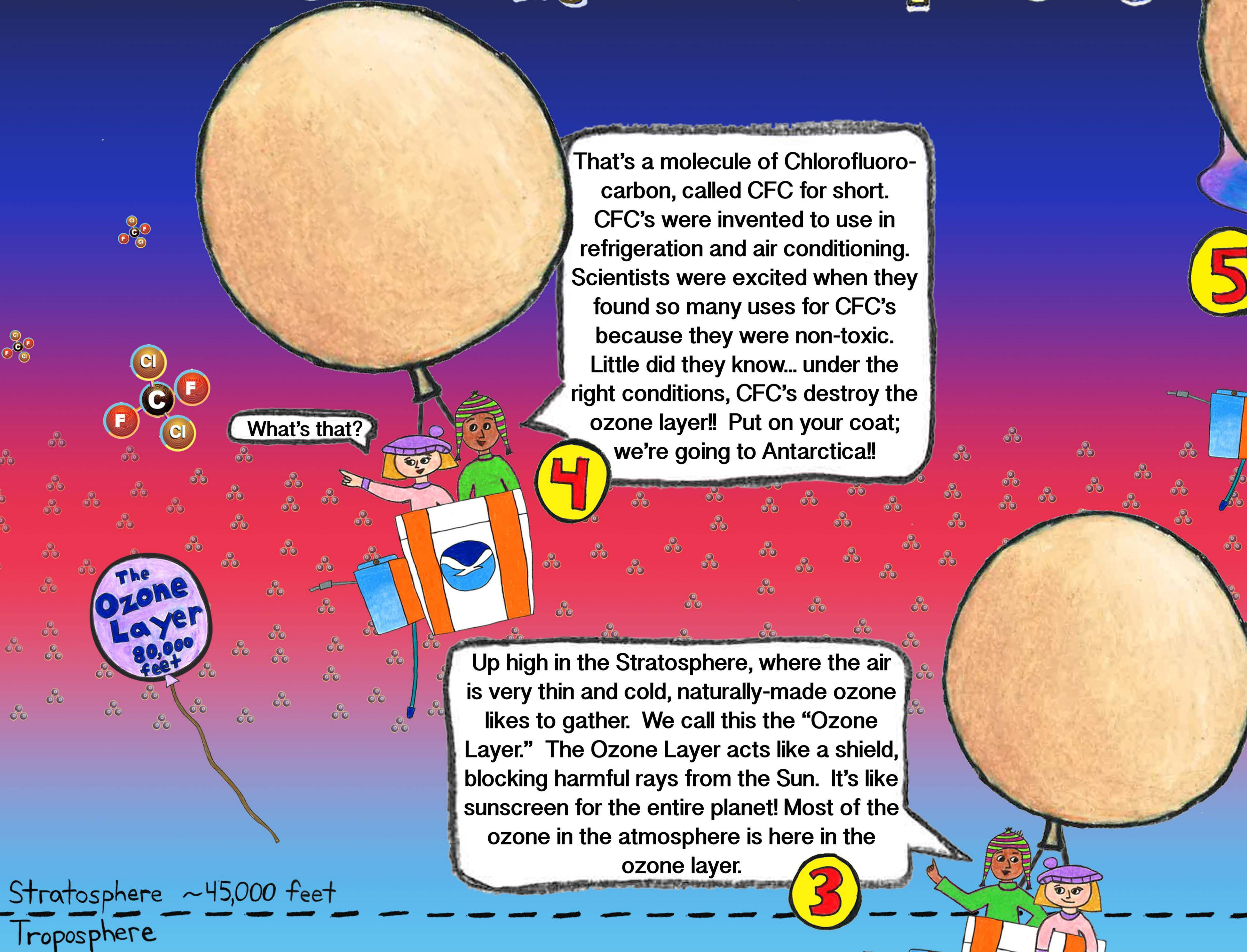


# Ozone in the Atmosphere

## The Antarctic Ozone Hole



**1** The atmosphere is full of molecules! One very important molecule is OZONE. Ozone is made up of 3 oxygen atoms. Even though ozone is made of oxygen, it is different than the oxygen we need to breathe.

**2** WHERE ozone is located in the atmosphere makes a huge difference! Here in the Troposphere there is a small amount of ozone which we call "surface ozone." Some surface ozone comes from cars, trucks, and industrial pollution. Too much surface ozone is bad for you and can irritate your lungs!

**3** Up high in the Stratosphere, where the air is very thin and cold, naturally-made ozone likes to gather. We call this the "Ozone Layer." The Ozone Layer acts like a shield, blocking harmful rays from the Sun. It's like sunscreen for the entire planet! Most of the ozone in the atmosphere is here in the ozone layer.

**4** That's a molecule of Chlorofluorocarbon, called CFC for short. CFC's were invented to use in refrigeration and air conditioning. Scientists were excited when they found so many uses for CFC's because they were non-toxic. Little did they know... under the right conditions, CFC's destroy the ozone layer!! Put on your coat; we're going to Antarctica!!

**5**

### Causes of Ozone Destruction

**A. Polar Stratospheric Clouds**  
Antarctica is the coldest place on Earth! It gets very little direct sunlight, and for most of the winter it is dark 24 hours a day! In the frigid cold temperatures above Antarctica, crystals form and make Polar Stratospheric Clouds (PSC's for short.) Chemical reactions occur on the surface of these ice crystals and release destructive chlorine in to the ozone layer!



### B. CFC's and Chlorine

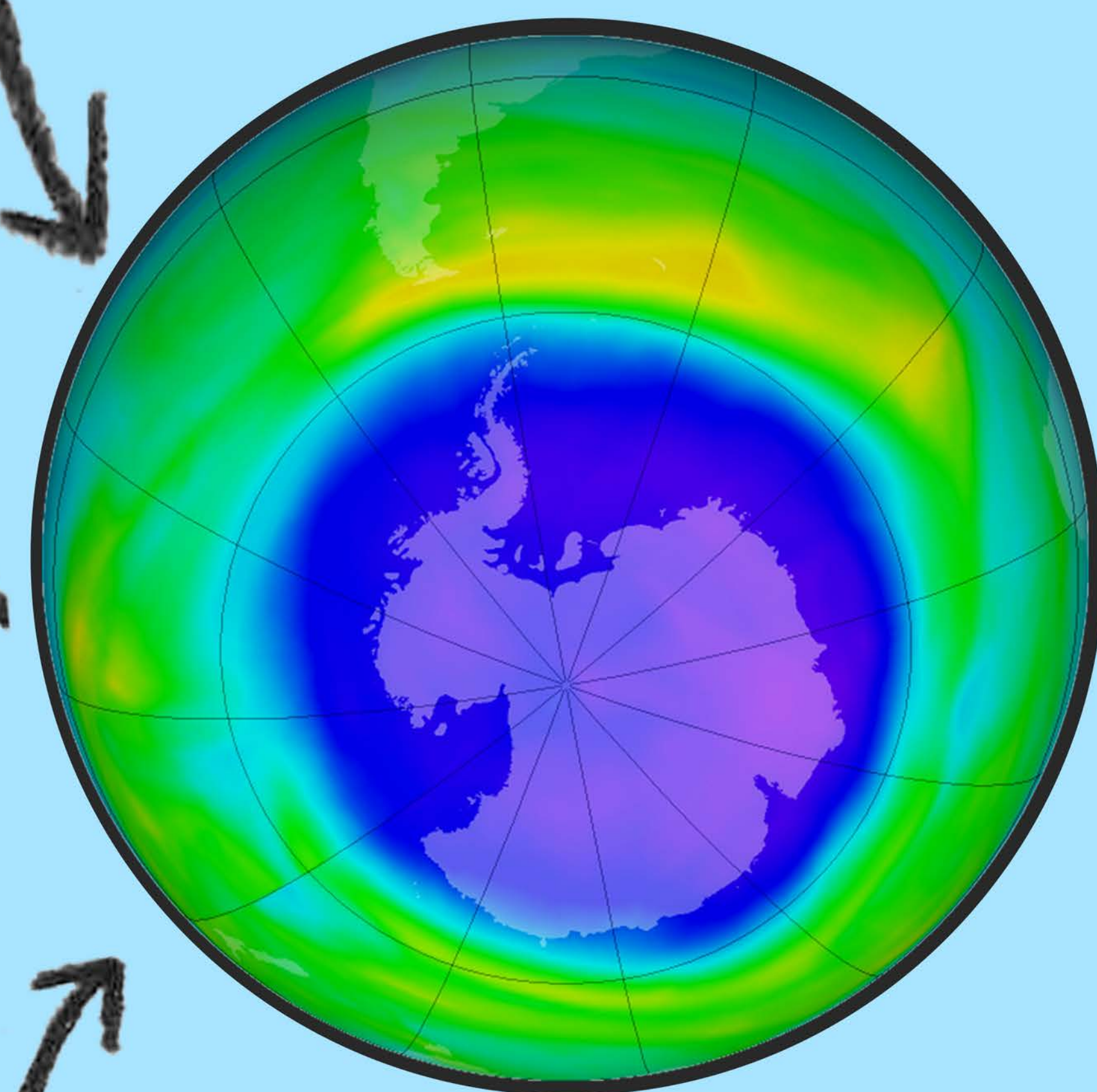
Chlorine is extremely destructive to Ozone. CFC molecules hold on tight to their chlorine atoms all the way up to the Stratosphere where extreme conditions finally release them from their bonds. In the darkness of winter, without an energy source to maintain reactions, chlorine atoms begin to build up. In the Stratosphere, these chlorine atoms are like a ticking time bomb just waiting for a spark!

### C. Return of Sunlight

During springtime in Antarctica, after months of darkness, sunlight finally returns to the frigid southern continent. Energy from the Sun is strong enough to spark the chlorine atoms into runaway chain reactions. Each individual chlorine atom can destroy thousands of molecules of protective Ozone!

### Halting Destruction

Eventually the ice crystals in Polar Stratospheric Clouds evaporate as air above Antarctica heats up. This halts the destruction of Ozone because the chlorine can finally re-attach to molecules released from the evaporating ice crystals.



### Solutions

When scientists discovered the formation of the ozone hole, a lot of people were really scared because the ozone layer is extremely important to life as we know it. Scientists and politicians were able to come together to enact a set of laws called the Montreal Protocol which phased out CFC production completely. Because of this action, ozone destruction has stopped getting worse and appears to be on the way to full recovery over the next several decades!!



Patrick Cullis and Kelsey Tayne  
Global Monitoring Division - [www.esrl.noaa.gov/gmd](http://www.esrl.noaa.gov/gmd)

Start here!

