

Western Antarctic Ice Sheet Instability – Ground Truth

Origin of the Disaster

The Western Antarctic Ice Sheet is a marine-based ice sheet containing enough ice to raise the global sea level by 3.2 meters. A marine-based ice sheet means the land the Western Antarctic Ice Sheet rests on is significantly below sea level. This is important for three reasons:

First, the Western Antarctic Ice Sheet is vulnerable to marine ice sheet instability. Marine ice instability is a condition that marine-based ice sheets suffer. In simple terms, it occurs when heavy sea water gets in between the land the ice sheet is resting on and the ice sheet. Since ice is less dense than water, this causes a buoyant force under the ice causing more ice to lift off the sea floor.

Second, is isostatic rebound. Ice is heavy and the bedrock of Western Antarctica has spent millions of years pressed by the weight of a kilometer or more of ice. Once that ice is gone, the below-sea level bedrock, no longer pressed down by nearly two quintillion kilograms of ice, will rebound upwards displacing the water above it. This is expected to cause a 1-meter rise in global sea levels. Typically, isostatic rebound takes a thousand years to occur. This is due to the ice taking a thousand years to melt. However, if the ice were suddenly removed, the isostatic rebound would occur much faster.

Third, the Western Antarctic Ice Sheet sits on top of the most volcanically active region on Earth, known as the Western Antarctic Rift System.

The disaster scenario occurs in two waves.

First, when the volcanic activity beneath the Western Antarctic Ice Sheet causes a cascading marine ice sheet instability event causing the entire Western Antarctic Ice Sheet to lift off the sea floor in a very short period of time. This near instantaneous release of pressure from the bedrock of the Western Antarctic combined with the intense geological activity of the Western Antarctic Rift System causes the isostatic rebound to happen in days instead of years. This causes the global sea level to rise approximately one meter in a week.

Second, the now floating ice of the Western Antarctic will calve and float out to sea where it will break up and melt in the ocean currents raising the global sea level by an additional three to four meters.

Specifics of the Disaster

During the first wave of the disaster, up to 230 million people globally will be displaced with very little warning. Many major population centers such as Tokyo, Shanghai, Mumbai, Miami, Djibouti, Panama City, Jakarta New York, Singapore, Ho Chi Minh City, and Honolulu will be mostly underwater. Countries with major population centers affected by the sudden sea level rise will have a humanitarian crisis like the world has never seen with millions of their citizens displaced. No country on Earth has the capacity to evacuate and rehouse one to fifteen million people in a week. This will result in mass hysteria, riots, looting, and clogged roads which will hamper the evacuation process. Additionally, the entire population of the Maldives, 540k people will need to be evacuated as their entire country is less than one meter above sea level.

The level of destruction will vary greatly depending on the geographical specifics of the location. Even with advanced warning, this issue will be exacerbated by the elevation data

having an error of 2-4 meters. Officials will be unable to effectively deploy their resources to the areas where they will be most needed since the rise in water level will be less than the error.

Additionally, the economic impact of the first wave will be enormous with many ports around the world being rendered useless by the sudden rise in water level. Oil and natural gas will no longer be able to be imported or exported leading many nations' electrical grids and heating to be rendered inoperative. Food will become trapped in ports or stuck on ships unable to be delivered to the populations that now need it more than ever. Most countries will be left with only the resources that were contained within their border when the sea level rose, and since most countries are major importers of at least one essential resource, very few people on Earth, even those located on the inner of continents will suffer from the effects of sudden sea level rise.

During the second wave of the disaster, up to a billion, or one-eighth of the global population will be displaced. This stage will not only affect nearly every coastal city but also those lying on rivers such as London. Many island nations in the Caribbean, Pacific, and Indian Oceans will no longer be viable for human habitation.

Insufficient access to food, water, and shelter will be rampant around the globe likely causing a significant decrease in global population, economic output, and scientific endeavors.

Many important historical sites and natural wonders will be destroyed resulting in the loss of a great deal of cultural heritage. Every single beach in the world will disappear and not naturally return for thousands of years. Global tourism is likely to become non-existent as resources are allocated to coastal defense and the building of new population centers.

Weather patterns are likely to change making current weather prediction models inaccurate and unreliable. Extreme weather events are also likely to increase in frequency and severity.