

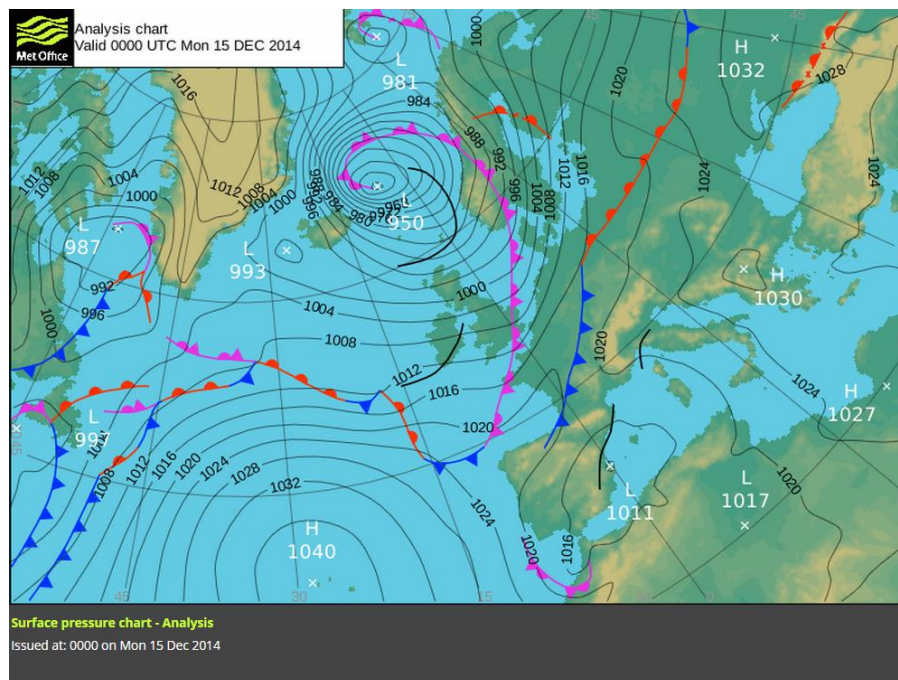
## When will it snow?

We hear/read/see news reports of impending, apocalyptic snow every winter. Just the other day there apparently was a ‘weather bomb’ headed this way to disrupt the UK...My wheelbin got blown over!

In October, the Express gave their yearly prediction that this year is ‘going to be the coldest for a century’ [1]. Strangely enough a similar prediction was made by the Express last year [2]; and again in 2012 [3]; Oh, and in 2011 [4].

These stories often go viral sending us winter climbers and walkers into an axe and crampon-sharpening frenzy; they are mostly bullsh\*t – nothing more than a stopped-clock prediction. Knowing when it will snow isn’t as easy as reading a sensational headline from a questionable news source.

With a little bit of knowledge about meteorology, specifically, how to interpret synoptic charts (Img. 1), you can create your own forecasts. I hope the following will inspire you to learn how to read synoptic charts – it’s really not that hard.



**Image 2.** – A Met Office Surface Pressure Chart.

## Synoptic charts or surface pressure charts

These show the current observed state of the weather systems for up to 5 days ahead. They are updated twice a day around 07:30 and 19:30 and they are surprisingly easy to understand. There’s a lot of information on them and things like the fronts (the coloured bunting symbols) and pressure (parallel black isobar lines with numbers) are easy to see.

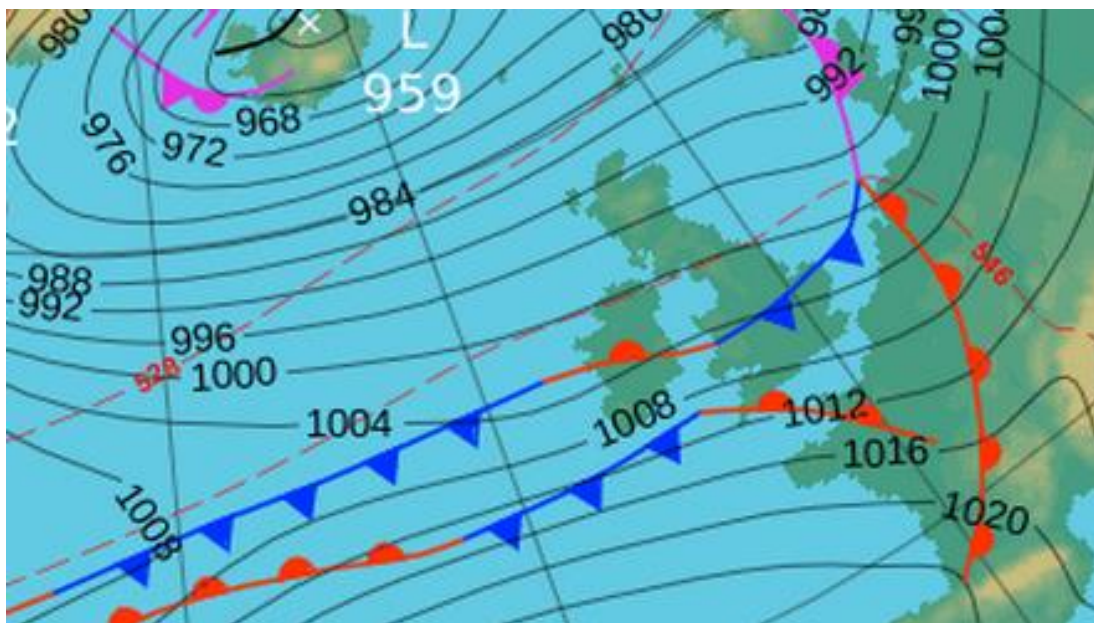
What's not so obvious is wind speed and direction which can be determined by following the direction of the black isobar lines – wind direction runs parallel to these lines – clockwise around a high pressure (anti-cyclone) and anti-clockwise around a low pressure (depression). The closer together the lines are, the higher the winds.

Noting where the wind comes from is highly important in determining whether it will rain/snow. In simple terms, if the wind is blowing over the sea it will pick up moisture: over land winds tend to be dry [5]. If the wind is blowing from the north, NE or east direction it will be colder than if it came from the South. All these factors add up to create great complexity to British weather forecasting. This is even before we add the effect of the jet stream into it, which I shall not go into here.

What many people don't realise is that the synoptic charts can also tell us the likelihood of snow through the 'thickness lines'.

### **Atmospheric Thickness lines**

These only become visible on the Met Office charts after +36 hrs and they are usually a good indicator of whether the news you've read is giving relevant information about the weather or clickbaiting you into reading their stories (I used this word very deliberately!). They are represented by a red-dashed line and are accompanied by a figure (Img. 2 and 3) which represents the thickness of the air between two pressure levels



**Image. 2** – Here is a forecast for +72 hrs. The red-dashed line represents the 'thickness'. Each line will have a figure associated with it – the one above Scotland is the 528 line and the one below is the 546 line. Basically, the lower the number, the lower the temperature of the air.

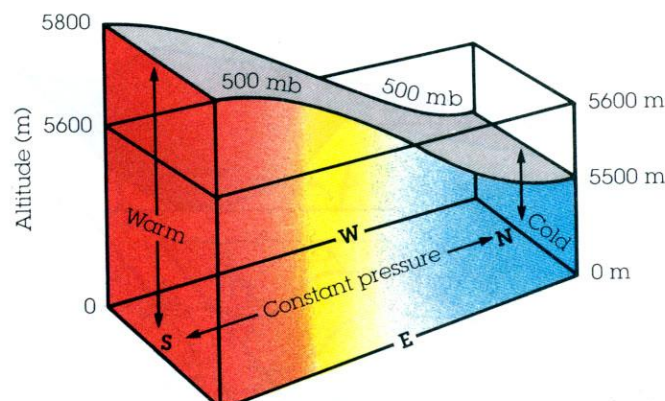


**Image 3** – Thickness symbol, as seen on Image 2. The figure represents a thickness of the air between the 1000Mb and 500Mb level. This is measured in Decameters (dam) where 1dam = 10m so the 528 figure means the thickness between the two pressure levels is approx. 5280m [6]

### What does it represent?

The pressure at the ground is usually around 1000Mb (Milibars). Higher up in the atmosphere, to a height of around 5,600m, the air pressure is 500Mb. The height of latter pressure level isn't fixed and will change depending on the temperature of the air – warm air occupies more space than cold and the only way an airmass can expand is upwards (Img. 4). It's interesting to point out that this part of the atmosphere contains ~50% of the mass of the entire atmosphere but only occupies ~6% of its height [7].

So, it can be said the thickness is the height of the 500Mb pressure level above the 1000Mb Level i.e. the higher the number on the thickness line, the warmer the air and vice versa. These lines are like the isobars in that the area between two different lines on a map depicts a gradient along which the pressure (and ultimately, the temperature) changes. This simple feature of synoptic charts allows us to determine the likelihood of snow based on all the other information the chart shows us like wind direction and frontal systems.



**Image 4** – The temp of the air is linked to the height of the 500Mb pressure line – the warmer the air, the thicker the column of air i.e. the height is greater .  
(Image Source: <http://grotjahn.ucdavis.edu/course/atm121A/1.jpg>)

For clarity, 1000-500Mb thickness lines of 528dam or less are frequently associated with snow if combined with moist polar air that has come over the sea. Conversely, Tropical air masses have 1000-500Mb thicknesses of 564dam and can bring heatwave temps.

Approximate relationship between Thickness (or Relative Topography): 500 - 1000 hPa & the maximum screen temperature (°C) [ NW maritime Europe; also see cautionary notes below]

Thickness 500-1000 hPa (in metres)	Nil / Poor insolation (a)	Moderate / High insolation (b)	High summer: strong sun
<b>5100</b>	-6	-1	
5150	-3	2	
5200	-1	4	
5250	2	7	
<b>5280</b>	3	8	
5300	4	9	
5350	7	12	
5400	9	14	15
5450	11	16	17
<b>5460</b>	12	17	18
5500	14	19	20
5550	16	21	22
5600	19	24	25
<b>5640</b>	21	26	27
5650	21	26	27
5700	24	29	30
5750	26	31	32
5800	29	34	35
<b>5820</b>	30	35	36

**Image 5** – Here you can see the relationship between thickness and surface temperatures. *n.b.* these are estimated temps based on the known average lapse rate of the lower atmosphere [8]

### What about mountainous regions?

It should be obvious from experience that the temperatures on top of a mountain are generally lower than at the bottom. This fact means that it's possible to have snowfall here even when the thickness lines are higher than 528.

In summary, Snow is most likely in higher areas. The lower the thickness, the greater the chance of snow. The direction of the winds/airmass dictates how dry or wet the air will be. Warm air can hold more moisture than cold air. Where two contrasting airmasses interact (warm/cold), the greater the chance of precipitation. Combined with the thickness information this will give you a fair idea of whether snow will fall though not necessarily where given local variations in topography.

Finally, take all newspaper reports of impending 'weather bombs' and apocalyptic temperatures and snow with a huge dose of salt (Grit). Instead, keep an eye on the surface pressure charts for the period from +36 to +84 hrs for thickness information, as well as the period up to +36hrs.

### References:

1. <http://www.express.co.uk/news/nature/520672/Winter-weather-2014-UK-forecast-cold-snow-November>
2. <http://www.express.co.uk/news/uk/443462/Winter-2013-expected-to-be-worst-since-1947-with-heavy-and-persistent-snow-forecast-for-UK>
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4. <http://www.express.co.uk/news/uk/358717/Coldest-winter-in-100-years-on-way>
5. [http://www.metoffice.gov.uk/media/pdf/a/t/No. 11 - Weather Charts.pdf](http://www.metoffice.gov.uk/media/pdf/a/t/No._11_-_Weather_Charts.pdf)
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8. <http://weatherfaq.org.uk/node/155>