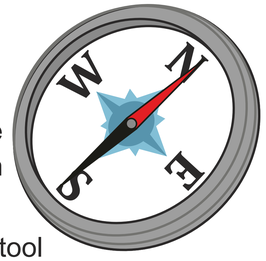
Why is it important to study the Earth's magnetic field?

It is important for navigation



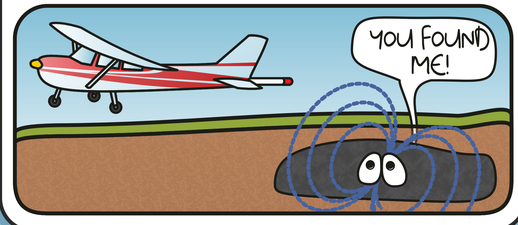
- Compass needles line up with the direction of the local magnetic field
- As Earth's strongest magnetic field lines run roughly South to North, this is the direction compass needles tend to point; however, the exact direction depends on location & changes with time
- Even with GPS, the Earth's magnetic field remains an important navigation tool e.g. smartphones have sensors which use the field to work out which direction they are being held

It helps us drill for oil & gas

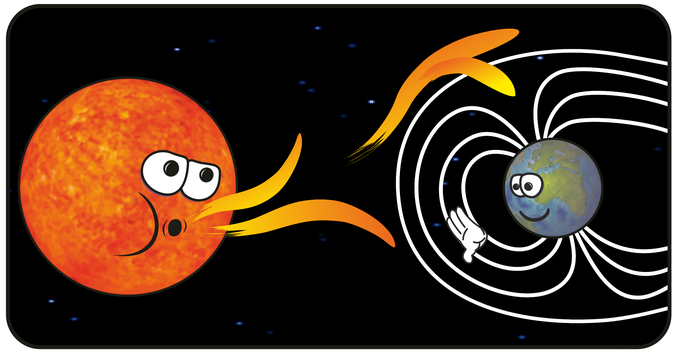
- Today, oil companies can drill multiple wells from one platform, but this requires underground navigation of the drill heads
- GPS doesn't work in this situation & other methods are too costly - instead, accurate maps of the local geomagnetic field are used

To survey the ground

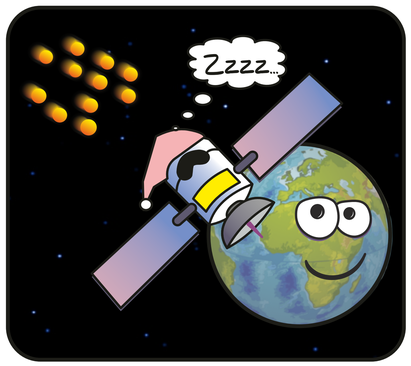
- Knowledge of the geomagnetic field is required for certain ground surveying methods, used in archaeology, mineral exploration & engineering investigations



It helps us predict the effects of space weather



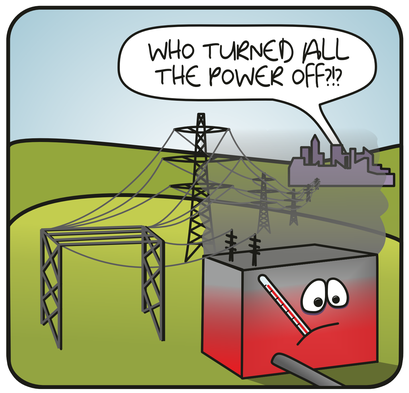
- The geomagnetic field forms a barrier in space to particles ejected from the Sun
- When many particles are released towards Earth at once, e.g. during a *coronal mass ejection*, more can get past this barrier and cause *geomagnetic storms*
- Even when storms aren't happening, there are other important space weather effects to study



- Some satellites can be damaged when they pass over spots where the geomagnetic field is weak
- Research helps predict where this might be a problem, allowing the satellites to be turned off in these areas for protection

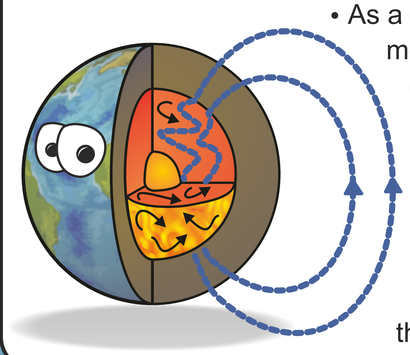
- During geomagnetic storms, solar particles react with the atmosphere to create the *aurora* near the poles
- Research helps predict when & where this might take place
- To find out when aurora might be visible from the UK, sign up for email alerts at www.geomag.bgs.ac.uk

- Geomagnetic storms cause more electricity to flow through the ground than usual
- Whilst harmless to humans, this can cause problems for power lines, train lines & pipelines
- Research is helping to predict & prevent these issues

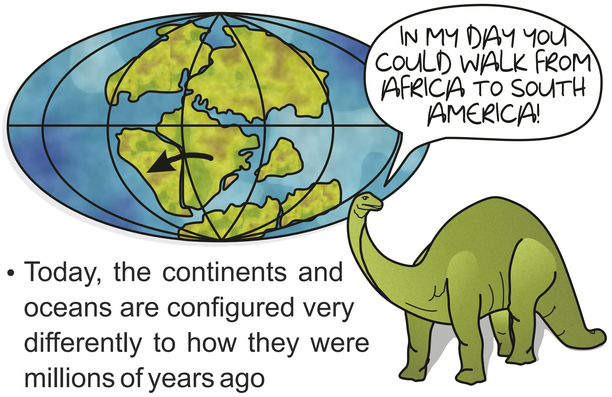


To understand Earth's interior processes

- The largest part of the geomagnetic field is generated by hot, molten iron in the Earth's outer core
- The slow motion of this fluid causes the field at the Earth's surface to gradually change
- As a consequence, measurements of the geomagnetic field can be used to piece together the inner workings of the Earth



To understand how Earth has changed with time



- Today, the continents and oceans are configured very differently to how they were millions of years ago
- Studying the magnetic properties of different rocks has played a large part in our understanding of how Earth's tectonic plates & magnetic field have changed with time

There are more reasons to study the Earth's magnetic field than you might think!

- The British Geological Survey has over 20 members of staff in Edinburgh and around the UK, who measure, model & study the Earth's magnetic field
- Learn more at: http://www.geomag.bgs.ac.uk

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