

# Discussions

List of discussions used for the experiment.

## Discussion 1 Harvested (1 err)

**# Error:** data shows that temperature was around 8.3 to 8.4 degrees. Significant is false.

**Alice:** Hi, everyone. I was looking at the data on this site or in this file about surface temperature change due to CO<sub>2</sub>, and there was a significant drop in temperatures in 1976 compared to the previous year, and we had a yearly surface temperature of 8.5 degrees.

**John:** Even if the data can't directly evince it, CO<sub>2</sub> emissions could be decreased that year, so we also had a temperature decrease.

**Bob:** Actually, there was indeed a drop in temperatures in 1976, but it wasn't that significant, in my opinion.

**Alice:** I understand but simultaneously believe even the slightest drop is a good sign for us and the environment.

**Bob:** Of course! I fully agree with you on the matter. Understanding the underlying factors of even the slightest decrease in temperatures is essential.

**John:** Great job, everyone. Let's investigate this thoroughly.

## Discussion 2 HOOD (3 err)

**Alice:** Hi all. I was going through the data about surface temperature due to CO<sub>2</sub>. Interestingly, it looks like the temperatures were relatively stable in the 1960s (1960, 1969), staying below the 8.9 degrees range.

**John:** Interesting. I noticed temperatures went up to 9 degrees between 1970 and 1990.

**# Error:** Mistakenly stated that temperatures significantly decreased in the 1990s, dropping to around 8.6 degrees. However, the data shows that the temperatures during the 1990s were about 9.2 to 9.3 degrees.

**Bob:** Yes, and from what I understand, in the 1990s (1990, 1999), there was a significant temperature decrease, dropping to around 8.6 degrees.

**# Error:** Temperature was already this high

**Alice:** Oh, right. But then, the temperatures rose again in 2000.

**# Error:** 2013 temperatures were around 9.6

**John:** You're right, Alice! There was a sudden jump in temperatures around the early 2000s. But I also found that in 2013, the temperature dropped drastically to about 9.2 degrees.

**Bob:** That's true. But overall, it's evident that there have been fluctuations in temperatures over the years due to CO2 emissions.

**Alice:** Agreed! This information should prompt us to take action toward mitigating climate change.

## Discussion 3 Harvested (2 err)

**Alice:** Hi, everyone. Data about dioxide concentration here, which I got from this site, are pretty surprising. I expected the concentration to increase over the years, but less than it does.

**# Error: the increase between 2018 - 2019 was higher**

**Bob:** Unfortunately, I would have expected the same, but that is untrue. Just look at the rise between 2019 and 2020. It never increased by as much ppm in any of the three years before.

**John:** It does seem highly concerning. Who knows what consequences all of this will bring to us?

**Alice:** Rises in temperature, worse quality of the air, etc.

**# Error: it was higher in 2022 compared to 2021**

**Bob:** Hmm, you might be right overall, Alice. Luckily in 2022, the concentration was identical to 2021.

**John:** That's, of course, a good thing, but we should keep working on reducing emissions.

## Discussion 4 Augmented (2 err)

**Alice:** Hi, everyone. I discovered something interesting about the concentration of carbon dioxide in the atmosphere. The values were significantly lower in the early years, with a value of 315.232 ppm in 1958. By the way, you can find data here with a nice visualization here.

**# Error: the increase was not rapid and there's no spike**

**Bob:** Correct, Alice! I expected the concentration to increase slowly over the years. But then I noticed a massive spike in 1965, leading to a rapid increase since then.

**# Error: the value in 1964 was lower compared to 1965 but still higher than in 1963**

**John:** It seems unusual, but there was a decrease in 1964. This may be the reason behind the sudden increase.

**Alice:** That's intriguing! I can see the value in 1964 was 319.61 ppm.

**Bob:** Hmm, you might be right, John. But overall, the trend shows a steady increase in carbon dioxide concentration across the years; look at the concentration levels in 2022; they reached more than 418 ppm.

**John:** The upward trend is evident, and we must address this issue.

## Discussion 5 Augmented (1 err)

**Bob:** Hey, I just got over this interesting data about surface temperature by country. Let's take a look at it! Maybe we can find new insights. I also found a great visualization here.

**John:** Interesting data. It shows some extreme temperature changes over the years. In 1961, the surface temperature in France was 0.827 degrees.

**Alice:** Right, John. In 2022, it says the temperature in France went up to more than 2.9 degrees.

*# Error: the peak was in 2022 in France, not in 2020*

**John:** Yes, that's exactly what I meant. By the way, take a look at the peak in 2020.

**Alice:** There're constant fluctuations over the years, but they're different for each country.

**Bob:** Absolutely! By studying them, we can get a more accurate understanding of surface temperature changes.

## Discussion 6 HOOD (1 err)

**John:** Hi! Have you checked out the data about surface temperature change by country?

**Alice:** Yes, I did! It's fascinating to see how temperatures have fluctuated over the years. Finland has experienced quite a variation. In Finland [1961], the temperature was 1.892 degrees, the highest value in the 1960s (Finland [1961], Finland [1969]).

*# Trend: false, they increased in 1964 and 1967, for example,*

**John:** Finland's temperatures show some extremes but continually decrease until 1972, look at Finland [1972].

**Alice:** You're right, John! Finland has quite extreme temperatures.

**Bob:** Well, look at the lowest temperature in Finland in those years. It was in Finland [1966].

**John:** Good catch, Bob! Such a low temperature.

**Alice:** Can we all agree that the -1.8 degrees in Finland [1966] was an incredibly low temperature?

**Bob:** Right?! Maybe we should be happy with such values.

## Discussion 7 Harvested (3 err)

**# Error: Italy has not always had higher temperatures**

**Bob:** Hey, everyone, I've been looking at the surface temperature data for Italy and Greece; and I noticed that Italy has always had higher temperatures than Greece. Is it curious or just a regular thing? Data can be found in this file or on this site.

**John:** I believe that's normal because Italy generally has high temperatures.

**Bob:** So it's normal. I thought I found something curious to talk about.

**# Error: Greece had a higher temperature in 2021**

**Alice:** Well, there are exciting things about them. In 2022 they had their highest temperature ever, and Italy had such a higher temperature compared to Greece.

**Bob:** Yes, that's true. Italy is a sweltering country, then. Can we conclude that from the surface temperature?

**John:** I believe that we can, yes.

**# Error: It was less than 1. It was 0.8**

**Alice:** I've grown quite fond of the matter now. Looking at the data, I found that Italy had one of the highest temperatures, even back in 1961, when it was already over 1 degree.

**John:** Wow! That's interesting, for sure.

## Discussion 8 Augmented (3 err)

**Bob:** Hey, do you have interesting insights about my country, Australia? by the way, I'm referring to this data about surface temperature change by country, and if you want, you may also take a look at the visualization you can find here).

**John:** I'd say it's interesting to see the temperature trends between Australia and New Zealand. In 1985, both countries had the temperature around 0.4 degrees.

**# Error: false because they're not similar**

**Alice:** They must have similar climates if they are experiencing similar trends. The same happened in 2007.

**John:** Yeah, they are going through temperature changes that resemble a similar trend.

**# Error: the trend of having similar temperatures is not valid in 2021, even though it is true in several other years**

**Bob:** I believe so, too. It's the same in 2021.

**# Error: it was the highest**

**Alice:** I also noticed that in 2021 it is the lowest temperature they got in common in those three years.

**John:** True, Alice, interesting.

## Discussion 9 HOOD (3 err)

**Bob:** Hey everyone, I've been looking at the data about surface temperature change by country for Spain and Portugal from 2012 (Spain [2012], Portugal [2012]) to 2022 (Spain [2022], Portugal [2022]). It's fascinating how similar their temperature trends are!

**John:** Really? That's interesting! Do both countries have the same temperature patterns during that period?

**# Error: they were not always higher. For example, in 2013, they were lower**

**Alice:** I think what Bob meant is that the overall trends are similar, but Spain's temperatures were always slightly higher throughout those years since 2012 (Spain [2012], Portugal [2012]).

**John:** Oh, I see! It would make sense since Spain is generally known for having a warmer climate than Portugal.

**Alice:** Yes, that's true. But how significant is the difference in their temperatures? Are we talking about a few degrees?

**# Error: false; there are bigger differences**

**Bob:** The most significant difference I can find since 2012 in Spain [2012] and Portugal [2012] is in 2021 (Spain [2021], Portugal [2021]) and it's less than a degree.

**Alice:** That's quite a slight difference, but it can still have some implications, so we shouldn't ignore it.

**# Error: they were around 2, surely not over 3**

**John:** Absolutely, even a slight difference can be of influence. Moreover, consider that in 2022 the temperatures were over 3 degrees, see Spain [2022] and Portugal [2022].

## Discussion 10 Harvested (1 err)

**Alice:** Hi all, I came across data about the concentration of carbon dioxide in the atmosphere. Can someone point out something interesting? Data can also be found on this site.

**John:** I don't know about something interesting, but something worrisome? For sure! Look at how high carbon dioxide concentration is in 2022 compared to 1958. It increased by roughly 100 ppm!

**# Error: John was right. 2022 is the worst in terms of concentration**

**Bob:** 100 ppm? I can see more than 100 ppm increases in a few years before 2022. Compare 2022 and 2020 to 2021, for example. You will see 2021 is even worse than the former two.

**John:** Maybe you're right. I might have missed some critical data over the years.

**Bob:** Don't worry. There is so much data that it's easy to get lost.

**Alice:** I was looking for interesting insights, but now I'm worried about the overall situation. I mean, John pointed out how high the concentration was in 2022, and look at it, it is over 415 ppm.

**John:** I know Alice, this is a serious matter; we shouldn't underestimate it.

## Discussion 11 Augmented (2 err)

**Alice:** Hey, everyone, I came across this data on the concentration of carbon dioxide in the atmosphere. The concentration increased by around 1 ppm between 1959 and 1960. Does the same happen in other years? By the way, data can be visualized here.

**John:** I found the same happening between 1999 and 2000.

**# Single value: the increase was of more than just around 1 ppm**

**Bob:** That's interesting. I also found the same increase of around 1 ppm happening in 2016 and 2017.

**John:** Well, it's curious, but it's essential to determine if it can be relevant.

**Bob:** True, natural cycles can influence such trends of concentration raising by approximately the same amount.

**# Trend: in some years, it increased by more than 1 ppm**

**Alice:** I agree! More than anything, the increase of around 1 ppm looks like something characteristic of the last two years in a decade. It always repeats (e.g., 1959-1960, 1969-1970, etc.).

**John:** Exactly! Probably, It's a complex interplay between human activities and natural processes causing this common pattern.

**Alice:** Agreed. However, we must be cautious when interpreting this data and avoid oversimplifying the trend.

## Discussion 12 HOOD (3 err)

**Alice:** Hi all! Looking at the data about dioxide concentration, I noticed that the concentration increased by roughly 2 ppm between Brazil [2020] (see also 2020) and Brazil [2021] (see also 2021), with the same happening between Brazil [2021] (see also 2021) and Brazil [2022] (see also 2022). Curious, isn't it?

**# Error: the increase in 2019-2020 was more than 2 ppm**

**John:** The same can be said for Brazil [2015] (see also 2015) - Brazil [2016] (see also 2016) and Brazil [2018] (see also 2018) - Brazil [2019] (see also 2019).

**Bob:** Isn't the same happening between Brazil [2017] (see also 2017) and Brazil [2018] (see also 2018)? It is common for concentrations to increase by around 2 ppm per year. Maybe we have found a pattern?

**John:** This is a trend we might have overlooked all this time.

**# Error: the increase in a few years since 2015 was more than around 2 ppm**

**Bob:** True. I can see this trend starting in Brazil [2015] (see also 2015), as reported by John. We never got to the 3 ppm values. We always remained in the 2 ppm range.

**# Error: the highest increase in a few years since 2015 was more than around 2 ppm**

**Alice:** I agree! Since Brazil [2015] (see also 2015) the highest increase was around 2.6 ppm between Brazil [2019] (see also 2019) and Brazil [2020] (see also 2020).

**Bob:** Exactly! We must focus on this trend, which may lead to a few exciting discoveries.

**John:** I agree. It's essential to study these trends if they may lead to new actions to reduce carbon emissions.

## Discussion 13 Harvested (2 err)

**Bob:** Hi all! I found this data about surface temperature change by country and this other data about temperature change due to CO<sub>2</sub>. I have a curiosity I wanted to share with you. Why is it that even if we have an increase in temperature due to CO<sub>2</sub>, we don't necessarily have an increase in temperature in all countries? By the way, on this site you will find the data about surface temperature change by country, while on this other site you will find the data about temperature change due to CO<sub>2</sub>.

**# Error: the temperature was higher in 1980 in Australia**

**John:** Hi, Bob. It depends on a large number of factors. However, you can see temperature increases in several countries worldwide. Just look at Australia; it had a higher temperature in 1981 compared to 1980, which reflects the temperature increase in 1981 compared to 1980 due to CO<sub>2</sub>.

**Bob:** That's true. I figured it was a complex topic. I also noticed that the overall temperature due to CO<sub>2</sub> was slightly over 9 degrees in 1981.

**# Error: It was the first year**

**Alice:** Starting since 1980, 1981 was also the second year we surpassed 9 degrees due to CO2.

**John:** Across the years, it became an everyday thing. Look at 1991 and 1998, just to name a few.

**Alice:** Sadly, that's how it turned out.

## Discussion 14 Augmented (3 err)

**# Error: It wasn't the coldest year**

**Alice:** Hi, all! What do you think about having the lowest temperature due to CO2 in 1974 and Argentina's lowest surface temperature in the 1970s? You can find data about surface temperature change due to CO2 and surface temperature change by country here, which can also be visualized here.

**John:** Well, surely the low impact of CO2 on global surface temperature contributed to the low surface temperature in Argentina. The temperature was -0.106 degrees in Argentina that year.

**# Error: It was -0.008 degrees**

**Alice:** Yes, in 1972, we had the third lowest surface temperature due to CO2, and the surface temperature in Argentina was higher than in 1974. It was -0.050 degrees.

**# Error: It wasn't higher, it was lower, and in fact, 1976 is the coldest year**

**Bob:** The same happened in 1976 (the second lowest temperature due to CO2), and Argentina had a higher temperature than in 1972. So, we can say CO2 emissions very influence Argentina.

**John:** That's a good finding! Well done, Alice, Bob.

**Alice:** Thanks, John! We must investigate the topic and see if we can gather more insights!

## Discussion 15 HOOD (2 err)

**Alice:** Hello, everyone. I was looking at the data about surface temperature change due to CO2 and surface temperature change by country, and noticed that in 2007 and 2010, we had temperatures above 9.7 degrees worldwide due to CO2. Can you find any country having problems due to this?

**# Error: It increased by less in 2007**

**Bob:** Canada had a real problem. Their superficial temperature increased to more than 2.5 degrees in both years, see Canada [2007] and Canada [2010].



**Alice:** That's surprising because Canada usually does not have such high temperatures. In fact, surface temperatures stayed below 2 degrees in Canada [2008] and Canada [2009].

**# Error: it was higher than 2 degrees in Canada in 2012**

**John:** Indeed, the same happened in Canada [2011] and Canada [2012]. The temperature never reached 2 degrees, even if the temperature due to CO2 stayed around 9.5 degrees in both years. See 2011 and 2012.

**Alice:** Wow! Who knows what could have led to such surface temperatures?

**Bob:** I believe it's safe to say there were more factors than just CO2 emissions.

**John:** Sure, I agree with your take.

## Discussion 16 Harvested (1 err)

**# Error: It increased by less than 5 ppm**

**Alice:** Hi! Looking at the data, I found out that when for the first time in history, the surface temperature touched 9 degrees, the concentration of dioxide increased by a massive 5 ppm than the year before, and it went up to more than 340 ppm. You can find data about surface temperature due to CO2 [here](#) or in [this site](#) and data about dioxide concentration [here](#) or in [this site](#).

**Bob:** Wait. What? Really?

**John:** What a huge increase! Luckily things calmed the following year.

**Alice:** Right! The increase from 1981 to 1982 wasn't as problematic as the one you mentioned.

**Bob:** I agree. If this continued like in 1981, the situation nowadays would be even worse. We already had concentrations at more than 400 ppm in 2015, and the temperature was almost 10 degrees.

**Alice:** Imagine what could have happened if things continued like in 1980.

**John:** Well. Things would have been a lot worse than they already do.

## Discussion 17 Augmented (1 err)

**Bob:** Hi, all! I was looking at this collection of data and noticed that CO2 emissions increased the dioxide concentration and the surface temperature. In 2015 surface temperature was higher than in 1958, and the same happened with the dioxide concentration in that year. By the way, try to give a look at this nice visualization for dioxide concentration.

**Alice:** Yes, Bob. That's what data is telling us. In 2022, the dioxide concentration was even higher than in 2015.

**Bob:** Yes, I noticed, but since data about surface temperature stopped in 2015, I considered up until that year.

**Alice:** I get why you mentioned 2015. It's clear to me.

**# Error: It was less than 30 ppm**

**John:** Concentration in 2022 was 30 ppm higher than in 2015. Just imagine how high the surface temperature will be when data about 2022 will be available.

**Bob:** I know. It sure will be higher than 10 degrees, but we can only speculate.

**Alice:** I agree with Bob. In 2015 temperature was a bit lower than 10 degrees, so anything makes me think it will be higher in 2022.

**John:** Sadly, I think data will prove you correct when available.

## Discussion 18 HOOD (1 err)

**John:** Good afternoon, everybody! Data shows we had almost the same surface temperature due to CO<sub>2</sub> in 2005 and 2010. However, I noticed the dioxide concentration was much higher in Brazil [2010] (see also 2010) than in Brazil [2005] (see also 2005). What do you think? Would you expect this?

**Alice:** It's normal that dioxide concentration isn't the only factor to consider when looking at the data about the surface temperature. As you can see, the dioxide concentration rises even when the temperature decreases. Look at 2006, the temperature is lower than in 2005, but the dioxide concentration still increased in Brazil [2006] (see also 2006) compared to Brazil [2005] (see also 2005).

**# Error: 2008 had the lowest temperature, not 2009**

**Bob:** Alice is completely right. 2009 had the lowest temperature due to CO<sub>2</sub> emissions between 2005 and 2010, but dioxide concentration in Brazil [2009] (see also 2009) still increased compared to Brazil [2008] (see also 2008).

**John:** Oh, I see. Thanks. I thought there was a tight correlation between the two pieces of information.

**Alice:** Well, it's difficult to say. It depends on a lot of factors. This information can be extremely useful in some cases but not in others.

**John:** I get what you mean. It's complex, but yet, thanks for the fruitful discussion.

**Bob:** You're welcome!

**Alice:** Glad you enjoyed it!