# Northern and Southern Lights

## My Research

The Aurora Borealis – otherwise known as the 'Northern Lights' – is a vivid demonstration of the Earth's magnetic field interacting with charged particles from the sun. It's also beautiful, and worth braving a cold night out when visiting the high Northern (or Southern) latitudes. Auroras are centred on the earth's magnetic poles, visible in a roughly circular region around them.

Aurora displays are created when protons and electrons stream out from the solar surface and slam into the earth's magnetic field. Since the particles are charged, they move in spirals along the magnetic field lines - the protons in one direction and the electrons in the other. Those particles in turn hit the atmosphere. Since they follow the magnetic field lines, most of them enter the atmospheric gases in a ring around the magnetic poles, where the magnetic field lines come together.

The air is made up largely of nitrogen and oxygen atoms, with oxygen becoming a bigger component at the altitudes auroras happen at – starting about 60 miles up and going all the way up to 600 miles. When the charged particles hit them, they gain energy. Eventually they relax, giving up the energy and releasing photons of specific wavelengths. Oxygen atoms emit green and sometimes red light, while nitrogen is more orange or red.

Satellites can take pictures of the aurora from Earth's orbit and the images they get are pretty striking. In fact, auroras are bright enough that they show up strongly on the night side of the Earth even if you were looking at them from another planet.

The International Space Station's orbit is inclined enough that it evenly plods through the heavenly lights. Most of the time nobody notices, as the density of charged particles is so low. Rodney Viernes, director of the Space Weather Prediction Test Bed at the National Oceanic and Atmospheric Administration (NOAA), said the only time it matters is during particularly intense solar storms, when radiation levels are high. At that point, all the astronauts have to do is move to a more protected area of the station. (Ironically, intense solar storms can actually *reduce* the amount of radiation around the space station, because of the interactions of charged particles

with the earth's magnetic field). Meanwhile, ISS astronauts can snap gorgeous aurora panoramas.

Auroras are relatively dim, and the redder light is often at the limit of what human retinas can pick up. Cameras, though, are often more sensitive, and with a long-exposure setting and a clear dark sky you can pick up some spectacular shots.

The Northern and Southern lights come in a variety of colours including: red, green, blue, purple and pink.