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UK Climate

Background Information for Teachers

UK Climate

Most of the UK has a temperate oceanic climate according to the Köppen classification (see chapter 5), with some northern upland areas, particularly in the Scottish Highlands, qualifying as subpolar oceanic.

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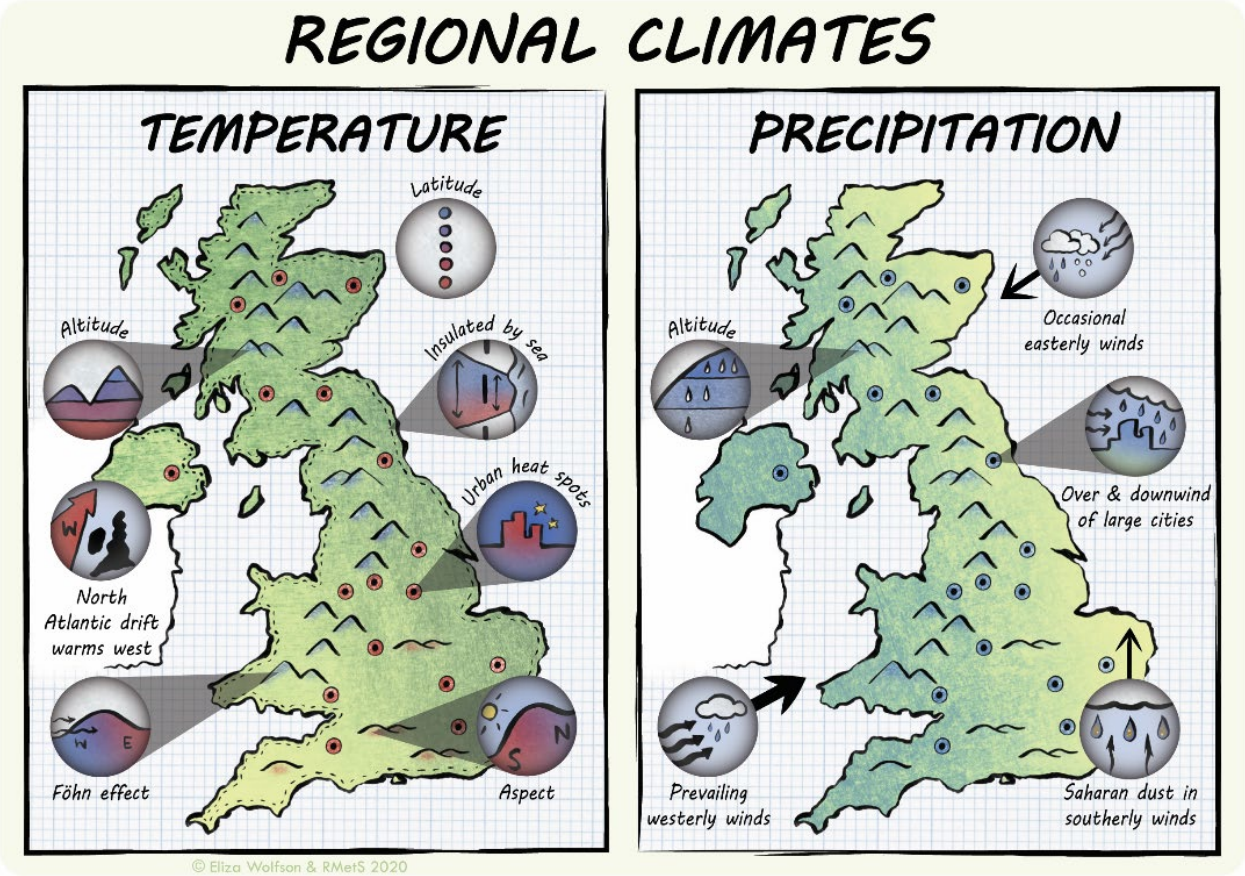
Local Climate Variations



Regionally, UK climate varies because of:

Prevailing wind direction

The prevailing wind direction is one of the most important factors controlling local climate variations around the UK.

Considering Air Masses (chapter 7), the prevailing wind direction will largely determine the temperature, humidity and rainfall. The weather associated with the wind direction will vary around the country. For example, a polar or returning polar maritime air mass (north westerly to west south westerly wind) will bring rainfall primarily to the west coast of the UK, and this is our prevailing wind direction. A polar continental air mass will bring rain (or snow) fall primarily to the east coast.

The wind direction will also affect things like the orographic enhancement of rainfall, the area in the rain shadow of any mountains and the Föhn effect (see chapter 9).

Altitude

With altitude:

- Air pressure falls, by approximately 1.2hPa for every 10 metres of height at around sea level. As you go higher in the atmosphere, the rate at which pressure falls with height also gets slower.

- Temperature falls (see chapter 9) because as the pressure falls, the air expands, doing work by pushing away the surrounding air. As the air does work, it loses energy and so cools. So, as air rises the pressure falls and it cools.
- Cloud may form which may in turn lead to precipitation (see chapter 9).

Proximity to the sea

Water has a higher heat capacity than air, meaning that it warms and cools more slowly. Therefore, the seasonal variations in the water temperature around the UK are smaller than the seasonal variations in air temperature. For example, the seasonal variation in water temperature at Liverpool is only 9°C. In the winter, the warmer water will prevent local air temperatures from falling too much. In the summer, the cooler water will prevent local air temperatures from rising too much. The closer you are to a large body of water, the smaller the seasonal variations in temperature. Even a small lake will have an impact on local microclimates in this way.

In addition, the North Atlantic drift, which is part of the Atlantic Meridional Overturning Circulation (see chapter 4), brings warmer surface waters to the UK. These in turn raise the temperature of the prevailing westerly winds, raising the temperature locally by up to around 5°C in winter.

Locally, land and sea breezes may have an effect (see Chapter 18).

Latitude

Temperature falls with distance from the Inter Tropical Convergence Zone (see Chapter 4). In the winter, this is more pronounced than in the summer because of the extremely cold temperatures that can be reached in the polar regions.

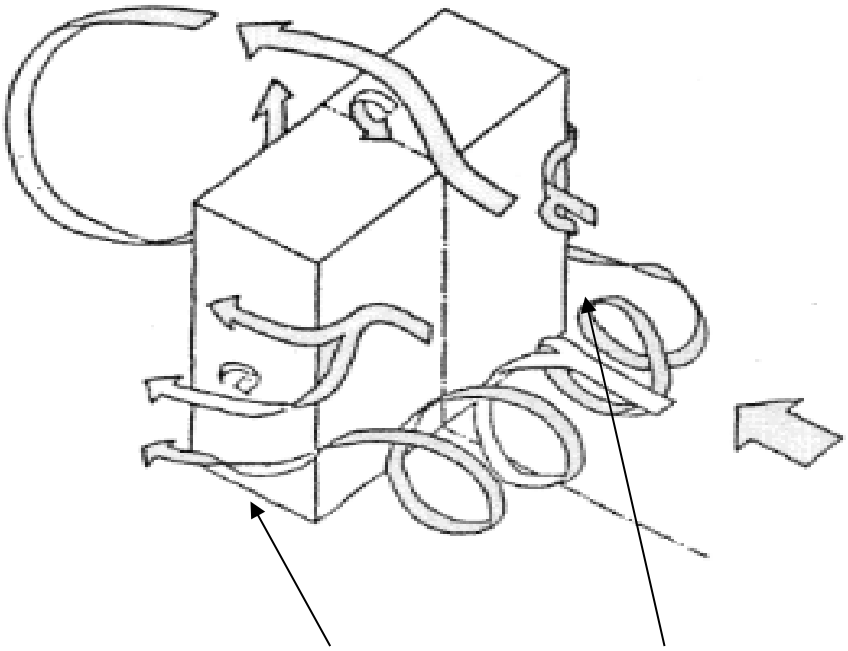
Urban effects (see Chapter 19)

Urban areas have an impact on their climate – temperature, wind patterns, air quality and even precipitation.

An urban heat island is a metropolitan area which is significantly warmer than its surrounding rural areas. The temperature difference is usually larger at night than during the day and is most obvious when winds are weak. One of the main causes of the urban heat island is the fact that there is little bare earth and vegetation in urban areas. This means that less energy is used up evaporating water, that less of the Sun's energy is reflected and that more heat is stored by buildings and the ground in urban than in rural areas. The heat generated by heating, cooling, transport and other energy uses also contributes, particularly in winter, as does the complex three-dimensional structure of the urban landscape.

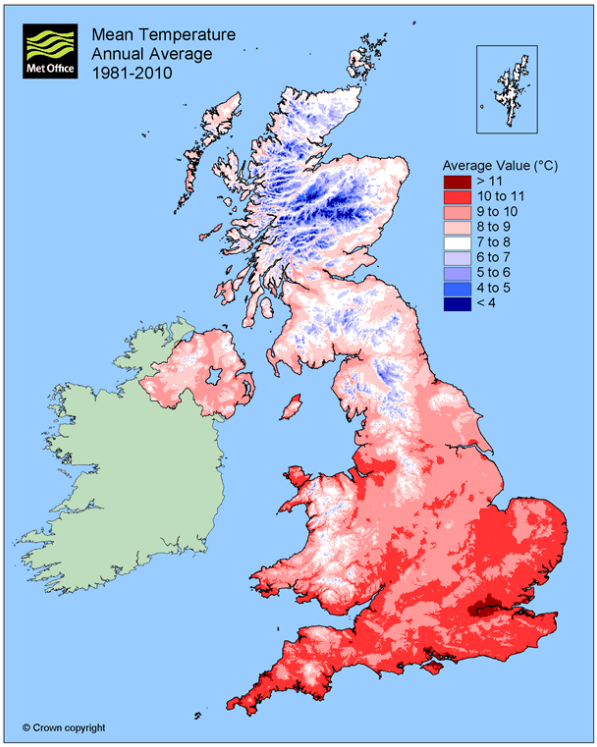
In urban areas, tall buildings and a generally rougher land surface have an effect on the flow of air, altering the course of the wind and producing turbulence. Turbulence causes flow patterns to be random, not straight/aerodynamic. Even a simple building can

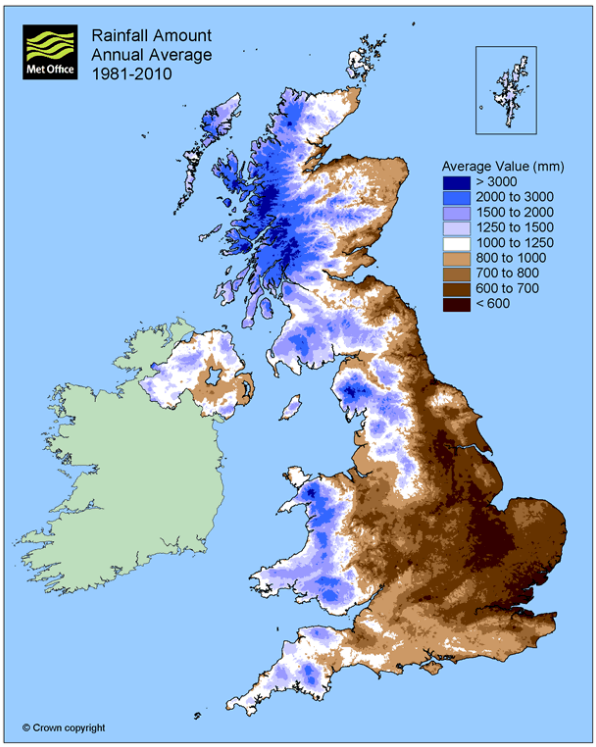
produce a complex air flow pattern. This flow of air can then have an impact on the transport and concentration of pollution.

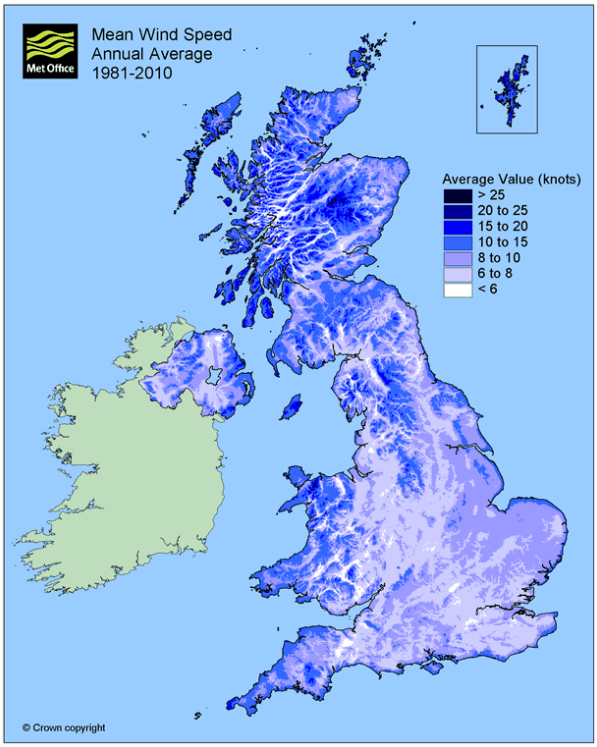


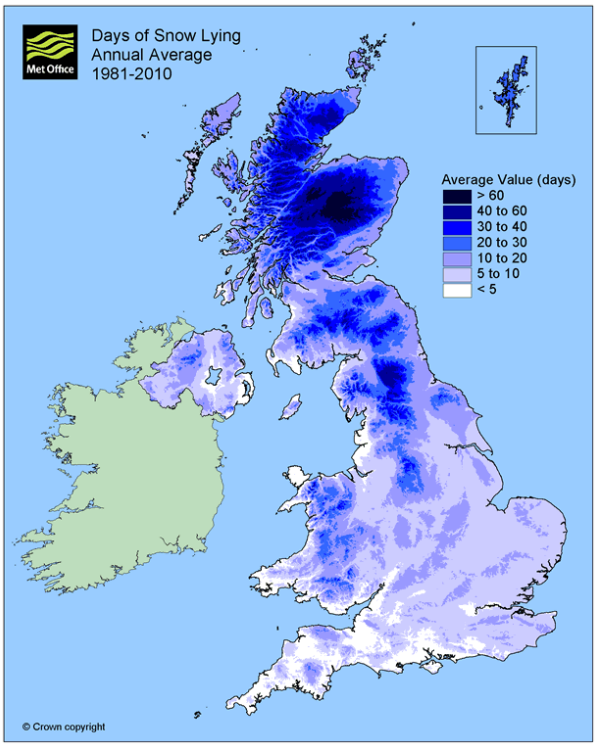
Urban heat islands can enhance convective precipitation, and urban pollution can make it cloudier if more Cloud Condensation Nuclei are available (see chapter 9). A 2019 study suggested that urbanization modifies rainfall, such that mean precipitation is enhanced by 18% downwind of the city, 16% over the city, 2% on the left and 4% on the right with respect to the storm direction.

UK Climate in Maps









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In 2021, the reference climate period for the UK will change to 1991-2020 (see chapter 3).

Tornadoes in the UK

Tornadoes are a form of extreme weather found in countries across the world, particularly the USA.

Surprisingly, you are more likely to see a tornado in some parts of the British Isles than you are to see one in most of the USA. For comparison, the density of occurrence is 2.2 tornadoes per year per 10,000 km^2 in England, but only 1.3 per year per 10,000 km^2 averaged over the whole of the USA. However, if you focus in on Oklahoma, part of Tornado Alley, the figure rises to 3.5. British tornadoes don't usually cause fatalities, but minor injuries and damage to property are not unusual. British tornadoes are most commonly associated with cold fronts.

Between 1980 and 2012, there were, on average, just over 34 tornadoes reported per year across the British Isles, with large variations from year to year. Most tornadoes occur in England (in particular near major cities such as London, Reading, Ipswich, Bristol, Birmingham and Manchester). Part of the reason for the uneven apparent distribution of tornadoes could be population bias since where there are more people, a tornado is more likely to be observed and reported.

Sources of Information

https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/library-and-archive/library/publications/factsheets/factsheet_4-climate-of-the-british-isles.pdf

https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/library-and-archive/library/publications/factsheets/factsheet_9_weather_extremes.pdf

Current UK climate data, graphs and maps can be found at (both annual and monthly): https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages

UK water temperatures https://www.seatemperature.org/europe/united-kingdom/