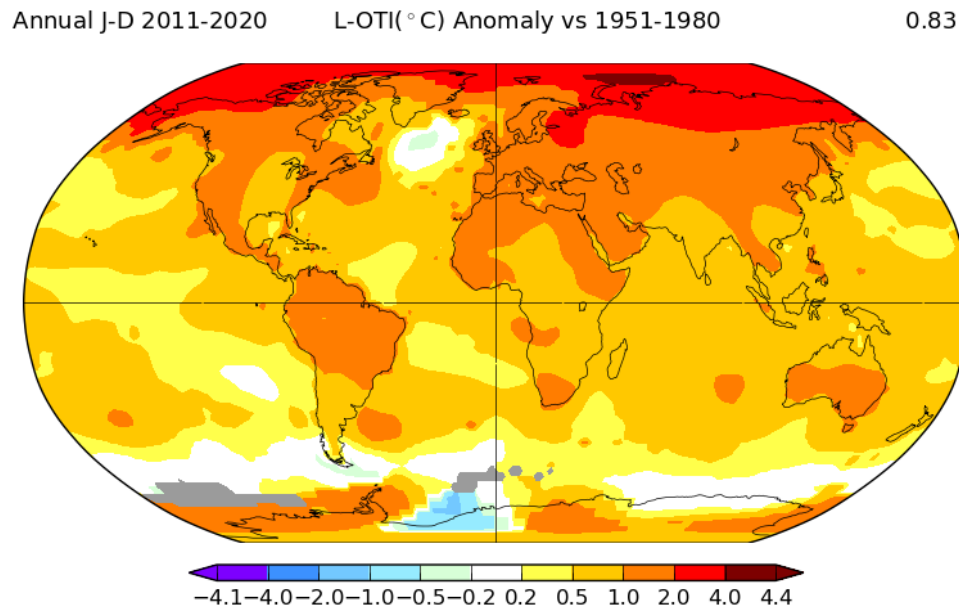


How does this new Antarctic configuration Play into our “current” Climate?

The Great Conveyor: Part 2 - The Amazing CO₂ Suckers

You may remember the “Dice Game” at our September, 2023 presentation. We looked at the climate during a reasonably stable 30 years (1951-1980) and then looked at how the **recent climate (2011-2020)** compared. Here’s another way to look at that information (the picture of the 1951-1980 baseline would be, by definition, all white - the colors here are from the **change** since that time):



The above graphic got me wondering about those two, blue spots near the poles. They show up in other contexts as well. Turns out they are intimately involved with what I’m calling (as of today) **The Amazing CO₂ Suckers!**

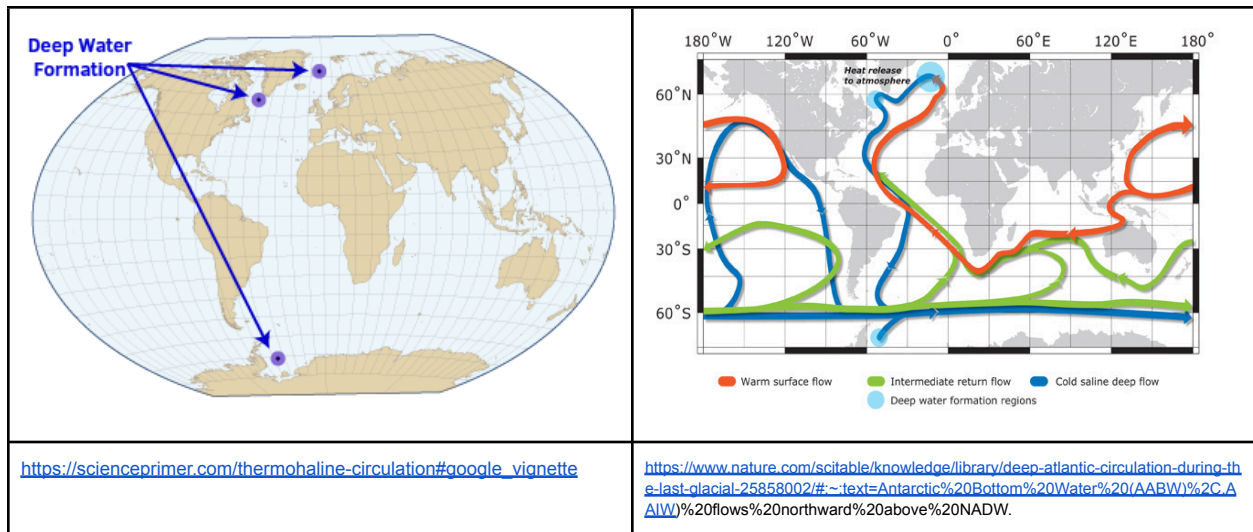
It’s not yet obvious, but we are sticking with our investigation of the Great Conveyor - this time by focusing on some **very rare spots** on the planet. These are where the spaghetti of currents **turn vertical** - plunging surface water and CO₂ (and O₂) to the bottom abyss of the oceans.

This is a result of **intense cooling** and **increasing salinity** because the ice which freezes in the ocean leaves the salt behind, increasing the density of the cold water further. Both the cold and the salinity **make the water much denser and it plunges down to the bottom.**

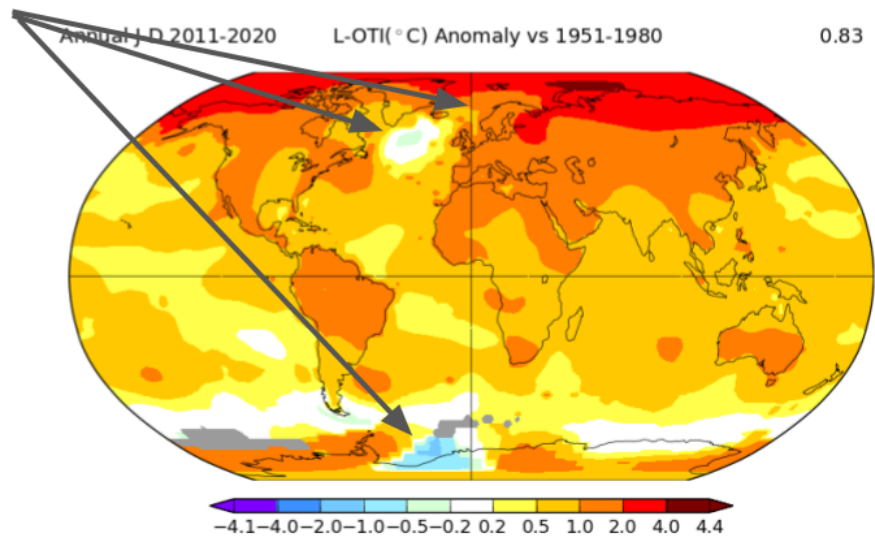
How does this new Antarctic configuration Play into our “current” Climate?

The Great Conveyor: Part 2 - The Amazing CO₂ Suckers

First, notice the “**Deep Water Formation**” and “**Heat release to atmosphere**” notations in the two frames below; this action is part of the pump that powers all of the circulating currents:



Look again at
the global
temperature
map: These
are the
overturning
points shown
above



How does this new Antarctic configuration Play into our “current” Climate?

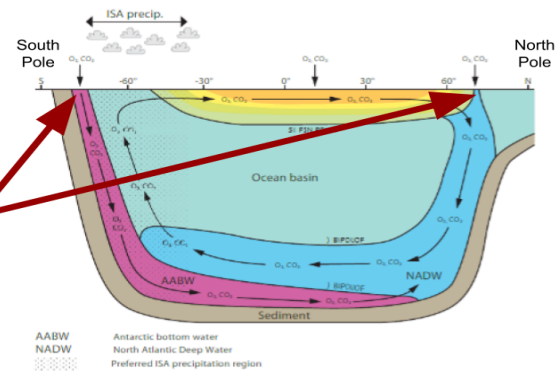
The Great Conveyor: Part 2 - The Amazing CO₂ Suckers



You can experience the complicated reality as a mess of spaghetti, but there are a couple of critical places which dramatically suck down CO₂ from the atmosphere. **Where the fork interacts with the tangle is where we will look today!**

The Great CO₂ Suckers

Where the Fork meets the Spaghetti



These few points are a huge help in pulling CO₂ out of the air (and keep it out, at least for centuries). Cold water can absorb a lot of CO₂, like a cold cola - much better than the rest of the ocean!

https://www.researchgate.net/publication/312392132_Climate_engineering_by_mimicking_natural_dust_climate_control_The_iron_salt_aerosol_method

This **crazy, CO₂-sucking, global-current-pumping effect** is a direct result of the 50-million year drift of the continents to their current configuration, particularly the isolation of Antarctica at the pole and the closing of the Isthmus of Panama. Let's see how!

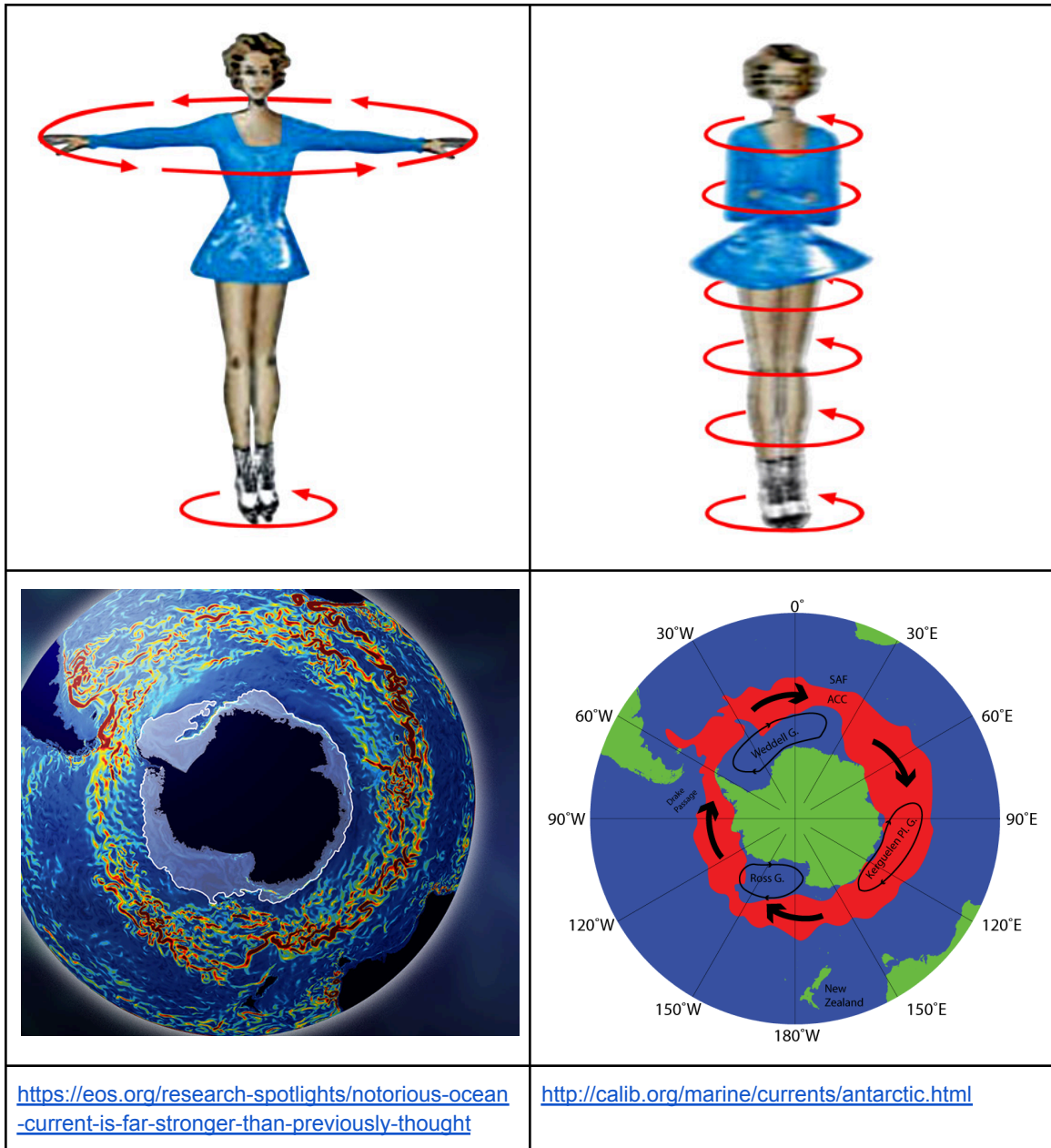
We will home in on two key things which emerged in Antarctica, certain features of which will show up constantly in the studies, particularly discussions of melting glaciers and possible tipping points. These are:

1. **The massive ice sheet covering the Antarctic resulted from the emergence of the Circumpolar winds and Current. For the first time, these could flow around the continent without obstruction. They became a barrier to heat coming towards the pole and delivered moisture for snow.**

A spinning ice skater bringing her arms in closer to her spin axis **twirls faster**. In the same way, air and water currents flowing towards the poles are getting closer to the spin axis of the planet and turn to flow around the axis faster. **This is why we have an enormous Antarctic Circumpolar Current (ACC) driven by the winds.** This kind of spin will show up all the time in hurricanes, ocean currents, the jet streams, etc. so it's good to start getting familiar with it. This ACC blocked a lot of warmth from the North. **This allowed the miles-thick Antarctic Ice Sheet to develop and grow.**

How does this new Antarctic configuration Play into our “current” Climate?

The Great Conveyor: Part 2 - The Amazing CO₂ Suckers



Air flowing South from the equator towards the South Pole is like the arms of the skater being pulled in towards her axis. She spins faster. Likewise, the air current spins faster to the East. And, since, uniquely on the planet, the continent is isolated and at the pole, the winds can blow in a circle - and they do, intensely! This blows the ocean current at the surface. **Now heat is kept from the Pole and moisture dumps a lot of snow.**

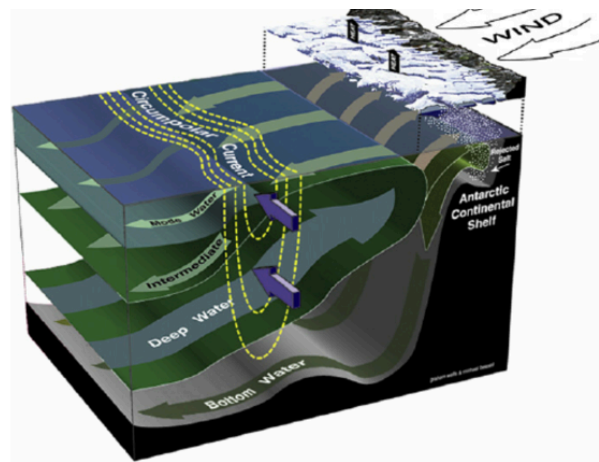
How does this new Antarctic configuration Play into our “current” Climate?

The Great Conveyor: Part 2 - The Amazing CO₂ Suckers

2. A “most curious” (my assessment) feature of this ice cap has resulted in a few “overturning” spots in the nearby surface water [Note the Gyres in the above sketch], **sending a huge amount of atmospheric CO₂ and O₂ to the bottom of the ocean!** “Antarctic Bottom Water is the coldest, densest water mass on the planet, and it **plays a crucial role in regulating the ocean's ability to store heat and capture carbon**; 90 percent of human-induced global heating and almost a third of the extra carbon released since the start of the industrial revolution has been absorbed by the ocean.” <https://phys.org/news/2023-06-antarctic-deep-ocean-consequences-global.html>

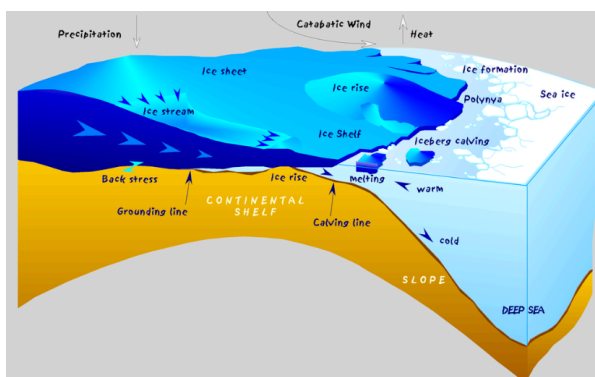
Katabatic winds are most commonly found blowing out from the large and elevated ice sheets of [Antarctica](#) and [Greenland](#). The buildup of high density cold air over the ice sheets and the elevation of the ice sheets brings into play enormous gravitational energy. Where these winds are concentrated into restricted areas in the coastal valleys, the winds blow well over hurricane force,^[2] reaching around 160 kn (300 km/h; 180 mph).^[3]

The winds 1) push ice away from the coast exposing water to freeze, 2) freeze ice, leaving behind saltier water, 3) provide plenty of CO₂ and O₂ for the now very heavy water to absorb and take to the bottom.



The overturning cell of the Antarctic Circumpolar Current (ACC) preventing effective north-south transport of surface waters across its boundary. Figure reproduced with permission from Rintoul (2000).

https://www.researchgate.net/figure/The-overturning-cell-of-the-Antarctic-Circumpolar-Current-ACC-preventing-effective_fig3_44806260



<https://en.wikipedia.org/wiki/Polynya>



https://en.wikipedia.org/wiki/Katabatic_wind

How does this new Antarctic configuration Play into our “current” Climate?

The Great Conveyor: Part 2 - The Amazing CO₂ Suckers

So, we’ve taken quite a ride!

1. The look at the global temperature maps is a reminder that we are looking at something that is actually going on. We brought our attention to those couple of points in the ocean that act very differently.
2. What forms those points, where the water gets so cold and salty that it plunges to the bottom?
 - a. In the case of the Antarctic, the Circumpolar Current blocks the heat and allows the ice sheet to form.
 - b. For all the points, the katabatic winds freeze and saltify (?) the water, making it **so dense it plunges to the bottom**.
 - c. The plunging cold water takes a huge amount of CO₂ out of the atmosphere.
 - d. The plunging water also is a big pump for the Great Conveyor.
3. Something we have not yet discussed: If these overturning points are disrupted (which they could be), **the climate can be impacted all over the world** both because of the reduction in CO₂ drawdown and because of the loss of heat transfer around the planet.

BONUS - a diversion to La Niña / El Niño

just for fun, here’s the pictures for last year (2022) and September, 2023 - this year has been a hot year. In the second frame you can see that El Niño (the reddish plume stretching to the west into the Pacific off of Peru) is seriously cranking up from the La Niña in play in 2022.

