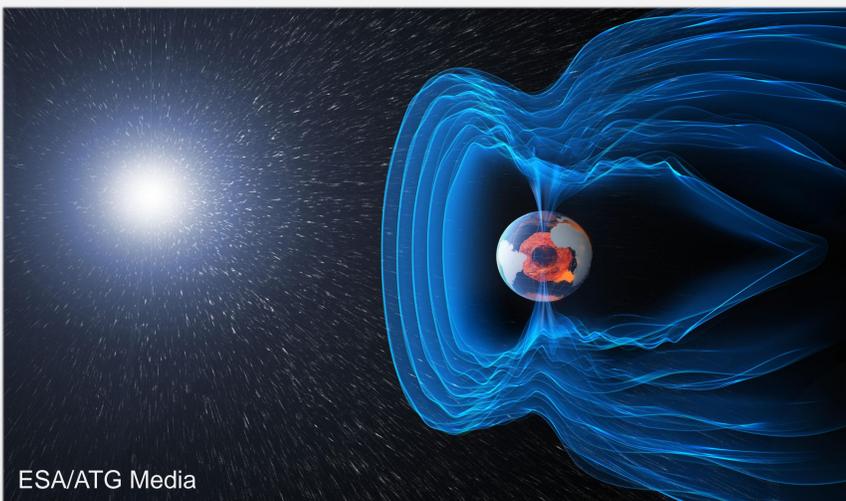


# Magnetic field modelling and navigation

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## Earth's magnetic field

Earth is shielded by a powerful magnetic field, generated by dynamo action deep in the molten iron outer core, that protects us from much of the Sun's radiation.



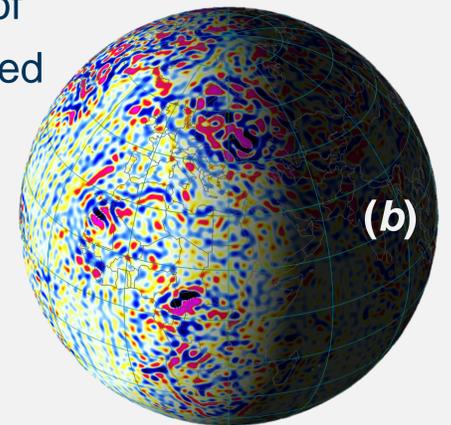
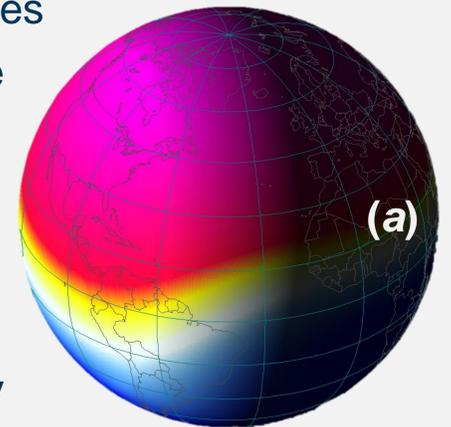
ESA/ATG Media

This field extends from the depths of the Earth out into space like the bow-wave and wake of a ship. The magnetic field has many uses, perhaps the oldest and best known being navigation.

## Magnetic field modelling

Earth's magnetic field can be mathematically represented by models which describe the variations of the strength and shape of the main magnetic sources

– the fields from the core (a), crust (b), magnetosphere, ionosphere and even the oceans. Such models are made by BGS using millions of measurements recorded at observatories and by satellites in orbit. BGS operates nine observatories worldwide.



## Directional drilling

Oil and gas extraction widely uses guided directional drilling to reach dispersed pockets of resources accurately and efficiently from a single, stationary drilling rig. Measurement-while-drilling (MWD) magnetic tools allow the orientation of a well-bore relative to the local magnetic field – if a reference global magnetic field model and local measurements are known from aerial, marine or ground surveys.



## Magnetic reference for UK maps

The magnetic models that BGS produces also help to provide magnetic referencing for UK maps such as those produced by Ordnance Survey. To properly orientate a map and yourself you might use the declination (the angle between *True North* and *Magnetic North*), and the Grid Magnetic Angle (c) (the angle between *Grid North* and *Magnetic North*).

