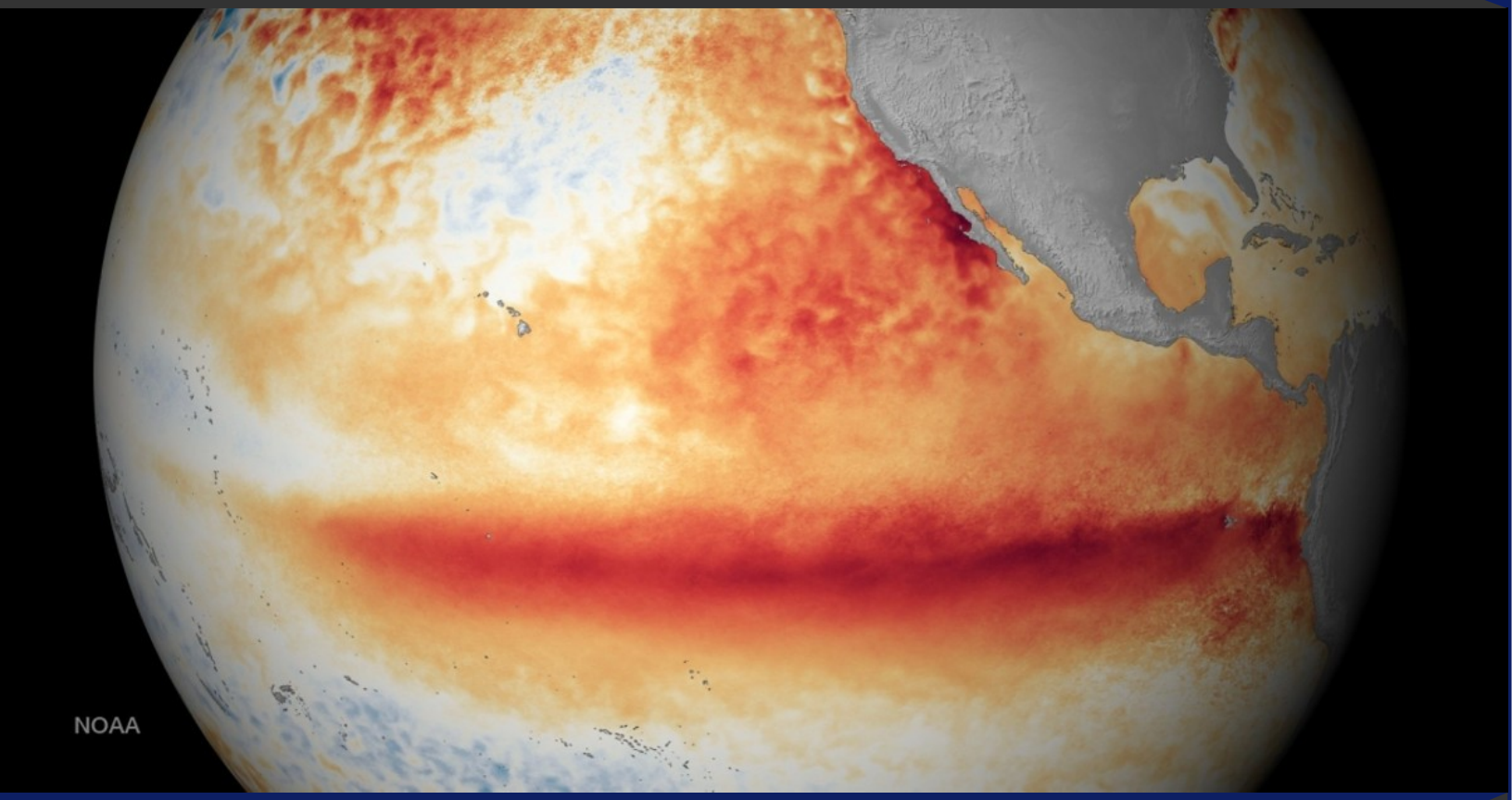
Why
You should
take El Niño Seriously



by Wolfgang Werminghausen
fasterthanexpected.one
Münster, Feb 2020

Is El Niño dangerous for you?

You live far away from the Pacific Rim.

In this report you will get more clarity about the global interconnections. It is the expanded version of an article on my blog:

fasterthanexpected.one/el-nino

Please pay attention to the detailed list of sources and links at the end.

① El Niño comes in 2020 with 80% Probability

The year 2019 has been quieter than expected. In Germany there were no major extreme weather disasters. The dying of the forests due to drought was occasionally mentioned in the media. Somehow you get used to it too. In May of 2019, there was an all-clear for an ice-free Arctic in 2019: Wieslaw Maslowski talks with Guy McPherson about Arctic Ice.

In this conversation Wieslaw Maslowski relativizes his former prediction of an ice-free Arctic in 2016 plus/minus 3 years. Newer calculation models would allow an exact prediction of 6 months. No ice-free Arctic would be expected in 2019. That was a relief.

But in autumn and winter 2019 catastrophic fires developed in Australia. Especially the dying and suffering animals have brought me deep grief.

In this situation came a very concrete prediction:

Very early warning signal for El Niño in 2020 with a 4 in 5 likelihood

by Josef Ludescher, Armin Bunde, Shlomo Havlin, and Hans Joachim Schellnhuber, 31 Oct 2019

> The El Niño Southern Oscillation (ENSO) is the most important driver of climate variability and can trigger extreme weather events and disasters in various parts of the globe. Recently we have developed a network approach, which allows forecasting an El Niño event about 1 year ahead. ...
>
> In September 2019, the model indicated the return of El Niño in 2020 with an 80% probability. ...
>
> We like to note that our algorithm only can warn of the El Niño event next year but not forecast its strength and duration.

And in The Jerusalem Post even more precise:

> Physicists have warned that there is an 80% probability of another El Niño cycle, which could occur in the Pacific region at the end of 2020.

The high probability of a new El Nino situation is bad news for Australia.

I also fear that further warming could affect the balance of the climate around the world.

I have started the year 2020 not very confidently.

Let's take a closer look at El Niño.

② El Niño Southern Oscillation

What are El Niño, El Niña and ENSO?

> ENSO is one of the most important climate phenomena on Earth due to its ability to change the global atmospheric circulation. - US National Weather Service

The El Niño Southern Oscillation (ENSO) is a recurring climate pattern in the central and eastern tropical Pacific Ocean. There it changes the sea currents and the surface temperature by 1-3 °C. A change between warm, neutral and cold periods usually takes three to seven years.

neutral

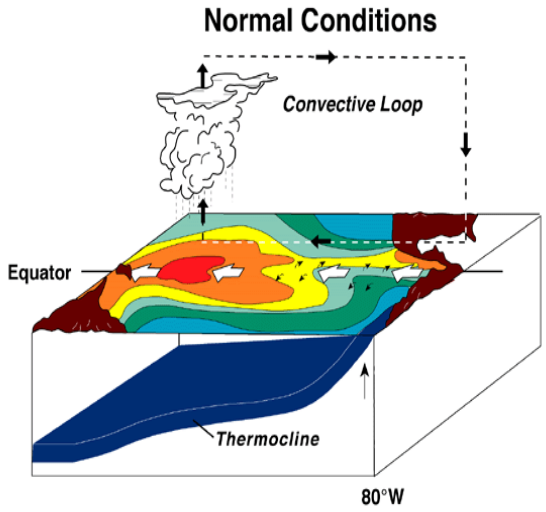


image: noaa.gov

During the neutral ENSO period there is a zone of warm water in the western part of the Pacific Ocean at the equator. Here the warm air rises with evaporated water, flows eastwards and sinks again over the cold Humbold Current off the South American coast. As a result, a westerly wind is established above the sea surface, which pushes the warm water westwards, and so on.

This is called Walker Circulation.

La Niña

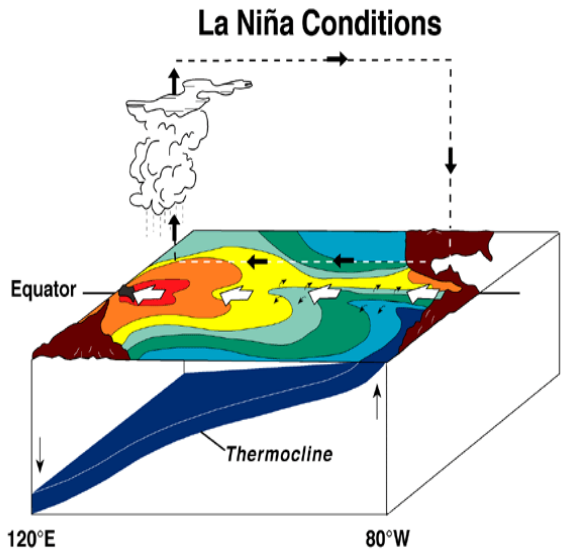


image: noaa.gov

We go on with La Niña because it is quiet similar to the neutral condition. In the La Niña period the equatorial trade winds become stronger. They are drawing up cooler deep water and push the warmer surface water more to the west. A lower-than-normal air pressure and ascending air loaded with water vapor contributes to increased rainfall in the western Pacific.

La Niña implies:

- summer monsoon in Southeast Asia tends to be greater than normal, especially in northwest India and Bangladesh (positive for Indian agriculture)
- catastrophic floods in northern Australia
- rainier-than-normal conditions in southeastern Africa and northern Brazil
- drier-than-normal conditions along the west coast of tropical South America, the Gulf Coast of the United States, and the pampas region of southern South America
- positive impact on the fishing industry of western South America

El Niño

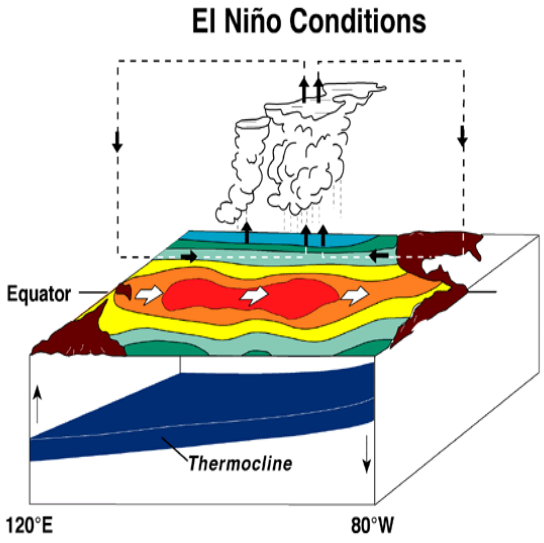


image: noaa.gov

In the El Niño period the pattern changes totally. The surface water of the Pacific is warmer than usually. The warm water pool approaches the South American coast. The upwelling of cool water in the east Pacific is stopped. Rising warm and wet air moves westwards to the central Pacific and leads to a lot of rainfall along the western coast of the Americas. Indonesia and Australia experience severe droughts. El Niño means *The Little Boy* or *Christ child* in Spanish. This name was used for the tendency of the phenomenon to arrive around Christmas.

El Niño implies:

- unusually warm ocean temperatures in the Equatorial Pacific
- drought in the West Pacific, Indonesia and Australia
- increased rainfall across the southern tier of the US and in Peru
- death of marine animals, seabirds and corals
- more rain in East Africa in countries like Kenya and Tanzania
- much drier in Zambia, Zimbabwe, Mozambique and Botswana (southern Africa)
- intensification of the Indian monsoon

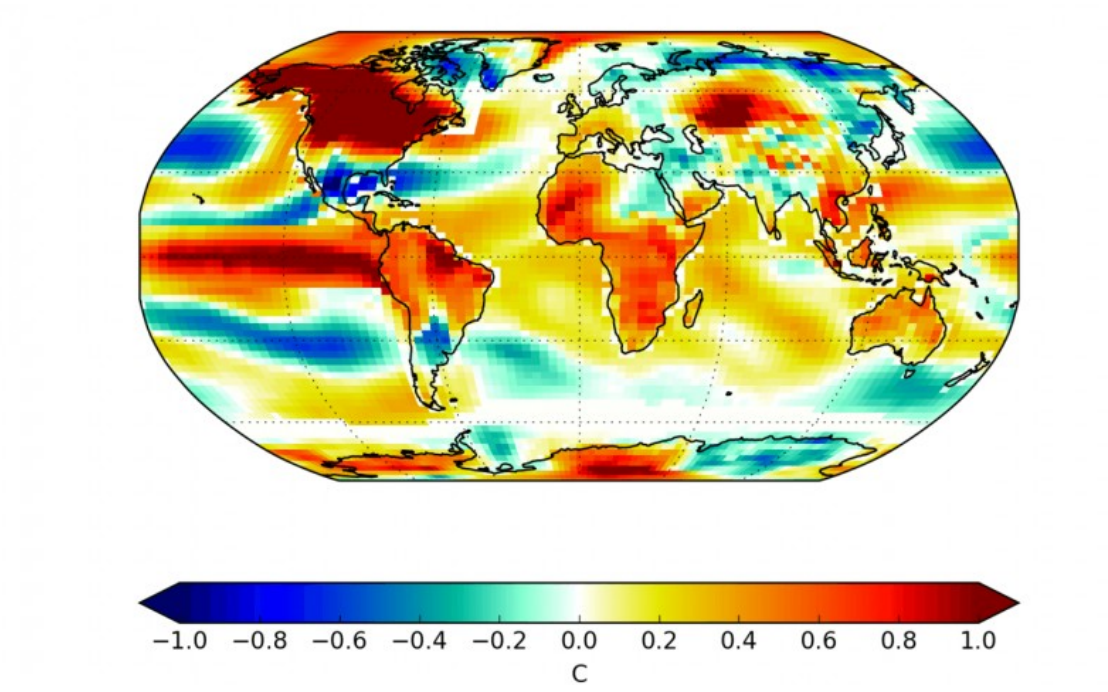


image: phys.org, Oct 2015

The image above shows the surface temperature response to an El Niño.

③ Two different types of El Niño

Mandy Freund and colleagues have analyzed drill cores of Corals. With this method they have been able to record the Ocean conditions. Especially the temperature could be conclude by analyzing oxygen isotopes. In this way we have a record of 400 year El Niño history.

The conversation journal:

El Niño has rapidly become stronger and stranger, according to coral records, 06 May 2019:

> A new “flavour” of El Niño is now recognised in the tropical Pacific. This type of El Niño is characterised by warm ocean temperatures in the Central Pacific, rather than the more typical warming in the far Eastern Pacific near the South American coast, some 10,000km away.

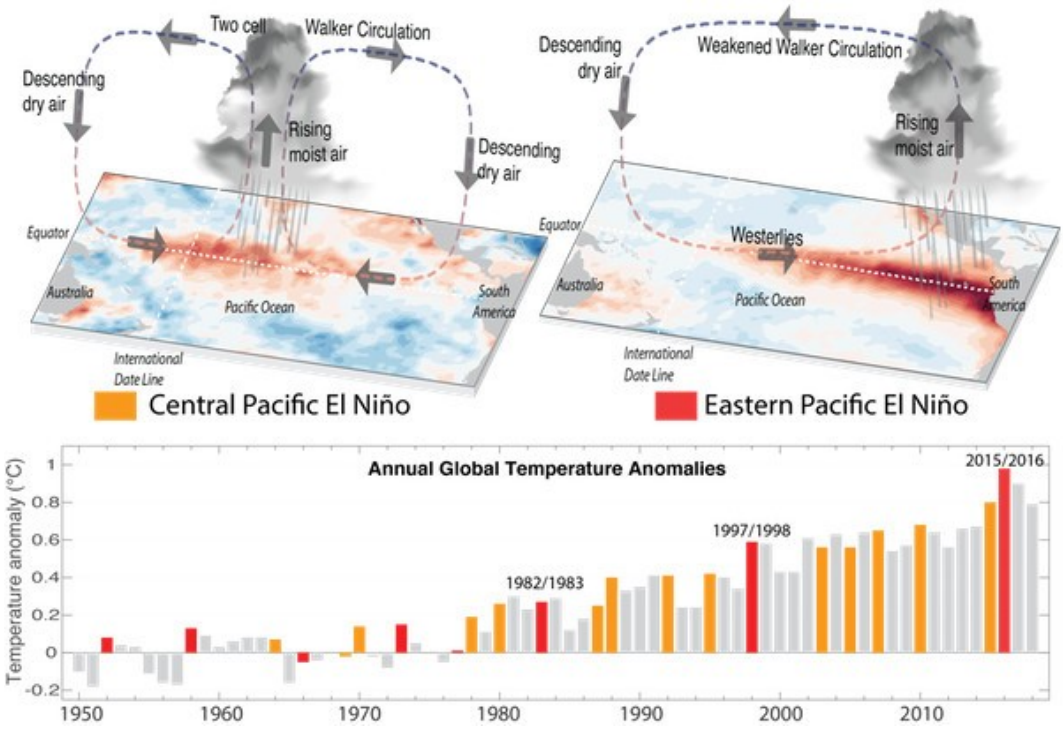


image: The Conversation, 06 May 2019

Central Pacific El Niño: This *new* type has been observed in the last 70 years more and more often. As you can see in the left picture above, the warm surface water is concentrated in the Central Pacific. With the ascending warm and wet air the rain comes down in the Central Pacific. Therefor the dry air is transported to the east and to the west. This type can be observed every 3 to 4 years.

Eastern Pacific El Niño: In the past 40 years these stronger El Niño events have been taken place 3 times (red columns in the image above). Every 13 to 15 years they trigger the temperature anomalies and have a huge impact on the world's climate systems. Many of the hottest years on record also coincide with El Niño events. During the Eastern Pacific El Niño 2015/16 - as a side effect - an increased number of disease transmissions has been observed ...

> ... resulting in an uptick in reported cases for plague and hantavirus in Colorado and New Mexico, cholera in Tanzania, and dengue fever in Brazil and Southeast Asia, among others. - phys.org, 28 Feb 2019

But:

Since the last El Niño took place at the turn of 2015/16, statistically we do not have to expect such a strong El Niño in 2020.

El Niño is one element of the global climate systems. Many feedback loops and tipping points work together to drive abrupt climate change.

④ Oceans have absorbed 93% of the heat

To put it positively: The oceans have saved us from a catastrophic heating of our planet.

So far.

The IPCC doesn't sound very optimistic.

> Key Facts: The ocean has absorbed 93% of the excess heat trapped by human-emitted greenhouse gases since the 1970s. This has tempered global heating but has caused the temperature of the ocean to rise, with multiple knock-on effects including deoxygenation. - IPCC – Special Report on the Ocean and Cryosphere in a Changing Climate, 23 Sep 2019

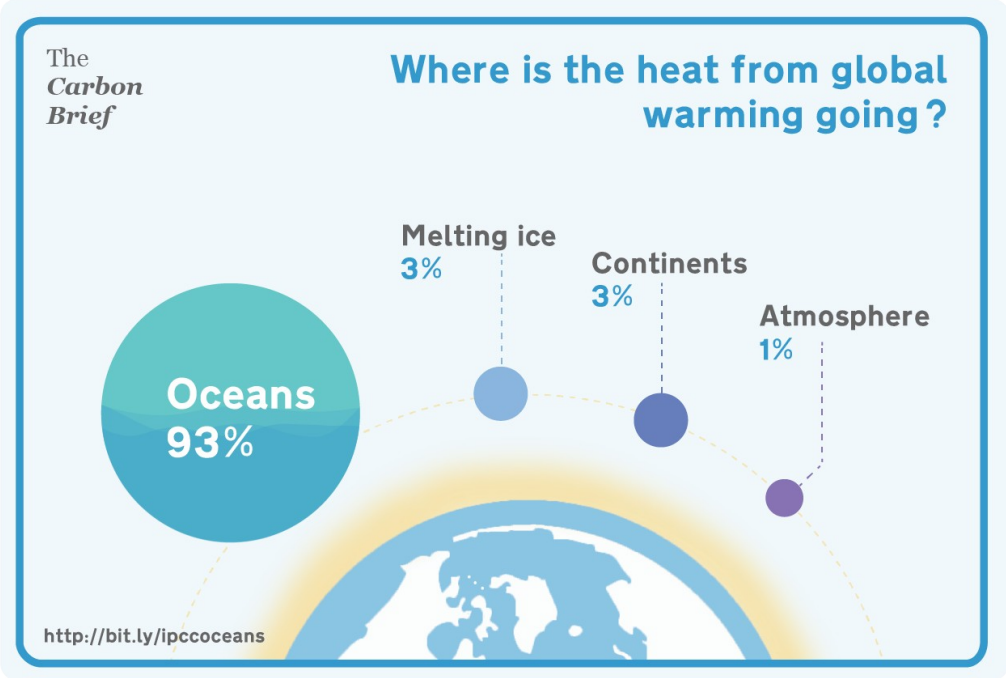


image: CarbonBrief.org – CC-by-nc-nd

The image shows the importance of the oceans as a heat buffer AND the importance of the melting ice as a heat buffer too. Small changes in this balance have enormous consequences on the heating of atmosphere and continents.

And on to the IPCC special report:

> Heating is one of the three deadly factors present in every mass extinction event in Earth's history. Along with acidification and deoxygenation, heating is pushing our ocean towards catastrophe. If we allow the ocean to heat unchecked we will start to lose vital ecosystem functions, sea levels will rise and biodiversity will decline. - Mirella von Lindenfels – International Program on the State of the Ocean.

In this fragile situation the oceans break new warming records year after year. I wonder how not to "allow the ocean to heat unchecked".

Record-Setting Ocean Warmth Continued in 2019, Cheng et al., Jan 2020

Data from earlier papers ...

> ... reveal that the world's oceans (especially at upper 2000 m) in 2019 were the warmest in recorded human history. Specifically, the ocean heat anomaly (0−2000 m) in 2019 was 228 Zetta Joules (ZJ, 1 ZJ=10^{21} Joules) above the 1981−2010 average.

228 Zetta Joule written out: 228,000,000,000,000,000,000,000 Joules.

> According to the study, the 2019 ocean temperature is about 0.075 degrees Celsius above the 1981-2010 average. - Eurekalert.com

The Oceans are heated not even a tenth of a degree C!

At first sight I was quite surprised. But even that means a huge amount of energy. Lijing Cheng compares this to the energy release of the Hiroshima bomb.

> The amount of heat we have put in the world's oceans in the past 25 years equals to 3.6 billion Hiroshima atom-bomb explosions. - Lijing Cheng

⑤ El Niño *may be* a fast trigger for global warming

The influence of the El Niño on the global temperature is almost underestimate. In the article How does El Nino warm the entire globe? Dietmar Dommenget and Nicholas Tyrrell discuss the effect of El Niño on

the global temperature.

> In a study we published last year, we used climate models to perform simulations in which we raised and lowered the temperature of the oceans to see how the land would respond.

They have found out that the global temperature reacts very sensible on the increase of the ocean surface temperature. Surprisingly, however, regional warming of the Pacific Ocean has already a significant impact.

> If the ocean surface temperature increased or decreased by 1 C, the land temperature increased or decreased by almost 1.5 C. Essentially, we found that the global land temperature can be altered simply by changing the temperature of the tropical Pacific Ocean.

They ask themselves: "Why is the tropical Pacific so influential?

> The answer is because of tropical convection – the tendency for warm air and moisture to rise high into the atmosphere.
>
> Atmospheric convection in the tropics reaches up to about 5-10 km above the ocean, taking the warmth into the mid-to-upper troposphere. This is fueled by the heat release from the condensing moisture in the tropical air. The colder oceans do not have the capacity to evaporate that much water vapor and therefore to generate the kind of convection that reaches this high.

There is a significant global temperature increase during an El Niño event. And there are influences in North America, Africa, Europe, Russia, Atlantic and Indian Ocean, even Arctic and Antarctic.

One more question:

⑥ Does El Niño return the stored energy?

This question is answered from Yale University in 2015: How Long Can Oceans Continue To Absorb Earth's Excess Heat?

> More heat stored in the ocean now means more will inevitably return to the atmosphere. "A couple of El Niño events will do the trick," said England. The warm water and calm winds of this periodic Pacific tropical condition are "a big way to get subsurface heat back to the surface."

Since two decades during the cool phase of the Interdecadal Pacific Oscillation atmospheric heat has been "pumped down into the western Pacific". Matthew England, an ocean sciences professor at the University of New South Wales in Sydney, Australia, thinks:

> There’s a hint this might already be starting to happen. ...
>
> Given the enormity of the ocean’s thermal load, even a tiny change has a big impact.

Together with the high concentration of greenhouse gases, a lower absorption of heat by the oceans leads to an accelerated rise in global temperature.

> As for marine life, ocean heating already presents multiple, intensifying dangers. Warmer water holds less oxygen and other gases. ...
>
> A further concern is that temperature increases could diminish the ocean’s vital role as a carbon sink.

This is the same as with sparkling water. Cold water can absorb more carbon dioxide than warm water. In the wide oceans the warmed surface water can absorb less CO2. Then the cooler deep water has little effect.

⑦ Conclusion

1. El Niño will come in late 2020 with a probability of 80%.
2. We don't know strength and duration.
3. A very strong Central Pacific El Niño is statistically unlikely.
4. El Niño influences weather pattern around the world.
5. El Niño is one of many triggers for abrupt climate change.
6. Oceans store a huge amounts of energy.

We are in a similar role as a seismographer: We know much about tectonic shifts and stresses in the earth's crust. We know there's a major series of earthquakes coming. But we cannot predict the exact time.

⑧ Sources

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