**Climate models can no longer keep pace with climate reality.**

**Here’s a bit of history for you. Way back in eighteen-ninety-six a**

**Swedish scientist by the name of Svante Arrhenius looked at all the smoke being produced by the Industrial Revolution that was in full swing at the time, and did some experiments that strongly suggested the carbon dioxide in that smoke could be causing a reaction in the planet’s atmosphere that would result in global surface temperature increases.**

**Who’d have thought it eh? Eighteen-ninety-six!**

**By the nineteen-fifties scientists like Gilbert Plass had started to use early computers to study atmospheric CO₂ effects, and the now famous Charles David Keeling of the Scripps Institute set up a monitoring station at the top of Mauna Loa on the Big Island of Hawaii to start taking accurate annual readings of the ebbs and flows of atmospheric CO2 concentrations at one of the highest, pollution-free locations on the planet.**

**In the nineteen-sixties, two very smart science bods called Syukuro Manabe and Richard Wetherald developed one of the first numerical climate models that simulated how increasing CO₂ could impact global temperatures. Ten years later that work morphed into the much more sophisticated General Circulation Models, which had the state-of-the-art computers of the day add in a bunch of additional real-world variables to represent oceanic and atmospheric dynamics.**

**Modern climate models are of course driven by supercomputers that crunch through unimaginable quantities of data and calculations to mimic the complex interactions between the atmosphere, the oceans, our continental landmasses, the planets enormous stores of ice, AND our own human activities.**

**And despite all this. Despite fully understanding the basic physics for a hundred and twenty-nine years, and despite the mind-blowing acceleration of computer processing power in recent times, the empirical evidence taken from field research around the world now tells us that even the very best models we currently have available are woefully underestimating the speed and severity of change in our planet’s climate. Which means our global leaders have been making poorly-informed decisions for several decades.**

**So, what the hell is going on?**

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

**Now, I think it’s fair to say that we’ve all had a good dollop of climate information foisted upon us in recent years, haven’t we? Most of us, for example, are well aware of scientific warnings about polar ice melt, global sea-level rise, extreme heat waves, droughts and floods and areas of the planet that will be uninhabitable to human beings in the near future. All very sobering, but, at least here in the comfortable west, just not quite setting us on fire enough or getting our feet wet enough or making our stomachs hungry enough to engender a mass demand for emergency action. There are even some people, and honestly, you won’t believe this, there are even some people who are saying the whole climate change thing is a hoax!**

**I know! Mental!**

**But if the latest data are to be believed (which they probably should be) then the next few decades look like they could be far worse and far more randomly destructive than the world’s most powerful climate models are predicting.**

**So, are these climate models completely useless then?**

**Well, no, not really. In fact, they’re some of the most sophisticated machines on earth and they’re actually very good at predicting BROAD climate trends. Scientists know that because they can ask the models to tell us what the climate should have been like going back in history based on known parameters and then compare the model’s results with what actually happened based on real-world data that was recorded at the time. And when they do that, they get a remarkably accurate correlation.**

**The trouble is that warming an atmosphere across an entire planet as complex and complicated and so rich in variety as the one we’re lucky enough to inhabit doesn’t result in broadly homogenous weather patterns in all areas.**

**The dynamics of clouds systems for example are extremely difficult to model in any kind of granular detail, and currently at least, pretty much impossible to model on any kind of timeline that’s longer than your local weather forecast. And yet clouds have a major bearing on the amount of heat that is either reflected back into space or blanketed down onto the earth’s surface on any given day in any given location.**

**So, it’s a pretty chaotic system, at least from the point of view of a number crunching computer. There are hotspots of extreme weather events like those heat waves, storms and floods that I mentioned earlier, and in some parts of the world things are already getting to the pointy end of dangerous and people are losing their lives and livelihoods.**

**This paper for example, published in November twenty-twenty-four, highlights what it calls a rise in regional heatwave hotspots that is outpacing the simulations. The researchers found that on every continent except Antarctica, extreme heat was increasing**

**“significantly and faster in magnitude than what state- of- the- art climate models have predicted under present warming even after accounting for their regional summer background warming.”**

**And it turns out that it’s not just geographically specific climate events that our climate models are not well equipped to predict, it’s also short-term spikes like the one we seem to be experiencing right now.**

**The conclusion of this paper’s authors is, unsurprisingly, that a much better understanding of the drivers of these more extreme events is urgently needed so that they can be factored into updated models.**

**Oh, and by the way, they say, it might be a good idea to up the ante on the old mitigation work too. In other words,**

**stop burning fossil fuels and stop destroying country sized areas of land-based ecosystems every year, so we can start dramatically reducing the amount of carbon dioxide and methane and other greenhouse gases that we’re currently pumping into the atmosphere at an accelerating rate.**

**In the meantime though, governments and corporations, and city planners and public health officers and the famers who grow our food, are all starting to demand pinpoint accuracy of how the climate in their specific region is likely to change in the coming years.**

**Two of the best-known exponents of global climate research are Gavin Schmidt, Director of NASA’s Goddard Institute for Space Studies, and Zeke Hausfather, who is a research scientist at Berkeley Earth. In a recent article that they co-wrote for the New York Times, the two experts addressed the unpredicted and largely unexplained jump in global temperatures that started in mid twenty-twenty-three, and discuss how climate research needs to up its game to keep pace with an increasingly turbulent planet.**

**Schmidt and Hausfather point out that climate science research 6:46 generally works on seven-year cycles to produce reports that summarize long-term trends. The data being used for the latest round of climate modelling are based on observations that ran up to twenty-fourteen, so they’re missing a whole bunch of more recent variables like COVID and the desulphurisation of marine freight shipping and even volcanic eruptions. So, right now there’s a big gap between what the models can provide and what policymakers and the public are demanding.**

**Essentially, climate models are very good at giving us general information about long-term trends and very poorly equipped to provide short term warnings about extreme events where people live. In an recent interview with** [**Zoë Schlanger**](https://www.theatlantic.com/author/zoe-schlanger/) **for the online journal The Atlantic,**

**Gavin Schmidt, explained that current models work at a resolution of about a hundred square kilometres per pixel. Reducing that down to something like one square kilometre per pixel would, he said, require**

 **“like a hundred thousand times more computation than we currently have,”**

**So, what’s the solution then, I hear you ask?**

**That’s a very good question!**

**According to the New York Times OpEd, we need**

 **“more comprehensive and faster data gathering from satellites, in situ measurements and economic statistics, converted by analysts for the climate and weather models.”**

**And then all the labs around the world need to use that data to update their simulations EVERY YEAR instead of every four years as is often the case at the moment.**

**That’s a lot of work, but Schmidt and Hausfather reckon the**

 **“goal of analyzing data in under six months is achievable if the data-gathering and climate-modelling labs prioritize it.”**

**The only caveat to that is that it would require a concerted and coordinated effort from U.S. agencies like the National Oceanic and Atmospheric Administration and the Department of Energy, alongside international agencies like Copernicus here in Europe. And, I don’t know if you’ve spotted this, but those agencies in the US don’t appear to be receiving quite the level of support under the new administration as they’ve enjoyed in previous years. So, whether such an increase in funding and resources will be forthcoming is very much open to question.**

**The bottom line, right now, in all honesty, is that we’re guessing a little bit about the specifics of future changes to our climate. But recent real-world data is strongly indicating that those guesses are predominantly underestimating the severity of what’s coming, not overestimating it. Which brings us briefly to the financial risk managers.**

**We’ve looked at the work of Sandy Trust and his colleagues at the Institute and Faculty of Actuaries and Exeter University a couple of times in the past. They make the point that conservative**

**estimating in climate science, which tends to draw all the lines of possibility on a graph and then strike a notional median line right through the middle of all the results, is in very stark contrast to conservative estimating in the world of financial risk management, which draws all the same lines on the same graph and then says “we need to cover our asses against THAT LINE there, because that’s the worst case scenario and, however unlikely, if that did happen, we would be wiped out financially.**

**Even the world’s most prolific fossil fuel investing bank, JP Morgan Chase has just published a paper warning its partners and the wider industry that rapid climate change is a very real thing that is very really happening right now and will continue to get worse in the coming years. Have they done this because they’ve suddenly had some kind of environmental epiphany? No, they’ve done it because they want to protect their assets and those of their clients.**

**I’ll take a deeper dive into that paper in a future video, but in the meantime, the work of improving the accuracy of climate models continues at pace, with the inevitable help of good old Artificial Intelligence of course. And, despite the utterly delusional garbage spouted by Donald Trump and his mates about climate change being a hoax and pulling the United States of America out of the Paris Climate Agreement AGAIN, most individual states are pushing full steam ahead with climate initiatives and energy transition projects, which by the way are creating millions of new, well-paid skilled jobs, often in deeply Republican states. So maybe we need to ignore the circus clowns at the top, and focus on the grownups who are actually doing some useful work on the ground.**

**Anyway, no doubt you have your view on this one, so as usual, the place to leave your thought is in the comments section below.**

**That’ll do us for this week though.**

**Thanks, as always to the amazing folks over at Patreon, who keep the content on this channel completely independent and enable me to keep ads and sponsorship messages out of your way. And an extra special thank you to the folks whose names are scrolling up the screen beside me here, all of whom celebrated an anniversary of Patreon support in February.**

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**Most important of all though, thanks very much for watching! Have a great week, and remember to just have a think.**

**See you next week.**