Exploring the Atmosphere with Extreme Balloons

Columbia Space Initiative



What is the Columbia Space Initiative?

Workshop Overview

- 1. The Ozone Layer
- 2. Weather Balloons
- 3. The Experiment
- 4. Q&A

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The Ozone Layer

What is the ozone layer?

- A layer of ozone (O_3) in the Stratosphere
- 20 to 30 kilometers (12 to 19 miles) above the Earth
- Not very thick 10ppm (parts per million) compared to 0.3ppm near the surface



Why is the ozone important to the Earth?

- It's a very thin layer of gas very high up why is it important?
- It's important because it absorbs harmful radiation from the sun.
 - The Ozone layer blocks 98% of UVB, or Ultraviolet-B, radiation from the sun.
 - \circ $\,$ $\,$ The Ozone layer also blocks 100% of UVC radiation.
- UVB is harmful to life on Earth.
 - UVB is linked to skin cancer and cataracts in humans
 - UVB leads to damage to oceanic life.
 - UVB also impairs photosynthesis in plants.



The ozone layer is extremely important to life on Earth.

What happened to the ozone layer?

- Beginning in the 1970s, the ozone layer began to be significantly affected by CFCs.
 - CFCs, or Chlorofluorocarbons, were used in aerosol cans.
 - Chlorine reacts with ozone and destroys it.
- By the late 1980s, the ozone layer above the arctic was destroyed by up to 65 percent.
- The Montreal Protocol was signed in 1989 to limit the use of CFCs.
- It will still take ~50 years for the ozone layer to recover.



The world we avoided

Weather Balloons

What is a weather balloon?

- A weather balloon is a large balloon made to reach high altitudes.
- It is often filled with helium or hydrogen.
- It can reach 120,000 ft (23 miles, 37 km) or even higher.
- The balloon expands to be very large as it rises.
- It has a lot of applications:
 - Weather research: NOAA
 - Hobbyist: Cameras
 - Special: Red bull



Weather balloons







Weather balloons



Captured



Gator in space



3:30

The Experiment (The Scientific Method)

The Question

What are we looking for? What do we want to know? How does the amount of UVB radiation change as we go higher in altitude?

The Hypothesis

What do we think will happen? What is our educated guess? IF-THEN statement

The Experiment

Design and plan the experiment

- Materials
- Logistics
- Independent variable
- Dependent variable
- Procedure
- Data

Analysis

Interpret the data What does the data mean?



UVB plot

Conclusion

What did we learn? Do we accept or reject the hypothesis?

