When you open up the mapping app on your smartphone, a little blue dot appears showing where you are. Out one side, a little shadow shows which way you’re facing. Type in your destination and it leads the way. It knows if you pause and it knows when to tell you to turn. It’s a piece of technology that is so incredibly useful that it’s hard to remember life without it. Childhood memories of family holidays featuring frequent pitstops in roadside laybys, with maps spread across the dashboard and heated disagreements about your location are all but history.

A tale of two norths

Mapping software works with your phone’s GPS for the location and then the in-built compass finds north, adjusting to the direction you’re facing and pointing the way. But that’s not easy because there are two ‘norths’. There’s true north – which is the direction of the north pole and which reliably stays put – and there’s magnetic north which, thanks to the flowing layer of molten iron in the Earth’s outer core, has a habit of moving around.

Your phone can only detect that continuously moving magnetic north so a team at BGS helps to nudge you in the right direction, operating a network of nine magnetic observatories around the world. Three of these magnetic observatories are in rural Scotland and England, three in North America and three on islands in the South Atlantic Ocean (including the remote South Georgia). Four dedicated engineers, who go out once a year to service the computers and instruments, check their alignment and train local observers to use the equipment and make manual measurements to ensure the observatories operate at top quality.

Global effort

The nine BGS observatories around the world, constantly taking measurements and feeding them back into a system that then gets used by your phone’s software, are part of a much bigger network. There are around 180 observatories worldwide and they all provide freely available magnetic data. In addition, the European Space Agency operates three dedicated satellites. The BGS churn all the data through high performance computers to work out the magnetic field’s strength and direction across the Earth and how it will change over the next few years.

As well as smartphone users and seasoned hill walkers, there are many other applications that use the magnetic field for navigation such as backup systems for aeroplanes, orientating satellites in space so they can point towards Earth and even for directing underground drilling for oil and gas.

So the next time you use your phone for maps, remember it is even smarter than it appears.