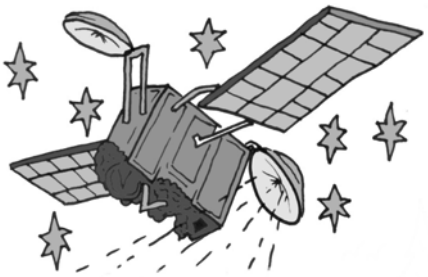
Introduction to the Global Positioning System

Finding location

If you look at a map of the world in an atlas, the planet will be covered with a series of grid lines. These grid lines measure latitude and longitude, which is a positioning system used to measure location. In the past, to calculate your location using these numbers was a long mathematical process. Today, however, the easiest way of calculating your latitude and longitude is to use a hand held GPS (Global Positioning System) unit.

GPS data is crucial to the GLOBE Programme. You need to know your precise location when you collect data so that your position can be accurately pinpointed, wherever you are on the globe. However, the GPS is not entirely accurate: it has an in-built error which means that if you were to take just one reading, there is a possibility that it would be up to 300 metres out.

Finding your site position and altitude



The task

To find out the position and elevation of all your study sites using a GPS (global positioning system) unit.

You will need

GPS unit
Position and elevation data sheet

How to do it

1. In small groups, decide where you think would be the best sites to take your measurements for land cover; weather, etc.
2. You will take five readings over five minutes at each site then you will average the readings to get an accurate value.
3. Position the GPS unit where you need to take the reading, but always remember that the GPS unit needs to 'see' the sky above the site. Be aware that any obstructions such as tree cover, buildings or your heads may block out the satellite signals.
4. Switch on the receiver and stand with the instrument held up and away from your body.
5. Watch the display until the receiver has located at least 4 satellites. Check that there are no warning messages or icons indicating poor signals.
6. Write down the latitude, longitude and elevation (altitude). Don't forget that the satellite is not completely accurate: and so you need to take 5 readings, one a minute for 5 minutes, but be careful not to move the GPS unit any further than one meter away from the original site.
7. Turn off the receiver after you have taken all of the readings.
8. When you get back into the classroom, you will calculate the average reading for each of the chosen sites. You can do this on the GPS Data Sheet.

GPS data sheet.

Year:	Month:	Day:	Time (UT):
Name of site		Type of site:	
Source of data: GPS or other			

	Latitude		Longitude		Elevation (m)
	ddd.dddd	N/S	ddd.dddd	E/W	
1					
2					
3					
4					
5					
Average					

About your GPS

Manufacturer:
Model no:
Serial no:

Use the average latitude, longitude and elevation numbers to define each new site on the GLOBE database.

Glossary

average

A technique for using one number to describe a group of numbers. An average (or mean) value is worked out by adding a set of values and dividing the answer by the number of values added.

compass

A hand-held instrument showing direction. Earth behaves like a giant magnet and the magnet in the compass will point toward Earth's magnetic pole that is magnetic north pole.

degree (°)

A circle may be divided into 360°. Small fractions of a degree may be indicated either as decimal fractions (25.2525°), using whole degrees, minutes, and seconds 25° 15' 9") or using degrees and decimal minutes (22° 27.32')

GMT (Greenwich Mean Time also called Universal Time)

This is the time of day defined to cause the yearly *average* location of the sun to be overhead at noon when observed at Earth's zero degree longitude.

GPS (Global Positioning System)

The Global Positioning System is a navigation system that includes 24 satellites orbiting 20,200 kilometres above the Earth. Using time measurements of GPS satellite signals, a hand-held receiver can pinpoint your latitude, longitude, and elevation.

latitude

The angle measurement in degrees north and south of the equator. Beginning at the Earth's equator (0°), latitude is measured in degrees, with the poles being 90° north and south.

local solar noon

The time of day when the sun angle is greatest at your location. This time depends on your location and varies by about half an hour throughout the year. It is the time half way between sunrise and sunset. Your GPS unit may tell you the time of your local sunrise and sunset.

longitude

The angle measurement in degrees east and west around the Earth's spin axis. The Prime Meridian is the north-south line through the town of Greenwich, London. This is 0° longitude, and the International Date Line is 180° from the Prime Meridian in the Pacific Ocean.

minute

In a circle, one degree may be divided into 60 minutes. Therefore, there are 360 x 60 = 21,600 minutes in a circle.

second

In a circle, one minute may be divided into 60 seconds. Therefore, there are 60 x 60 = 3600 arc seconds in one degree or 1,296,000 arc seconds in a circle.

trigonometry

The mathematical study of triangles. Trigonometry allows us to use angles to work out the lengths of sides of a triangle.