back towards the cooler side of the ocean to complete a continuous cycle of air movements known as the Walker Circulation.**

**During a La Niña phase those trade winds get much stronger and push the warmest water further towards the western tropical Pacific, bringing above average rainfall to Eastern Australia.**

**Then there’s the other two weather systems I mentioned earlier. The first one is the Indian Ocean Dipole, or IOD. It refers to the difference in sea-surface temperatures on opposite sides of the INDIAN Ocean. Just like the ENSO system it also has different phases ; positive, neutral and negative.**

**A positive dipole phase generally brings higher-than-average rainfall and floods to eastern Africa and droughts in south-east Asia and Australia.**

**A negative dipole phase has the opposite effect, with cooler and drier conditions in the west, and warmer water and more rainfall in the eastern Indian Ocean.**

**Twice this year Australia has been in a negative phase of the Indian Ocean Dipole, which meant more moisture was available to fall as rain over the continent.**

**The Southern Annular Mode, or SAM is an index used to monitor the position of a belt of winds that flow from west to east between Australia and Antarctica.**

**In a negative phase, these westerly winds move further north, and in a positive phase they move further south. During twenty-twenty-two the SAM has been predominantly positive and with those westerly winds further south and out of the way, the moist easterly winds have been able to dominate Australia’s weather patterns.**

**The results for Australia have been pretty grim. Two very wet years have left much of eastern Australia sodden, and floods now frequently follow even moderate rainfall. Twenty-two people are known to have died during flood events. Almost a thousand schools have been closed at various times, and the public has been advised to avoid non-essential travel during downpours. Supply chains have been badly affected, and food shortages have been reported across the region.**

**Over on the other side of the Pacific Ocean, the unusually cold waters caused by La Nina push the air currents of the Jet Stream further north than they would normally be, exacerbating drought conditions in places like California.**

**Changes in the Jet Stream caused by La Nina can reach across the Atlantic as well.**

**In late autumn and early winter, high pressure in the mid-Atlantic can prevent Atlantic weather systems delivering mild air to our side of the pond, resulting in very cold winter conditions over Western Europe.**

**The head of the World Meteorological Organization, Petteri Taalas, recently confirmed that the worsening drought in the Horn of Africa also bore the hallmarks of La Niña.**

**He said: "The new La Niña update unfortunately confirms regional climate projections that the devastating drought in the Horn of Africa will worsen and affect millions of people.”**

**"It is exceptional to have three consecutive years with a La Niña event.” Taalas said**

**And that’s because the sophisticated computer modelling that our climate scientists use to project the likely trajectory of future global temperatures all suggest that it’ll be El Nino, not La Nina that becomes the dominant system, and El Nino conditions tend to add an additional warming boost to the global atmosphere. What the models project is that, as our overall atmosphere warms more and more, the cold, deep water that rises to the surface off South America will meet increasingly warmer air above, causing it to warm more quickly than the water over on the other side of the tropical Pacific. That decrease in temperature difference from one side to the other is expected to reduce the strength of the east west trade winds, which essentially is what happens in an El Nino phase. It’s a projection that’s supported by evidence from the paleoclimatological record which shows that during warmer periods, El Nino conditions were indeed prevalent.**

**So, the findings in this new paper, published in September by a research team from the University of Washington, come as something of a surprise.**

**The team studied actual real world Pacific Ocean surface temperatures taken by ships and ocean buoys between nineteen seventy-nine and twenty-twenty. What they show is that the water on the South American side of the ocean has actually cooled slightly in recent years despite a warming atmosphere, while the water over on the Western side and in the Indian Ocean has warmed more than anywhere else.**

**That’s not what the models say should be happening, so the conclusion has to be that something else is going on in those areas that simply hasn’t yet been factored into the super computers’ algorithms.**

**Whatever it is, the upshot is that the water temperature differential between the east and west sides of the tropical Pacific has increased not decreased, and the trade winds have strengthened, which is what happens in a La Nina phase.**

**The paper’s lead author, Robert Jnglin Wills said**

**“The climate models are still getting reasonable answers for the average warming, but there’s something about the regional variation, the spatial pattern of warming in the tropical oceans, that is off.”**

**Now, at this point you might be expecting me to furnish you with some sort of great reveal about a lurking deep-sea phenomenon that nobody knew was there.**

**And, erm…no**

**Turns out the researchers aren’t sure what’s going on at all.**

**Right now, they’re looking at all the tropical climate processes and as far down as the ocean around Antarctica to see if they can solve the puzzle.**

**Once they get to the bottom of it, so to speak, then they hope to put a timeline on how long the anomaly will go on for and when we might expect the ENSO system to switch back to a predominantly El Nino state in line with currently climate modelling.**

**“If it turns out to be natural long-term cycles, maybe we can expect it to switch in the next five to 10 years, but if it is a long-term trend due to some processes that are not well represented in the climate models, then it would be longer. Some mechanisms have a switch that would happen over the next few decades, but others could be a century or longer,” Wills said.**

**The researchers do stress though that none of this should be taken as a suggestion that the projected overall long term global atmospheric warming trend is wrong. The team expects that at some point the relentless march of human induced greenhouse gas emissions will reverse these local trends and cause the ENSO system to produce El Niño conditions more often. And that brings a whole different set of challenges.**

**In the meantime, the World Meteorological Organisation is predicting the current phase of La Nina will likely continue into the first few months of twenty twenty-three, so there may unfortunately be no short term let up in the Australian rains or the devastating droughts over in East Africa.**

**But research data from papers like this one from the University of Washington and hundreds of other teams all over the world, do at least help to add greater regional accuracy to the overall warming patterns predicted by climate modelling. The more local details our scientists can uncover, the more they will be able to help governments and communities in those areas plan effectively for the extreme weather events that are set to hit all of us in the coming years.**

**If you’ve got news or views on how El Nino and La Nina might affect our planet in the future, or if you’ve got direct experience of how they’re affecting us right now, then why not jump down to the comments section below and leave your thoughts there.**

**That’s it for this week though. Thanks, as always to our amazing Patreon supporters who guide the content of these videos and help me keep the channel completely independent.**

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**As always, thanks very much for watching, have a great week, and remember to Just Have a Think.**

**See you next week**