**Antarctica latest : Thwaites Glacier ice shelf could disintegrate within five years!**

**About two years ago I made a video exploring how climate change was starting to affect Antarctica, and in particular one of its largest ice sheets, Thwaites Glacier, sometimes called the Doomsday Glacier.**

**Back then, scientific research was revealing an erosion of the underwater grounding line of the glacier, which is the bit where its front floating ice sheet joins up to the mainland, and there was speculation that one day in the future the Doomsday Glacier may disappear completely.**

**The thinking was that this would be mostly bad, with global sea levels rising by perhaps as much as a metre as a consequence, flooding land that’s currently inhabited by more than a quarter of a billion human beings.**

**But the general scientific consensus seemed to be that the process would take about a century to play out completely, so you if you were a true optimist you might have been forgiven for thinking that those affected coastal areas had a bit of time to make the relevant adaptations and geographical relocations over the coming decades.**

**Which is why the latest data, published in December twenty-twenty one by the International Thwaites Glacier Collaboration, or ITGC, is so unnerving. Their research has found other additional issues that have led them to suggest the floating ice sheet could potentially shatter completely in just a few years from now, effectively paving the way for a much more rapid loss of the entire glacier.**

**So, are these researchers overplaying their hand, or do coastal real estate sales teams around the world need to start seriously reviewing their property sale prices?**

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

**Antarctica really is a very big place indeed – to give an idea of scale, you could easily fit the lower forty-eight states of America within its boundaries.**

**And of course, it’s covered in ice. In fact, it’s covered in the largest ice sheet on the planet. It’s about one mile or sixteen hundred metres thick on average and it contains no less than seventy percent of all the fresh water on earth.**

**If all of it suddenly melted into the sea, then global sea levels would rise by more than sixty metres. Thankfully, that’s not going to happen anytime soon, but our rapidly changing climate is nevertheless having a severe impact on Antarctic stability.**

**You see, underneath all that ice, Antarctica is really two separate entities.**

**The East Antarctica ice sheet sits on top of solid bedrock and has been incredibly stable for aeons – some of the ice has been there for millions of years.**

**But West Antarctica is a series of islands that dip below the water line. That means the ice sheet over here is perched relatively precariously between land and sea.**

**And it’s in this part of the continent that we find some of the largest glaciers in the world, including Thwaites glacier, which is the size of Florida, or the UK if you prefer.**

**Back in the Antarctic summer of twenty-twenty, an unprecedented high temperature of twenty point seven five degrees Celsius was recorded at a monitoring station on Seymour Island, and it’s around that same time that the ITGC carried out the research I mentioned earlier, using a submersible called Icefin to dive six hundred metres down below Thwaites Glacier to the grounding line, where they discovered that the water temperature was roughly two degrees Celsius ABOVE freezing. That was causing the underside of the glacier to melt more quicky than normal which, in turn, was pushing the grounding line further backwards.**

**The leading edges of Antarctic glaciers build up over time and project forward away from the land mass to create quite precarious ice shelves, and the grounding line is the point where those ice shelves cling onto the mainland.**

**It's completely normal for erosion at the top and bottom of the glacier to cause large lumps to periodically sheer off into the sea. It’s all part of the natural cycle of glacial renewal. It generally happens extremely slowly, and the volume of ice lost is roughly balanced out by fresh snowfalls on the land which, over many years, gradually build the glaciers back up again.**

**But two years ago, the researchers found that a warming Pacific Ocean was shifting the wind patterns in the air streams above Antarctica, which in turn was causing a flow of relatively warm water to come into contact with the edge of the continental shelf. The difference in temperature was only two or three degrees Celsius, but on a scale as vast as this, the consequences were becoming very significant indeed.**

**And as larger and larger sections drop off the front of the glacier, they leave behind thicker and thicker sections of shelf.**

**Gravity acts on these sections with the effect that they get pushed forwards more quickly.**

**So, the more the glacier melts, say the scientific researchers, the faster the ice within the glacier is likely to flow out. The prediction back in twenty-twenty was that Thwaites glacier could start disappearing in the coming decades and that there was a possibility it might all have gone within a century or so. The vast glaciers in this region act like corks in a bottle, keeping all the ice behind them in place. So, when the glaciers go, then there’s not much stopping the movement of mainland ice towards the ocean.**

**So, we can probably say that any reduction in the overall size of Thwaites Glacier is not ideal, and losing it all by the end of the century is probably something that all nations with coastal cities should be planning for.**

**But the ITGC have continued exploring and studying the so-called Doomsday Glacier over the past two years and it seems like the more they find out the more unsettling the information becomes. In December twenty twenty-one, they published further findings from their ongoing research, which they summarised during this online Press Conference. And it wasn’t a particularly comforting message.**

**Erin Pettit, Glaciologist and Associate Professor at Oregon State University, described two further drivers for the collapse of this front section of the glacier, which is a fifty-kilometre long floating ice shelf running from the grounding line out to what they call a pinning point, on what is effectively an underwater mountain, or sea mount. The front edge of Thwaites glacier is about a hundred and twenty kilometres wide, and the rate at which the whole thing is sliding into the sea is slowed down and stabilised by this wedged-in shelf which effectively acts like a dam. Or at least it does at the moment anyway.**

**That looks set to change though. Erin and her team discovered that the ice shelf is increasingly losing its grip on that wedging point. They already knew it was being affected by that underwater warm water that I mentioned earlier, but recent satellite imagery has revealed that this area, that they call an ice tongue, on the western side of the shelf is now no longer a single solid sheet but has deteriorated into nothing more than a loose cluster of icebergs which now don’t have any kind of stabilising influence over the eastern part of the ice sheet. So, the connection between east and west ice sheets is now almost completely gone.**

**That split has caused the eastern ice shelf to change its flow direction dramatically. This is how it flowed in two thousand and nine… and this is how it was flowing in twenty nineteen, moving out to the left towards where the solid ice tongue used to be. And that change of direction is another indicator of the loss of grip on the underwater sea mount.**

**But, the field study had plenty more bad news to reveal. Since twenty sixteen, the researchers have seen fractures propagating in the Eastern ice shelf, and at alarming rates – well over ten kilometres a year for short bursts of time. Each new satellite image the team gets back shows deeper and longer fractures. These two spots are where the research team based their field sites. The ice below these areas is weaker and thinner and has what Erin Pettit describes as ‘latent basal crevasses’ waiting to be reawakened. Ice naturally flows off the continent, out onto the ice shelf and into the ocean. The sea mount pinning point is back here. If we cut away a section of the surface we can see what the ice looks like from underneath. And as you can see it’s already pretty spiky. The rapidly propagating surface fractures are headed right into this area of thinner weaker ice. The prediction from the team is that when these fractures reach this weak zone, new fractures will initiate in different directions. And just like a crack in a car wind shield can slowly grow over time and then suddenly shatter the entire panel, so the team thinks these accelerating fractures could lead to the demise of the ice sheet within three to five years.**

**Meanwhile, back at the grounding line, the Icefin robot was earning it’s keep by taking lots more measurements of the underside of the shelf, and it probably won’t surprise you to learn that what it found wasn’t too encouraging either.**

**Cornell University research associate, Peter Washam, explained that IceFin is not just equipped with temperature measuring equipment. It’s also capable of mapping the ice, ocean and sea floor over about five kilometres all the way up to the grounding line point.**

**The data the team got back from IceFin depict what Peter Washam describes as a chaotic grounding zone. The bottom side of the ice sheet isn’t smooth as you might expect. It’s actually quite rugged and jagged. There are corrugations near the grounding line which turn into deep upside-down crevasses as you move further away. And then on the outer sections there are step-like features which the team call terraces. Those flat sections of ice are melting relatively slowly at about two metres per year, but the crevasses have proven to be hot spots, and the ice here is melting horizontally at about twenty metres per year. Peter explained that the slope of the ice determines the efficiency with which the ocean heat and salt mix into it and drive melting, so the steeper the gradient, the more rapid the melt.**

**Icefin was also able to show that the grounding line has retreated rapidly up the sea floor slope over the past decade. In two thousand and eleven, remote sensors mapped the grounding line at this point*.* It was mapped again at this point in two thousand and sixteen*.* And here’s where Icefin has it now, about eighty metres up the slope from its twenty-eleven point. That’s a very significant movement in an extremely short space of time and it represents yet another compounding factor suggesting a very rapid demise of this vital floating barrier.**

**But satellite imagery shows that the stresses acting on the Thwaites Glacier ice sheet are literally changing on a week-to-week basis, so making a simple linear projection out into the future is quite difficult to do, and that’s something that even the scientists themselves, with their fantastic capability for understatement, say they find somewhat unsettling.**

**If you want to delve more into the consequences of Antarctic ice loss, then I can recommend watching the video I made back in twenty-twenty which takes a more detailed look at that side of the equation. And you can jump back to that by clicking up there somewhere.**

**And of course, if you’ve got views or comments on how Antarctica may play a part in our planets rapidly changing future, then why not dive down to the comments section below and leave your thoughts there.**

**That’s it for this week though.**

**As always, a big thank you to the folks at Patreon who keep these videos completely independent and ad-free. And a quick shout out to the folks who’ve joined since last time with pledges of ten dollars or more a month.**

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**And of course, a huge thank you to everyone else who’s joined since last time too.**
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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**