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.
- 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.
- 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.

**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.