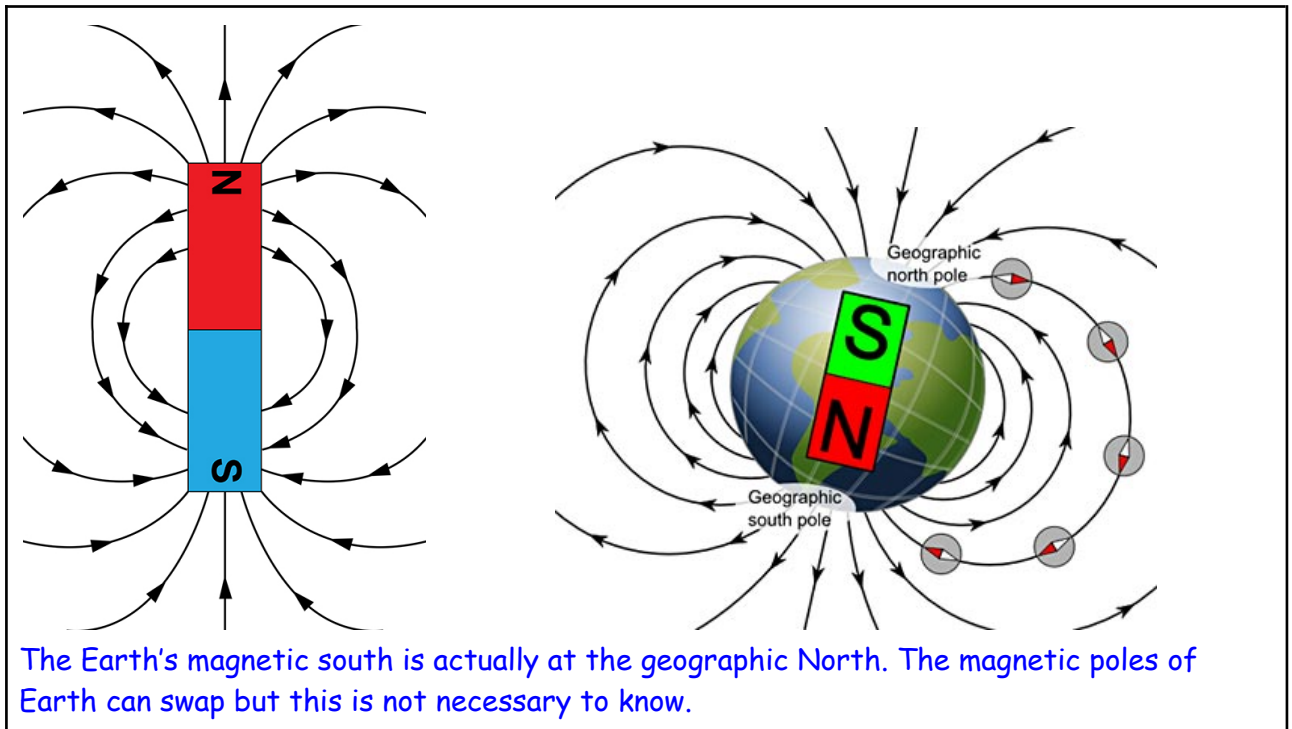


Background information: From Earth the Sun seems quite stable and unchanging but what is really happening on the surface of the Sun? Find out about solar flares [here](#).

Q1. Solar flares have massive amounts of energy and come from the Sun, however most of the energy is blocked by Earth's magnetic field. This is just one part of what we call 'Space Weather'. Earth's magnetic field is similar to any magnetic field. In the box below draw what a magnet and its magnetic field lines look like and what you think the magnetic field lines look like for Earth.



Q2. Oersted showed the connection between electricity & magnetism. (If you have not completed worksheet 1.5 watch [this video](#) to show his experiment). If solar flares are electrically charged what might happen when they come into contact with a magnetic field?

From Oersted we know that if you bring a magnet near electricity then it changes the magnet. So if the electrically charged solar flare comes into contact with a magnetic field or the Earth's magnetic field the magnetic field is changed.

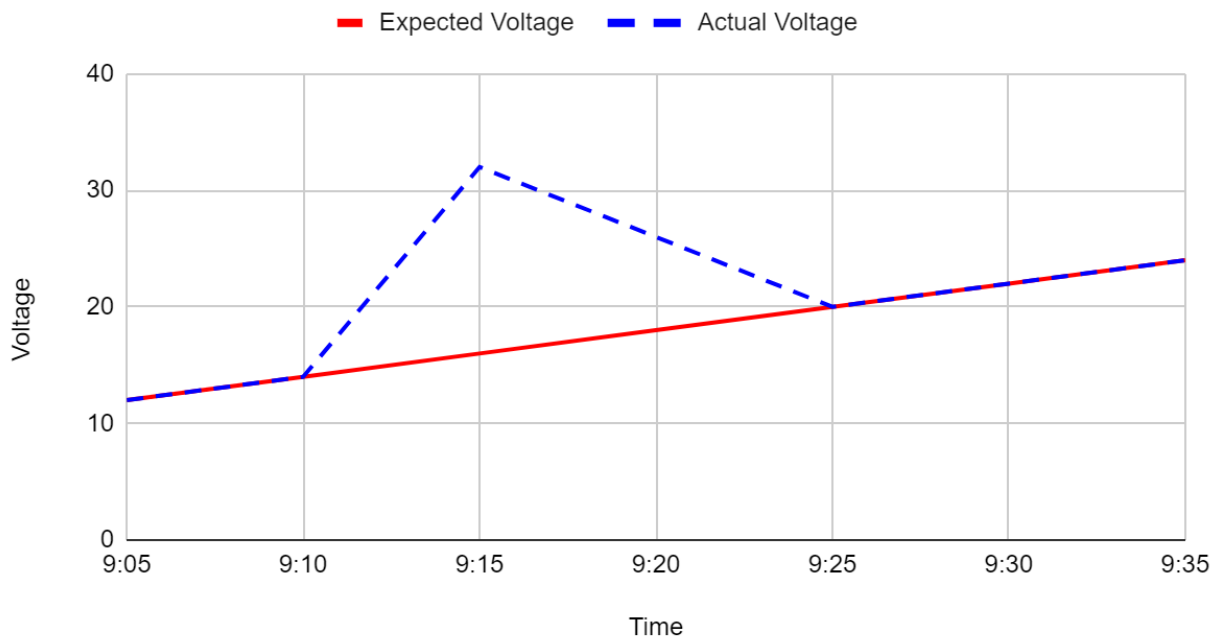
If the Earth's magnetic field is changing it can also create currents here on Earth.

Q3. During the time of the solar flare, a scientist noticed some strange results in the data below. Resistance is 0.5Ω . Using the data below, plot the actual current against the time and mark on the graph when you think the solar flare hit Earth. Explain what you think happened to give the scientist this unexpected result.

Time (am)	Voltage	Expected Current	Actual Current
9:05	6	12	12
9:10	7	14	14
9:15	8	16	32
9:20	9	18	26
9:25	10	20	20
9:30	11	22	22
9:35	12	24	24

Graph:

Strange Results



Explanation:

As the solar flare hit Earth's magnetic field it changed it and this changing magnetic field created a current in the scientists experiment.

Q4. Based on your ideas from Q3, connect the effects of space weather with human technology and explain how these issues are connected.

GPS Navigation 3	1. Warmed air rises so the air is more dense and harder to travel through
Aircraft/Spacecraft 5	2. Radiation high up in the atmosphere
Electricity grid 4	3. Signals are changed as they pass through the atmosphere
Satellites in orbit 1	4. Overwhelmed because of extra electrical currents
Humans 2	5. Electrical equipment stops working

Connection 1:

The change in the air causes the satellite to be slowed down and may need its path corrected.

Connection 2:

Humans aboard high flying planes or spacecraft may be exposed to radiation if the vehicle is not protected

Connection 3:

As the air changes the signals for GPS are changed and are inaccurate

Connection 4:

The electricity grid could have problems if the solar flare causes too much current to be running through

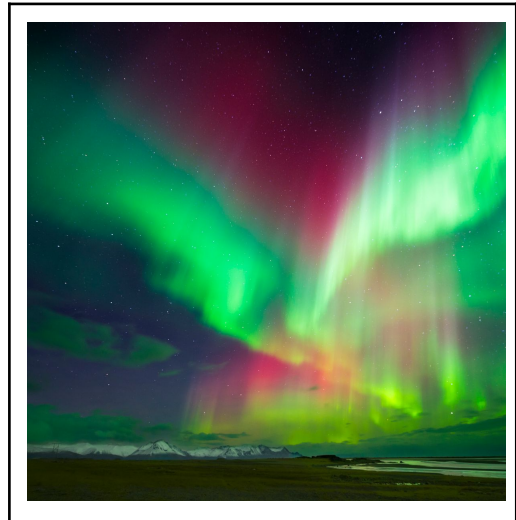
Connection 5:

The currents created by the solar flare can cause problems to electrics on board aircraft and spacecraft

Q5. As well as having effects on our technology, space weather can also create beautiful sights like the Northern and Southern Lights (Aurora Borealis). As the Solar storm hits Earth's magnetic field some of the energy escapes to the poles and gives extra energy to the Oxygen and Nitrogen atoms in the air causing them to emit light. Imagine you are the writer of a scientific paper and the Northern Lights have been seen for the first time. Write about the myths and scientific discovery made.

Headline: _____ Terror in the Sky _____

Author: _____ Jane Smith _____



In the late 18th century, the onset of the French Revolution threw the country into turmoil. In the weeks before the monarchy was overthrown, a bright red Aurora was seen in the skies over England and Scotland and people reported hearing huge armies battling in the skies. The frightened onlookers believed it foretold of impending war and death.

THE LATEST NEWS: We now know that this is just energy from the Sun being diverted to the poles heating up elements in the sky and this extra energy is turned into light, so no need to be scared.