

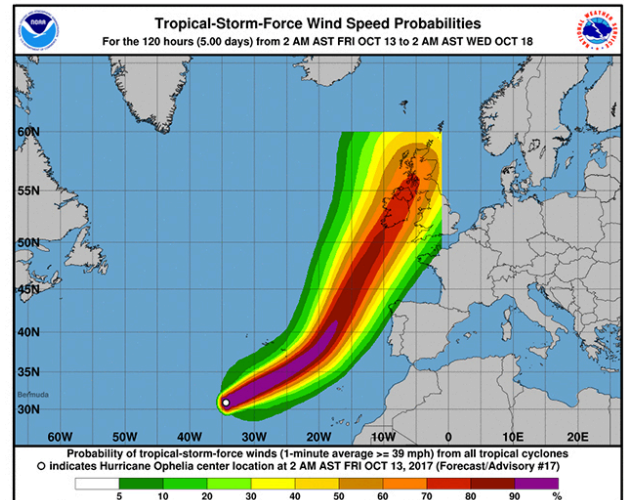
October 2017 Beaufort Weather Station Summary

Ex-hurricane Ophelia

Ireland unexpectedly found itself making international headlines due to the arrival of ex-hurricane Ophelia to our shores. The 10th Atlantic hurricane this season, Ophelia was a highly unusual one. The U.S. National Hurricane Center classifies hurricanes of Category 3 and above on the Saffir-Simpson Hurricane Wind Scale as “major hurricanes”. These are hurricanes characterised by sustained wind speeds of 50-58 ms⁻¹ (178-208 km/h) minimum. Therefore, Ophelia now holds the record as the easterly-most major hurricane to occur since records began.

Ophelia’s formation was also unusual: unlike most hurricanes which form over warm tropical waters, Ophelia started out as a rather typical non-tropical low-pressure system south of the Azores Islands. This low-pressure system was pushed south-eastwards towards the Canary Islands by a dense cold front from a decaying mid-latitude cyclone, were it remained almost stationary for 48 hours. It was during this time that this low-pressure system took on tropical characteristics with an intensifying circulation, and thus Ophelia came into being.

Although an event of this scale is unprecedented, it is not unheard of for winds this strong to have been felt here in the past, however this event remains extremely unusual.



However, as our seas warm as a result of climate change, we may well see storms of this magnitude occur more often, as warmer oceans accommodate the development and movement of hurricanes further east in the Atlantic, it is possible more storms will track towards Irish shores.

Ophelia made landfall in Ireland on Monday 16th of October 2017 and caused significant damage to infrastructure, with many thousands of people being without power for up to a fortnight after the storm, due to the destruction of power lines and water networks, and fallen trees blocking access for many repair crews.

Unfortunately, the storm claimed 3 lives, highlighting the huge risk associated with these types of events. We also experienced another strong wind event last month, with Storm Brian occurring just a week after Ophelia.

Weather Summary

Temperature: Winter is Coming

We can see a noticeable drop in temperatures this month as the seasonal change takes its grip. The Beaufort Weather Station recorded a maximum daily temperature (MxDT) of 18.5°C (on October 1st), a mean temperature of 12.9°C and a minimum daily temperature (MnDT) of 5.9°C (October 6th).

The Mean temperature for the entire month was 12.9°C making this the 7th month the BWS has recorded temperatures above the Long-Term Average (61-90) for nearby Roches Point.

Month	Departure from Normal Mean Temperature (1961-1990)
April*	+2.2°C
May	+2.4°C
June	+1.8°C
July	+1.3°C
August	+0.4°C
September	+0.5°C
October	+1.6°C

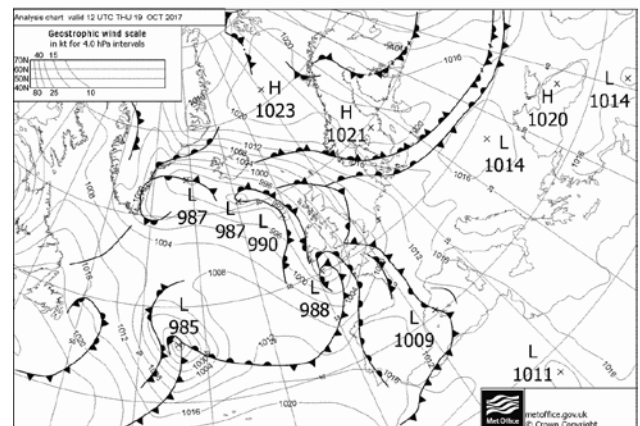
* Beaufort weather station began recording April 11 2017

The Highest Diurnal Temperature Range (DTR) was 9.6°C which also occurred on October 6th which started out as a cold day with a MnDT of 5.9°C at around 7am, rising to a MxDT of 15.5°C by 3pm. The lowest DTR was just 1.2°C on 13th of October (the Friday before Ophelia arrived in Ireland) with MxDT of 16.9°C and MnDT of 15.7°C. Indeed, for the entire 72 hours prior to the 16th DTR was low notably. Mean DTR for the month of September was 5.2°C.

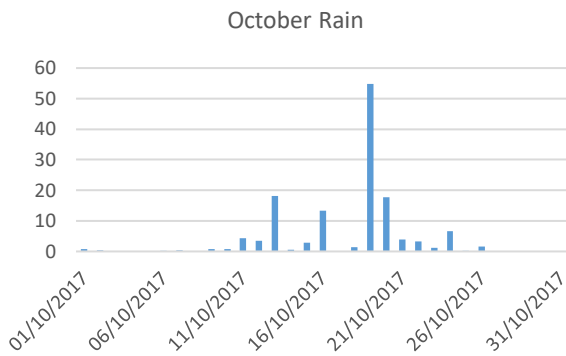
Wet Wet Wet

October was quite a wet month, with a total of 137mm of rain recorded over the entire month. This is quite a bit more than the LTA recorded at Roches Point which is 95.7mm for October. This represents about 133% of the LTA. Although wetter overall than September, the rainfall is more in line with what we would expect for this time of year. Roches Point recorded 125.5mm over the same period.

The majority of the rain occurred over a short period, with 54.8mm of rain falling on the 19th of the month. This coincides with a period of low pressure over Ireland.



September Rainfall Amounts	BWS
No. of days with rain \geq 0.2mm	8
Mean no. of days with \geq 1.0mm	8
Mean no. of days with \geq 5.0mm	5
No. of days with no rain	10
Greatest Daily Amount	54.8mm



You can note from the station data that although the storms did bring unsettled conditions, rain was not a significant factor. In this respect we were fortunate, as the impact of heavy rain with winds of that significance could have been potentially devastating.

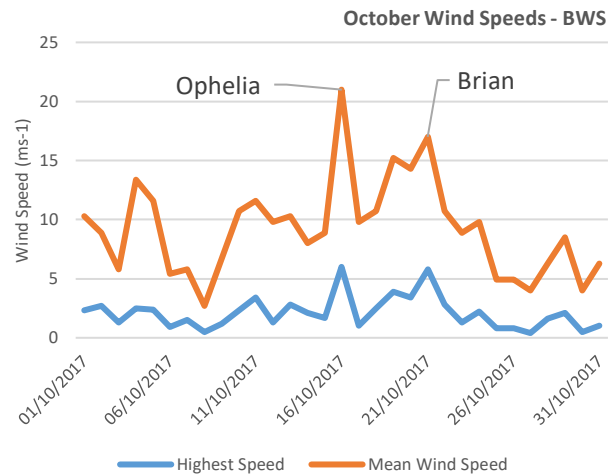
Significant wind event

Overall, the month of October was quite windy, with a few notable events taking place over the course of the month.

As we know, the strongest winds in October occurred on the 16th of the month, with ex-hurricane Ophelia making her presence felt. The highest winds recorded at the BWS was a gust of 21ms^{-1} at 12:05 – or 75.6kph. This is the equivalent of force 9 of the Beaufort scale. The average wind speed over the entire day was 6ms^{-1} (21.6kph).

This gives us an indication of the sheltered nature of the Beaufort Weather Station (BWS), as by comparison, the highest gust recorded at the Met Eireann station at Roches Point was a huge 84 knots – around

156kph, putting this into the bracket of hurricane force winds (>118kph).



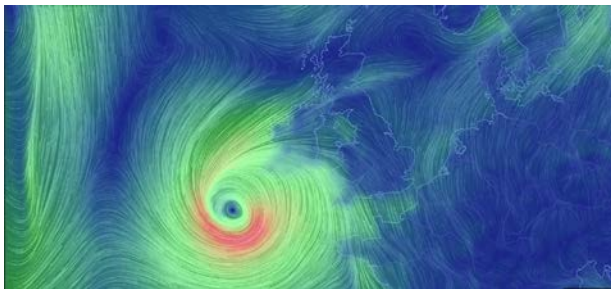
The following week, a second storm, Storm Brian, swept the country once more. BWS recorded average wind speeds of 5.8ms^{-1} (20.88kph) high gusts on October 21st of 17ms^{-1} , or 61.2kph. Roches Point, on the other hand, recorded average speeds of 52.5kph, and gusts up to 94.5kph, again indicating how sheltered our station is in comparison.

Dominant Wind Direction

As can be seen from the Wind Rose diagram below, the dominant wind direction for the month for BMS were winds from the West North West direction. There were two significant periods in the month where the winds did not come from a North Westerly direction. These were from October 14th to 16th, and October 18th to 20th, when winds switch to a South Easterly. Interestingly, both periods align with the lead-up to the two most significant wind events of the month, and on examining weather charts and satellite images, we can see that this

correlates with the direction from which these storms approached Ireland.

Examining the events more closely, we can see from the raw data that the wind direction changed quite dramatically from a predominantly South-Easterly direction, back to North-Westerly, at around 13:35 on October 16th, in line with the nature of these storms, which due to the Coriolis effect rotate in an anti-clockwise direction (in the Northern Hemisphere) as they move.



Surface Winds Chart showing Ophelias Approach from the SW early on the morning of October 16 (0600hrs) see

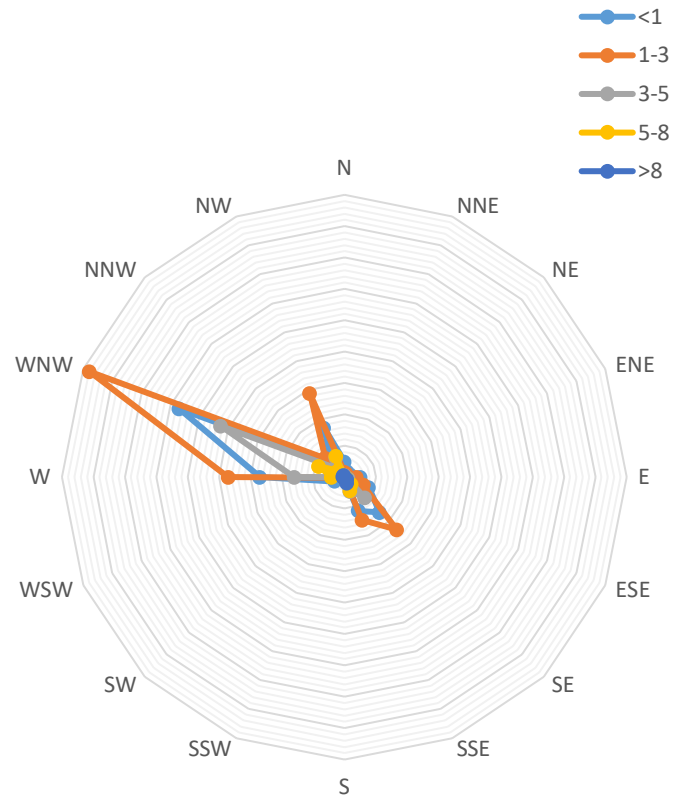
<https://earth.nullschool.net/#2017/10/16/0600Z/wind/surface/level/orthographic=-7.25,53.20,3000>



Storm Brian over Ireland a week later on October 21 (0600hrs) see

<https://earth.nullschool.net/#2017/10/21/0600Z/wind/surface/level/orthographic=-6.11,52.36,3000>

Dominant Wind Direction



Summary Table

NOAA Report



MONTHLY CLIMATOLOGICAL SUMMARY for OCT. 2017

NAME: Beaufort Building CITY: Cork STATE: Munster, IRE
ELEV: 5 m LAT: 51° 50' 04" N LONG: 8° 18' 07" E

TEMPERATURE (°C), RAIN (mm), WIND SPEED (m/s)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	15.3	18.5	14:10	12.1	0:05	2.7	0.0	0.8	2.3	10.3	15:35	WNW
2	12.6	14.9	17:25	9.7	23:25	5.4	0.0	0.4	2.7	8.9	0:05	WNW
3	11.2	14.9	16:25	7.4	7:40	6.8	0.0	0.0	1.3	5.8	13:20	NW
4	12.9	15.5	14:25	9.3	3:50	5.1	0.0	0.0	2.5	13.4	17:05	WNW
5	13.9	16.1	3:15	9.1	23:45	4.1	0.0	0.0	2.4	11.6	0:40	NNW
6	11.2	15.5	15:20	5.9	7:10	6.8	0.0	0.2	0.9	5.4	20:40	WNW
7	14.2	15.5	12:50	11.7	23:50	3.8	0.0	0.4	1.5	5.8	0:10	NW
8	12.6	14.9	15:50	10.3	8:05	5.4	0.0	0.0	0.5	2.7	0:25	WNW
9	12.4	16.6	15:20	7.7	6:40	5.6	0.0	0.8	1.2	6.7	16:10	WNW
10	14.5	16.6	14:35	11.7	8:00	3.5	0.0	0.8	2.3	10.7	13:45	WNW
11	14.3	16.6	13:20	10.2	23:25	3.7	0.0	4.4	3.4	11.6	13:30	WNW
12	12.8	16.2	13:10	7.9	4:35	5.2	0.0	3.4	1.3	9.8	23:05	WNW
13	16.1	16.9	11:55	15.7	22:05	1.9	0.0	18.2	2.8	10.3	2:55	WNW
14	15.6	17.3	12:25	14.7	19:20	2.4	0.0	0.6	2.1	8.0	21:00	SE
15	14.9	15.5	15:40	14.1	18:45	3.1	0.0	2.8	1.7	8.9	1:50	SE
16	13.6	17.3	7:10	10.9	23:45	4.3	0.0	13.4	6.0	21.0	12:40	SE
17	11.0	16.3	15:30	7.1	8:40	7.0	0.0	0.0	1.0	9.8	0:45	WNW
18	12.0	14.2	15:20	8.9	3:55	6.0	0.0	1.4	2.5	10.7	13:30	SE
19	12.6	13.8	15:30	10.0	00:00	5.4	0.0	54.8	3.9	15.2	18:10	SSE
20	10.6	13.6	21:20	6.2	6:20	7.4	0.0	17.8	3.4	14.3	15:40	SSE
21	11.7	12.9	13:55	9.3	23:20	6.3	0.0	4.0	5.8	17.0	11:45	NW
22	11.1	13.8	14:55	8.0	3:00	6.9	0.0	3.2	2.8	10.7	0:40	WNW
23	13.7	15.4	13:15	11.6	22:55	4.3	0.0	1.2	1.3	8.9	0:20	WNW
24	14.1	15.5	13:25	12.0	00:00	3.9	0.0	6.6	2.2	9.8	4:55	W
25	12.0	15.1	13:00	9.0	6:05	6.0	0.0	0.2	0.8	4.9	2:45	WNW
26	12.4	14.1	14:40	10.8	2:05	5.6	0.0	1.6	0.8	4.9	5:40	SSE
27	12.5	14.2	14:35	11.7	8:30	5.5	0.0	0.0	0.4	4.0	12:15	WNW
28	13.3	14.9	16:05	11.9	4:25	4.7	0.0	0.0	1.6	6.3	23:45	WNW
29	13.1	14.7	13:15	8.6	23:55	4.9	0.0	0.0	2.1	8.5	11:10	NW
30	10.4	13.6	12:55	6.8	7:40	7.6	0.0	0.0	0.5	4.0	15:35	WNW
31	12.6	13.7	11:30	11.9	21:30	5.4	0.0	0.0	1.0	6.3	12:40	WNW

	12.9	18.5	1	5.9	6	156.8	0.0	137.0	2.1	21.0	16	WNW

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0

Max Rain: 54.79 ON 19/10/17

Days of Rain: 21 (> .2 mm) 10 (> 2 mm) 1 (> 20 mm)

Heat Base: 18.0 Cool Base: 18.0 Method: Integration

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This report was undertaken voluntarily please contact either of the authors directly for more information