

Proposal

Healing the Ozone Hole

The deterioration of the ozone layer first began during the Industrial Revolution. At this time, Chlorofluorocarbons (CFCs) were used widely in the United States and around the globe to operate early air conditioners, refrigerators, and aerosol cans. At first we were not aware of the possible hazards of using this chemical. Soon enough though, we began to find out that the chlorine found in this compound was bonding with molecules of O^3 , causing the hole in the ozone layer. This was mostly taking effect in the North Pole. Later, in 1996, the US passed a law to ban CFCs and now, as a replacement, we are using Hydrochlorofluorocarbons (HCFCs), which are similar, but somewhat less destructive to the ozone layer. Since then, we have been able to see the ozone layer slowly begin to regenerate itself over time. There is just one problem, it is not regenerating fast enough and other forces are still causing temperatures to rise. There are many options that we can take to decrease the surface temperature of the earth in order to save the polar bears and all of the other animals that are currently losing their homes and their lives; however, there is one way that we can increase the rate at which the Ozone is currently healing itself. While HCFCs are less harmful to the Ozone, it is still causing O^3 particles to dissolve over time. We propose banning the use of HCFCs as well and using another less harmful alternative such as Hydrofluoroolefins (HFOs), which .

Executive Summary

Chlorofluorocarbons were first introduced to the world in 1928, during the industrial revolution. This chemical consisted of a single carbon with two chlorines and two fluorines and was originally used to operate early refrigerators and air conditioners. Later, it was discovered that the chlorine in this chemical compound was disintegrating the amount of O_3 we had in the atmosphere, because of this, in 1994 we began looking for less harmful alternatives and eventually banned the use of CFCs in the US. Today we are using less harmful, HCFCs. While it still has chlorine in it, it does not have as much as CFCs and therefore poses less of a threat to the Ozone layer. Over the years, scientists have been watching the hole in the Ozone above Antarctica. It appears as though the banning of CFCs has allowed the hole to slowly repair itself over time; however, it has been hypothesized that at the rate it is repairing itself now, the hole should be completely filled in in about 50 years. Unfortunately, due to the other causes for climate change, such as the greenhouse effect, which is basically just bouncing back more of the sun's rays and allowing more of them to penetrate the weak ozone, the issue of climate change is still at large and many animals who survive on the colder weather are now beginning to feel the heat and are slowly dying out and losing their homes. When looking for possible solutions, using the information we already knew about the ozone, the solution seems pretty clear. If we can help the Ozone repair itself even faster, than less of the sun's rays will continue to bounce back to the earth. Our solution would be to ban HCFCs, since they are also known to disintegrate O_3 molecules. We have created a model showing exactly how the Ozone has been affected by these chemicals and also what will happen to the ozone if they were to disappear from the atmosphere. While the greenhouse effect is

another issue of its own, it is an issue that can be lessened a little if the Ozone was not in this weakened condition. <No more than one page. This is the “make or break” part of your report! The judges read the Executive Summary to decide whether to shelve the report or to continue on to the body of the report. Remember that this part of the report is expected to:

Cover the significant points of the report

Be well-organized and tightly written (i.e., all necessary, but no extraneous material)

Be written in plain English, *not* in technical terms>

Report

Introduction

We are currently investigating the hole in the Ozone and all the best possible ways to help it heal itself as quickly and as possible. At the beginning of our research, we were looking at climate change as a whole; however, we were informed that it would probably be best if we only looked at a single aspect of climate change instead of trying to research all of attempting to cram all of its components into a single project. We had decided as a group to concentrate on the hole in the Ozone, since it was our most researched topic in our old scrapped idea. We had downloaded the coding to represent climate change from NetLogo and added a few extra components in order to make it more realistic. Then we experimented with the program in order to represent the Ozone's health as the amounts of these pollutants in the atmosphere increased and decreased. Here is a list of all of the changes that we have made to the program:

- Modified the sunlight to come from a mobile sun
- Added Methane
- Added Nitrous Oxide
- Added Ozone
- Added CFC
- Added procedure to make CFCs destroy ozones on contact
- Updated comments to reflect changes

<Describe the problem that you are investigating. Explain how you developed your hypothesis and how it connects to previous research; explain the purpose of your experiments. Keep your discussion to the point and concise.>

Methods and Materials

For our project, we used the NetLogo software in order to create a representation of the earth, as well as the health of the Ozone layer as the amount of CFCs in the air both increased and decreased. <Clarify the method(s) you chose to test your hypothesis, and why. Give a step-by-step description of the method used to solve your problem. List the materials and equipment you use.>

Results

We were able to see an increase in the rate of Ozone regeneration as the amounts of pollutants lessened in the atmosphere.<Give your raw data, as collected and without interpretation or opinion; use lists, tables, graphs, and/or figures as needed.>

Discussion

The data did in fact support our hypothesis. The Ozone was able to regenerate itself at a much faster pace than before when the CFCs and HCFCs were in the atmosphere.<This is where you interpret the data. Discuss whether or not the data you collected supports your hypothesis, and why.>

Conclusions

If we were to stop the production of CFCs and use an alternative, then the hole would be able to regenerate itself faster and we will see the temperature and amount of sun rays that the earth is exposed to decrease as well. While researching, we found that the least harmful alternative would be to try using hydro powered systems instead of systems run by HCFCs. <Summarize the conclusions based on analyzing your results and drawn from your discussion.>

Personal Statement

Our most significant achievement was learning how to code. Everyone in our team had very little to no experience with coding and luckily we had one of the members in our team was able to heavily research the code for NetLogo and figure out how to work it. He then helped the rest of the team learn how to do minor changes to the program. <Give what you consider to be your most significant original achievement on the project.>

Acknowledgments

I would like to acknowledge Melissa Berryhill and Roger Duroux. Even though it was apparent at the beginning of our project that we had no idea what we were doing when it came to the coding, Mrs. Berryhill cheered us on and pushed us to do our best. She is the reason we were able to do this. Mrs. Berryhill unfortunately left the school a few weeks ago and since then, we have been relying on Mr. Duroux to be our new mentor/sponsor. We greatly appreciate his kindness in willingly taking Mrs. Berryhill's place after she left. <Acknowledge the people and organizations who helped you.>