

End of January/ Beginning of February 2015 – a case study of Arctic Maritime Air

The cold weather we experienced at the end of January/ beginning of February 2015 was associated with arctic maritime air which brought showers of snow, sleet and rain.

For Introductory Resources Exploring air masses see:

<http://www.metlink.org/secondary/key-stage-4/air/>

<http://www.metlink.org/secondary/key-stage-4/airmasses-2/>

<http://www.metlink.org/secondary/key-stage-4/airmasses/>

Air Masses

Definition

An air mass is a large body of air with relatively uniform characteristics (temperature and humidity) in the horizontal.

Source

The characteristics of an air mass are determined by its source region. The source regions tend to be semi-permanent anticyclones (associated with the sinking regions of the global atmospheric circulation) in the sub-tropics and polar regions ('tropical' or 'polar' air). The air masses acquire the characteristics by contact with the underlying surface in the source region.

Track

As the position of anticyclones changes, there can be an outflow of air whose properties are modified as it migrates from its source. The modification depends partly on whether the track is over land or sea ('continental' or 'maritime').

Properties

The properties of an air mass depend upon:

- its source – air originating in tropical regions is warm, whereas air originating in polar regions is cold.
- Its track – air travelling over the sea is moistened, whereas the moisture in air with a continental track is hardly changed.
Southward moving air is warmed from below and becomes more unstable, whereas northward flowing air is cooled from below and becomes more stable.

	Initial Air temperature	Direction of Travel	Humidity increasing or not?	Temperature increasing or decreasing?	Convection?	Rainfall?
Arctic Maritime	Very cold	North to South	Yes, the air picks up humidity over the ocean	Increasing	Yes, because the air is getting warmer	Yes, convective rainfall with some orographic enhancement.

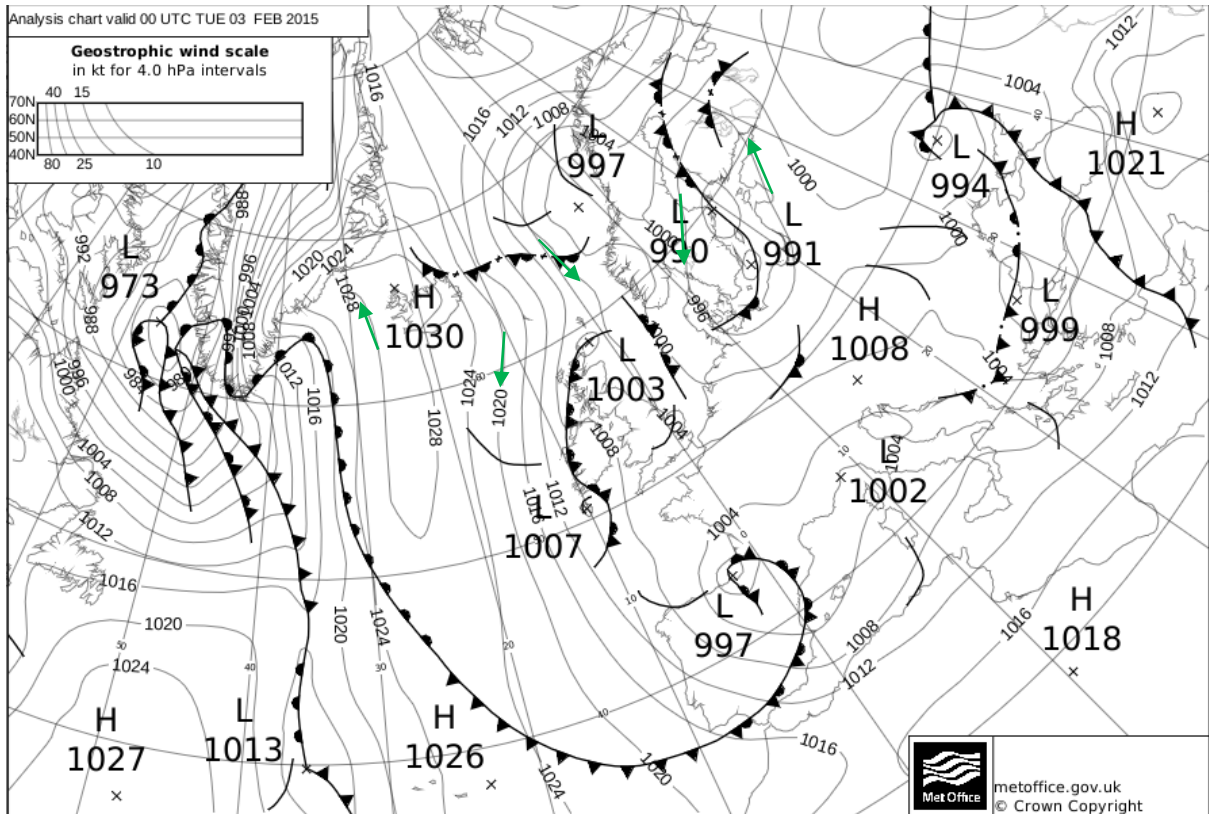


Cold, moist polar/
arctic maritime air



Most of the
snow/ rainfall
occurs at sea, on the
windward
coast and over
uplands where
there is
orographic
enhancement

For more information, see <http://www.bbc.co.uk/weather/feeds/31104513>



What is the wind direction over the UK?

Northerly (see green arrows on weather map)

What is the air mass affecting the UK?

Arctic maritime

Would you expect convective activity?

Yes, the air is being warmed from underneath as it moves south. In January, the ocean is warmer than the land, so most convection will occur at sea.

Describe the weather, in terms of wind speed, direction, temperature, cloud and precipitation. Explain your answer.

The winds are from the North, with some variation from day to day. We know this because the wind blows along the pressure contours and considering either the clockwise air flow around the High over Iceland, or the anticlockwise air flow around the 991mb Low near Sweden gives us the direction of the air flow along the contours.

The wind speed is fastest where the pressure contours are closest together – at the time of the chart above, this was to the west of Ireland, however the exact place varied over the period of the cold weather.

Temperatures are very cold, as the air is coming down straight from the Arctic.

The cloud will mainly be convective, cumulus clouds over the ocean. These appear as blotches on a satellite image:



MODIS satellite image (visible, 841-867nm), 1121UTC 3rd February 2015, courtesy of the Dundee satellite receiving station

Where there is convective cloud, precipitation can occur. As it is so cold, the precipitation will be wintry showers of snow and sleet.

Would you expect any difference between day and night?

Not much – the Sun isn't warm enough at this time of year to warm the land during the day.

Would you expect any difference in the weather between the sea/ the windward coast and inland regions?

Most of the precipitation will occur at sea, where the temperatures and humidity are highest, and over the first bit of land the air mass gets to (the windward coast). Inland, the air is drier but clouds can form again when the air is forced to rise over hills and mountains, cooling to the point where there is more condensation going on than evaporation.

