

Storm Franklin was the third storm in a period of particularly disturbed weather for north-western Europe, where three named storms, Dudley, Eunice and Franklin, developed within a week. They were associated with a powerful jet stream in the North Atlantic that developed due to a steep temperature gradient between a very cold arctic air mass moving out of Canada and warm subtropical air mass originating from the Caribbean. A strong stratospheric polar vortex aloft in the Arctic also helped to enhance the jet stream.

Storm Franklin began as a low pressure system over the Northeast United States. It went through rapid development as it crossed Newfoundland and moved quickly across the Atlantic towards the south of Iceland.

- The highest daily sustained (10-minute mean) wind speeds during storm Franklin were observed at Mace Head, Co Galway at 102 km/h (55 kt) at around 20 UTC from the direction of 280° (W), 20 February 2022.
- The highest gust (3-minute mean) observed were at Mace Head, Co Galway at 139 km/h (75 kt) at around 18 UTC from the direction of 280° (W), 20 February 2022.
- The highest 24hr rainfall totals of 38.3 mm were recorded at Lough Ouler, Co. Wicklow totals on 20th February 2022.
- The highest hourly rainfall totals of 6.1 mm were recorded at Mount Dillon Co Roscommon, at the hour ending 11 UTC 20th February 2022.
- The highest individual wave recorded was 28.1 m at the M4 Buoy 21 February 2022 at 03 UTC.
- The lowest MSLP (985.4 hPa) was recorded at Malin Head, Co Donegal at the hour ending 13: UTC on Sunday 20 Feb 2022.

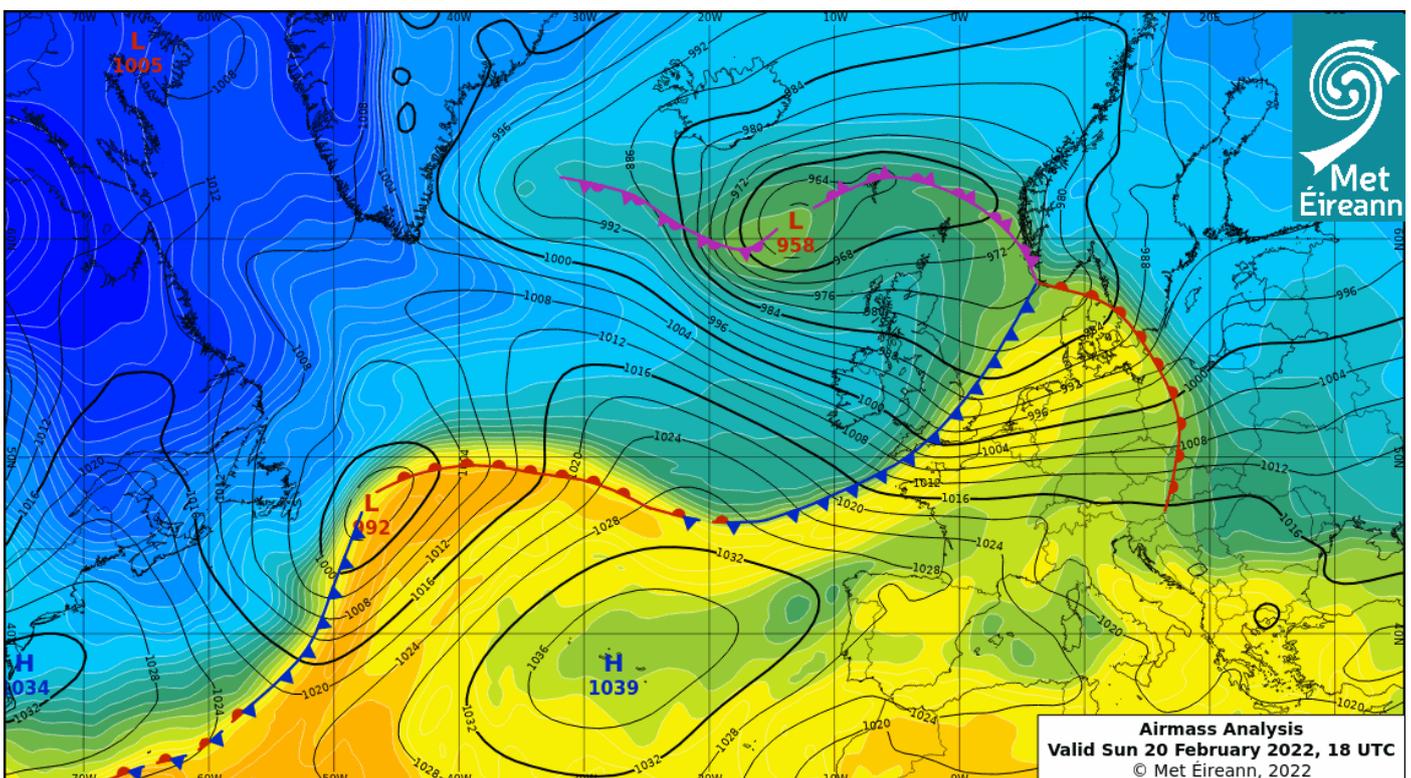


Figure 1. Analysis Chart closest to hour (18 UTC) on Sunday 20 February when the highest sustained wind speed was reported (139 km/h at Mace Head, Co Galway)

## Sunday 20 February 2022

On Sunday 20 February 2022 Ireland lay in a near gale to gale force south-westerly airflow maintained by a depression of 954 hPa centred southwest of Iceland. Showers during the day with near gale force westerly winds and severe gusts especially in the West and North with some very high seas and some coastal flooding. Storm Franklin brought some very heavy rain which moved south-eastwards and cleared to showers in the afternoon. Frequent showers and strong to gale force winds during the night, with severe and damaging gusts in the West and Northwest.

## Monday 21 February 2022

Storm Franklin (974 hPa) centred over eastern Scotland generated a gale to storm force north-westerly airflow over Ireland. Showery troughs are embedded in the unstable flow. Severe gusts and scattered showers in parts during the morning. Dry in many places in the afternoon. Cloud thickened during the evening with some rain, drizzle and mist in the West and spread eastwards early during the night with fresh to strong southwest winds.

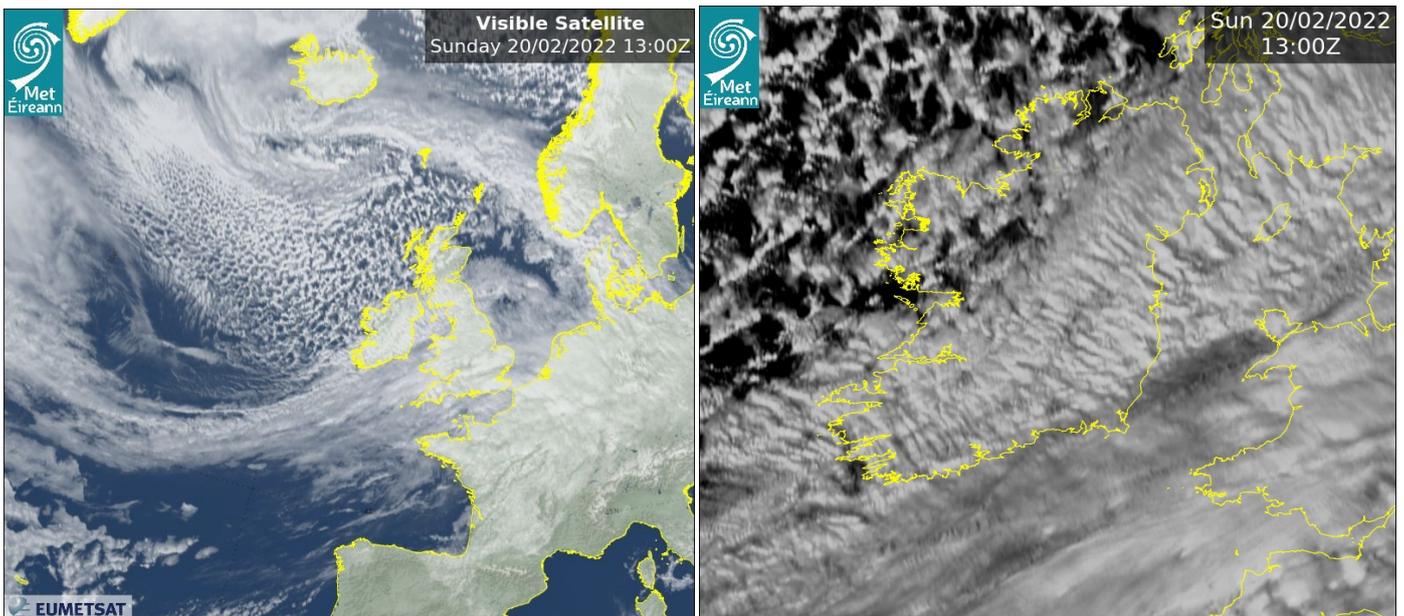


Figure 2 and 3. EUMETSAT Visible Satellite images closest to hour (1300 UTC) of the lowest mean sea level pressure 985.4 hPa at Malin Head, Co Donegal on Sun 20 Feb 2022 .

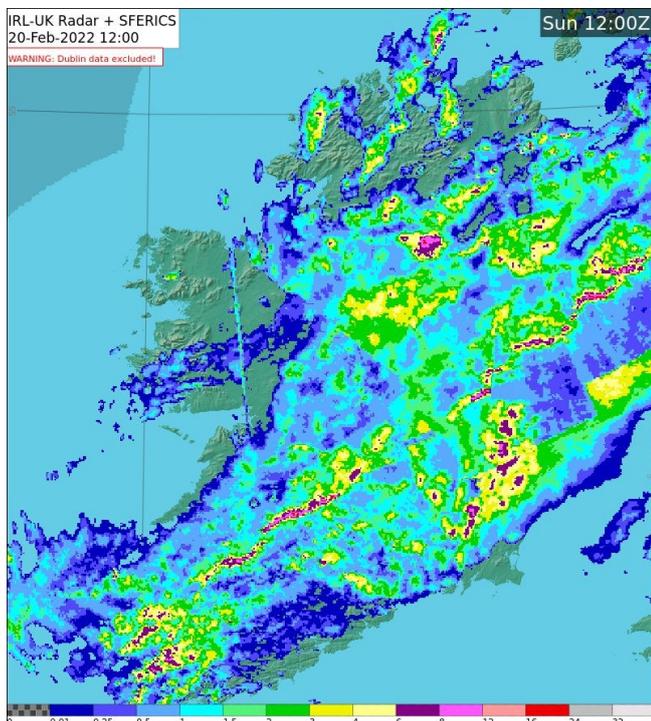


Figure 4. On Sun 20 Feb 2022 in the hour ending 12 UTC  
5.5 mm of rain fell at Mullingar, Co Westmeath

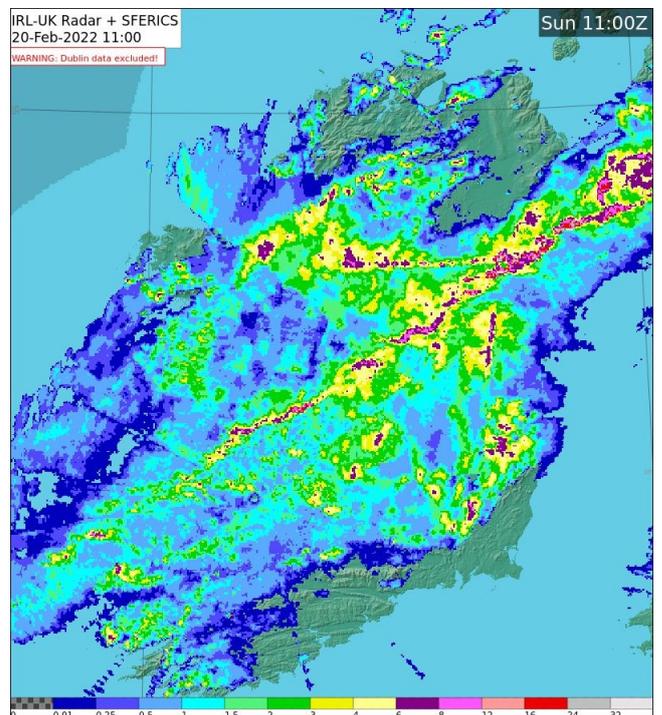
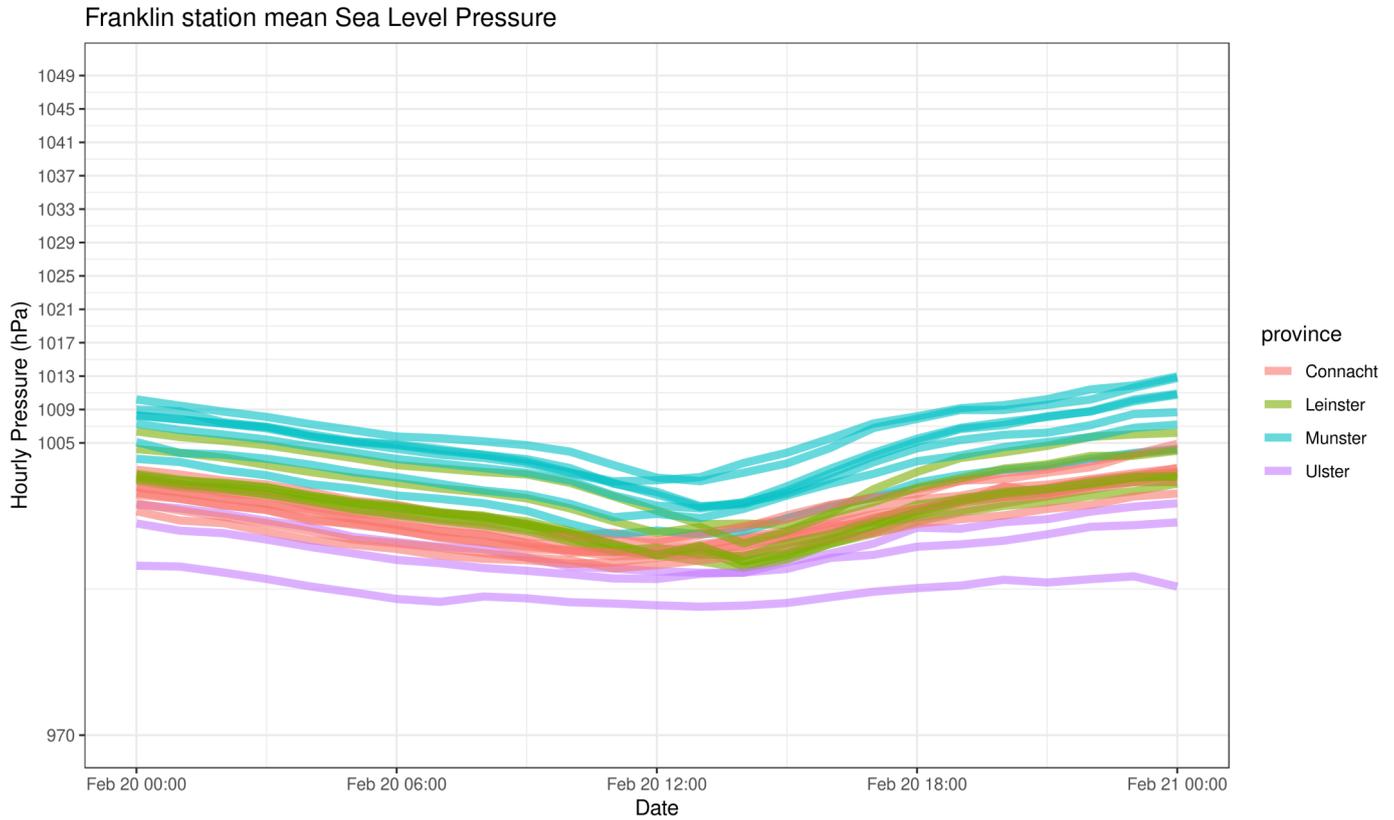


Figure 5. On Sun 20 Feb 2022 in the hour ending 11 UTC  
6.6 mm of rain fell at Mount Dillon, Co Roscommon

## Atmospheric Pressure

The minimum mean sea level pressure (MSLP) observed in Ireland during Storm Franklin was 985.4 hPa at Malin Head, Co Donegal on Sun 20 Feb 2022.



## Impacts

### Structural Damage:

- A large beach tree (*fagus sylvatica*) came down in one of the oldest sections of Dublin's Glasnevin cemetery, causing damage to some headstones and graves.

### Power Outages:

- ESB spokesman confirmed on 21 Monday 2022 that around 18,000 customers remained without power and in Northern Ireland Electricity Networks confirmed that just 2,000 customers were still cut off.

### Travel:

- Travel disruptions were mainly confined to roads and railways from fallen trees.

### Flooding:

- Some coastal flooding reported with the north and northwest worst affected.

## Table 1. Observations at SYNOPTIC STATIONS

The following table contains wind speeds and rainfall observations for the SYNOPTIC stations for 2 days, Sunday 20 & Monday 21. Some of the observations have weather warning thresholds and these are highlighted. See *the weather warnings page on [www.met.ie](http://www.met.ie)*.

Station location	Sustained (10-min mean) Wind Speed	Date highest mean	Wind Direction Highest	Gust (3-sec mean) Wind Speed	Date Highest Gust	Wind Direction Highest Gust	Daily Rain (mm)	Total Rain (mm)
Mace Head** Co Galway	<b>102 km/h</b> Storm Force (55 knots or 63 mph)	Sun 20 Feb 2022 20UTC	280° (W)	<b>139 km/h</b> (75 knots or 86 mph)	Sun 20 Feb 2022 1801 UTC	280° (W)	<b>7.0</b> Sun 20 Feb 2022	7.4
Malin Head* Co Donegal	<b>96 km/h</b> Storm Force (52 knots or 60 mph)	Mon 21 Feb 2022 00UTC	260° (W)	<b>133 km/h</b> (72 knots or 83 mph)	Mon 21 Feb 2022 0139 UTC	270° (W)	<b>6.5</b> Sun 20 Feb 2022	8.3
Finner Co Donegal	<b>89 km/h</b> Storm Force (48 knots or 55 mph)	Mon 21 Feb 2022 02UTC	280° (W)	<b>124 km/h</b> (67 knots or 77 mph)	Mon 21 Feb 2022 0216 UTC	280° (W)	<b>11.6</b> Sun 20 Feb 2022	14.8
Sherkin Island Co Cork	<b>83 km/h</b> Strong Gale Force (45 knots or 52 mph)	Sun 20 Feb 2022 21UTC	270° (W)	<b>117 km/h</b> (63 knots or 72 mph)	Sun 20 Feb 2022 2238 UTC	280° (W)	<b>5.8</b> Sun 20 Feb 2022	7.2
Knock Airport Co Mayo	<b>78 km/h</b> Strong Gale Force (42 knots or 48 mph)	Mon 21 Feb 2022 03UTC	290° (WNW)	<b>124 km/h</b> (67 knots or 77 mph)	Sun 20 Feb 2022 1558 UTC	290° (WNW)	<b>13.5</b> Sun 20 Feb 2022	14.3
Roches Point Co Cork	<b>78 km/h</b> Strong Gale Force (42 knots or 48 mph)	Sun 20 Feb 2022 15UTC	290° (WNW)	<b>104 km/h</b> (56 knots or 64 mph)	Sun 20 Feb 2022 1543 UTC	280° (W)	<b>8.9</b> Sun 20 Feb 2022	9.9
Shannon Airport Co Clare	<b>74 km/h</b> Gale Force 8 (40 knots or 46 mph)	Sun 20 Feb 2022 22UTC	280° (W)	<b>117 km/h</b> (63 knots or 72 mph)	Sun 20 Feb 2022 1537 UTC	290° (WNW)	<b>21.8</b> Sun 20 Feb 2022	24.2
Newport Co Mayo	<b>72 km/h</b> Gale Force 8 (39 knots or 45 mph)	Mon 21 Feb 2022 03UTC and Sun 20 Feb 2022 017UTC	290° (WNW)	<b>120 km/h</b> (65 knots or 75 mph)	Sun 20 Feb 2022 2001 UTC	280° (W)	<b>20.9</b> Sun 20 Feb 2022	25.6
Valentia Observ- atory Co Kerry	<b>72 km/h</b> Gale Force 8 (39 knots or 45 mph)	Sun 20 Feb 2022 20UTC	260° (W)	<b>107 km/h</b> (58 knots or 67 mph)	Sun 20 Feb 2022 2200 UTC	280° (W)	<b>8.2</b> Sun 20 Feb 2022	9.0
Belmullet Co Mayo	<b>70 km/h</b> Gale Force 8 (38 knots or 44 mph)	Sun 20 Feb 2022 17UTC	280° (W)	<b>111 km/h</b> (60 knots or 69 mph)	Sun 20 Feb 2022 1736 UTC and Mon 21 Feb 2022 0130 UTC	290° (WNW) and 280° (WNW)	<b>5.0</b> Sun 20 Feb 2022	6.3
Oak Park Co Carlow	<b>69 km/h</b> Gale Force 8 (37 knots or 43 mph)	Sun 20 Feb 2022 15UTC	270° (W)	<b>104 km/h</b> (56 knots or 64 mph)	Sun 20 Feb 2022 1516 UTC	260° (W)	<b>18.4</b> Sun 20 Feb 2022	18.4
Dublin Airport Co Dublin	<b>67 km/h</b> Gale Force 8 (36 knots or 41 mph)	Mon 21 Feb 2022 07UTC	280° (W)	<b>96 km/h</b> (52 knots or 60 mph)	Sun 20 Feb 2022 1217 UTC	290° (WNW)	<b>16.0</b> Sun 20 Feb 2022	1

\*Caution: Malin Head wind speeds are observed (using an anemometer) at a non-standard height of 23m while all others are at 10m. This will cause Malin Head's wind speeds to be higher in a strong air flow. \*\* Caution: Mace Head anemometer is situated above exposed rock at the coast line.

Station location	Sustained (10-min mean) Wind Speed	Date highest mean	Wind Direction Highest	Gust (3-sec mean) Wind	Date Highest Gust	Wind Direction Highest Gust	Daily Rain (mm)	Total Rain (mm)
Cork Airport Co Cork	<b>67 km/h</b> Gale Force 8 (36 knots or 41 mph)	Sun 20 Feb 2022 18UTC	280° (W)	<b>96 km/h</b> (52 knots or 60 mph)	Sun 20 Feb 2022 1657 UTC	290° (WNW)	<b>13.8</b> Sun 20 Feb 2022	14.6
Casement Aerodrome Co Dublin	<b>67 km/h</b> Gale Force 8 (36 knots or 41 mph)	Mon 21 Feb 2022 05UTC and Sun 20 Feb 2022 013UTC	260° (W)	<b>94 km/h</b> (51 knots or 59 mph)	Mon 21 Feb 2022 0542 UTC	260° (W)	<b>14.1</b> Sun 20 Feb 2022	14.3
Gurteen Co Tipperary	<b>59 km/h</b> Near Gale (32 knots or 37 mph)	Sun 20 Feb 2022 16UTC	270° (W)	<b>94 km/h</b> (51 knots or 59 mph)	Sun 20 Feb 2022 1435 UTC	250° (WSW)	<b>19.4</b> Sun 20 Feb 2022	19.8
Claremorris Co Mayo	<b>57 km/h</b> Near Gale (31 knots or 36 mph)	Mon 21 Feb 2022 01UTC	270° (W)	<b>96 km/h</b> (52 knots or 60 mph)	Mon 21 Feb 2022 0128 UTC and Sun 20 Feb 2022 1857 UTC	260° (W) and 280° (W)	<b>16.4</b> Sun 20 Feb 2022	17.4
Johnstown Castle Co Wexford	<b>56 km/h</b> Near Gale (30 knots or 35 mph)	Sun 20 Feb 2022 16UTC	270° (W)	<b>91 km/h</b> (49 knots or 56 mph)	Sun 20 Feb 2022 1632 UTC	290° (WNW)	<b>8.9</b> Sun 20 Feb 2022	8.9
Dunsany Co Meath	<b>56 km/h</b> Near Gale (30 knots or 35 mph)	Mon 21 Feb 2022 04UTC	270° (W)	<b>85 km/h</b> (46 knots or 53 mph)	Mon 21 Feb 2022 0337 UTC	270° (W)	<b>14.7</b> Sun 20 Feb 2022	16.8
Moore Park Co Cork	<b>52 km/h</b> Near Gale (28 knots or 32 mph)	Sun 20 Feb 2022 16UTC	280° (W)	<b>93 km/h</b> (50 knots or 58 mph)	Sun 20 Feb 2022 1633 UTC	290° (WNW)	<b>13.5</b> Sun 20 Feb 2022	14.4
Athenry Co Galway	<b>52 km/h</b> Near Gale (28 knots or 32 mph)	Mon 21 Feb 2022 04UTC and Sun 20 Feb 2022 017UTC	280° (W)	<b>85 km/h</b> (46 knots or 53 mph)	Mon 21 Feb 2022 0400 UTC	290° (WNW)	<b>18.0</b> Sun 20 Feb 2022	19.1
Mount Dillon Co Roscommon	<b>46 km/h</b> Strong Breeze (25 knots or 29 mph)	Mon 21 Feb 2022 04UTC and Sun 20 Feb 2022 013UTC	280° (W) and 270° (W)	<b>81 km/h</b> (44 knots or 51 mph)	Sun 20 Feb 2022 1353 UTC and Mon 21 Feb 2022 0448 UTC	270° (W) and 280° (W)	<b>19.0</b> Sun 20 Feb 2022	20.1
Mullingar Co Westmeath	<b>35 km/h</b> Fresh Breeze (19 knots or 22 mph)	Mon 21 Feb 2022 05UTC and Sun 20 Feb 2022 09UTC	270° (W) and 220° (W)	<b>67 km/h</b> (36 knots or 41 mph)	Mon 21 Feb 2022 0638 UTC and Sun 20 Feb 2022 1457 UTC	260° (W) and 270° (W)	<b>17.8</b> Sun 20 Feb 2022	18.4
Ballyhaise Co Cavan	<b>33 km/h</b> Fresh Breeze (18 knots or 21 mph)	Sun 20 Feb 2022 08UTC	230° (SW)	<b>78 km/h</b> (42 knots or 48 mph)	Sun 20 Feb 2022 1635 UTC	270° (W)	<b>19.4</b> Sun 20 Feb 2022	21.6

**Table 2. Buoy Observations - Sunday 20 – Monday 21 February 2022**

Buoy	Max Mean Winds	Max Gust	Max Sig. Wave	Max Individual Wave
M2	64.8 km/h <b>(35 knots or 40 mph)</b>	83.8 km/h <b>45 knots   51.7 mph</b>	3.1 m	5.3 m
M3	74 km/h <b>(40 knots or 46 mph)</b>	98.1 km/h <b>53 knots   60.9 mph</b>	11.7 m	20.3 m
M4	69.8 km/h <b>(37.7 knots or 43.3 mph)</b>	103.7 km/h <b>56 knots   64.4 mph</b>	13.8 m	29.5 m
M5	57.9 km/h <b>(31.1 knots or 35.7 mph)</b>	88.6 km/h <b>48.6 knots   55.2 mph</b>	6.1 m	11.9 m

## Wind warnings issued for Storm Franklin

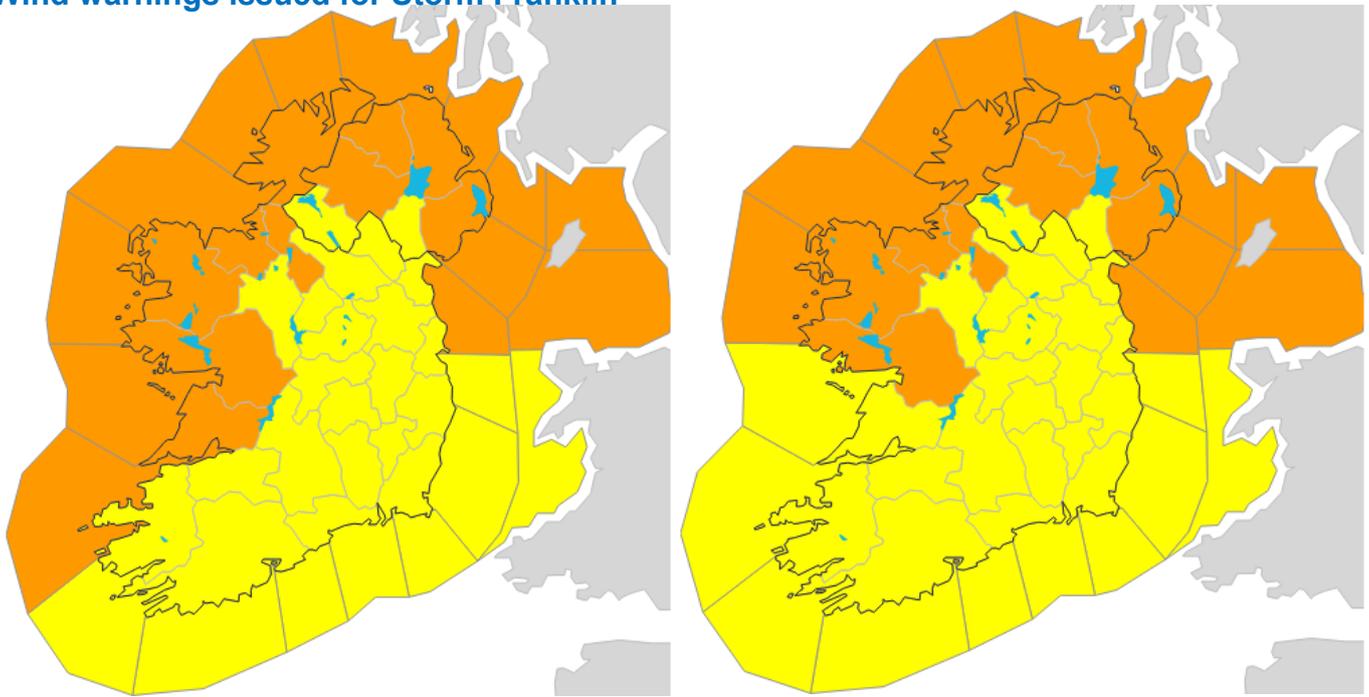


Figure 7. Wind warnings and advisories for Sunday 20 and Monday 21 February 2022. See the weather warnings page on [www.met.ie](http://www.met.ie)

## Climate projections for Ireland

Due to its geographic location along the Western edge of Europe, Ireland is affected by mid-latitude wind storms. Latest future projections indicate an overall decrease of 10% in the number of less severe storms affecting Ireland by the middle of the 21st century (Nolan and Flanagan, 2020). These projections also show there will be an eastward extension of the more severe wind storms over Ireland.

As our planet warms, so does our atmosphere. Warmer air has the ability to hold more moisture. In Ireland, we have seen an increase in average annual rainfall by about 6% over the last 30 years (compared to the previous 30 years).

Latest future climate projections for Ireland indicate a decrease in mean rainfall by mid-century; a decrease in mean annual and spring and summer rainfall (Nolan and Flanagan, 2020) while heavy rainfall events are expected to become more frequent. Rainfall is expected to become more variable, with projected increases in frequency of both heavy rainfall events and dry periods also. These projections are in line with those carried out previously (e.g. Nolan 2015, Nolan 2017).

These projections were downscaled from CMIP5 output of the EC-Earth global climate model (Hazeleger 2012).

### References

- Hazeleger, W, X Wang, C Severijns, S Stefanescu, R Bintanja, A Sterl, K Wyser, T Semmler, S Yang, B van den Hurk, T van Noije, E van der Linden, and K van den Wiel (2012), EC-Earth V2: description and validation of a new seamless Earth system prediction model. *Climate Dynamics*, 39, 2611-2629
- Nolan P, 2015. Ensemble of Regional Climate Model Projections for Ireland. Environmental Protection Agency, Johnstown Castle, Ireland. Nolan P and McKinstry A
- Nolan P, Flanagan J (2020). [Research 339: High-resolution Climate Projections for Ireland. A Multi-model Ensemble Approach](#). EPA report 339
- Nolan P, O'Sullivan J, and McGrath R (2017). Impacts of climate change on mid-twenty-first-century rainfall in Ireland: a high-resolution regional climate model ensemble approach. *International Journal of Climatology*

### Definitions

*Gust* wind speeds are an average of 3-second wind speeds.

*Sustained* wind speeds are an average of 10-minute wind speeds. For observations of sustained wind speeds:

- Storm Force 10  $\geq$  89 km/h (48 knots)
- Violent Storm Force 11  $\geq$  103 km/h (56 knots)
- Hurricane Force 12  $\geq$  117 km/h (64 knots)