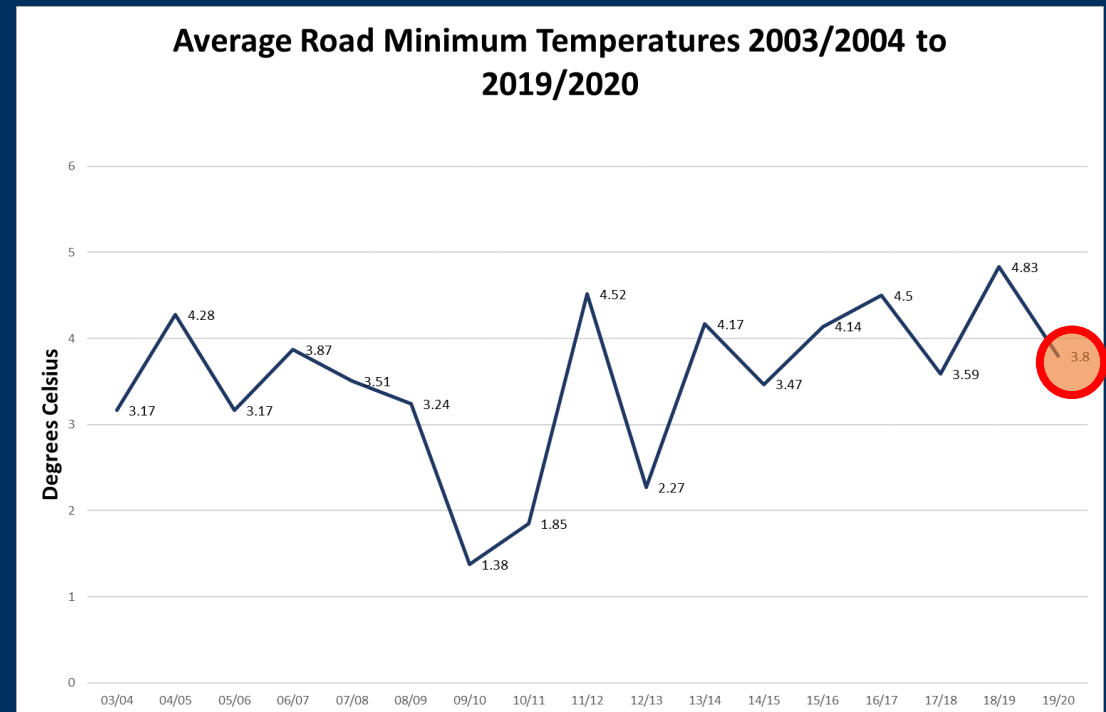


The Winter of 2019/20

Dawn from Met Éireann HQ, December 1st
2019 – A Marginal Night

A Milder and Wetter than Average Season

- Eighth (8th) mildest season in the 22 year series
- Average Road Minimum Temperature of 3.8 °C
- 1.03 °C lower than last year, the 2018/2019 season, which remains the mildest season in the 22-year series.
- 0.21 °C higher than the previous year, 2017/2018 which incorporated Storm Emma.

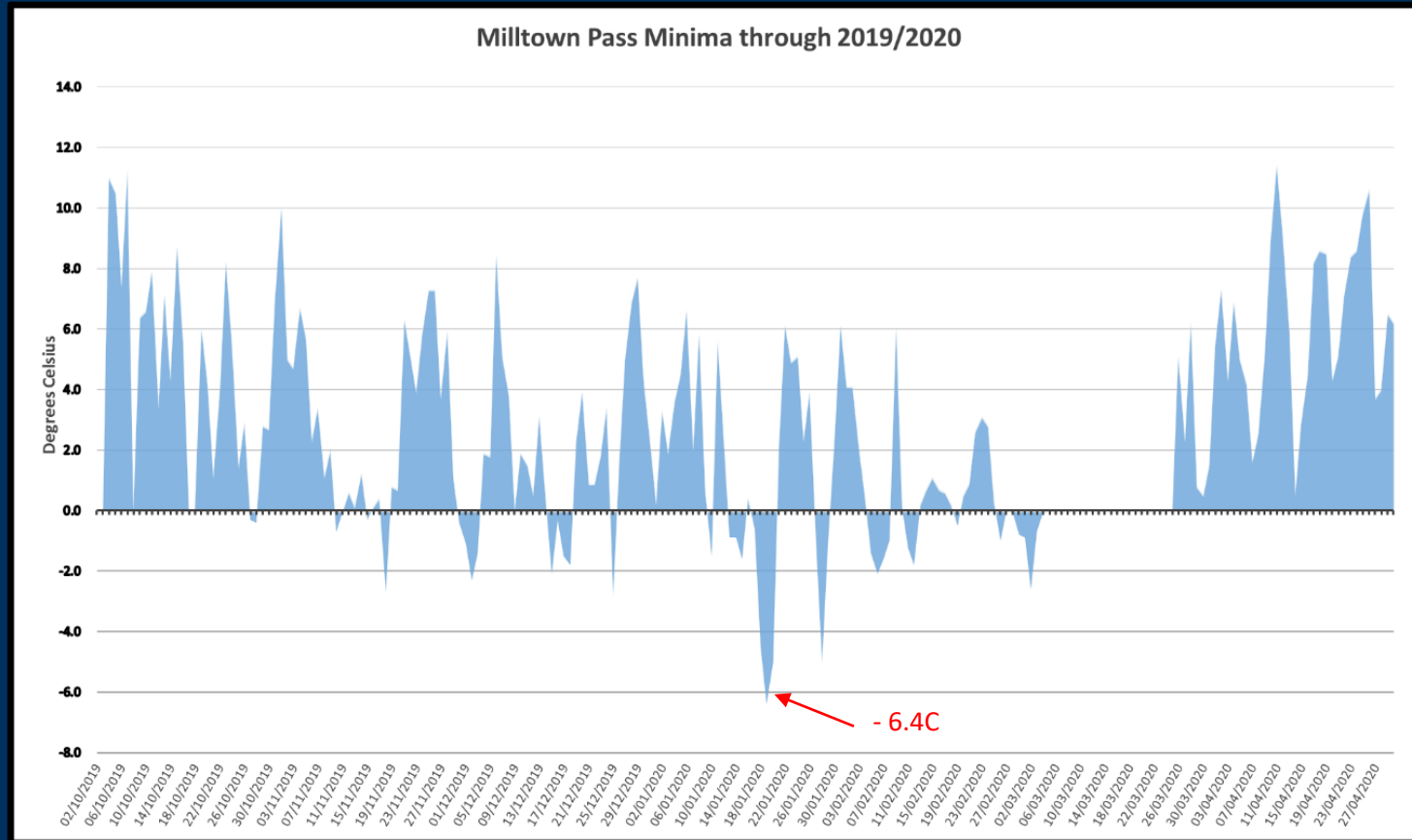


Largest number of stations to date

- The statistical analysis was performed across more than 100 stations for the first time.
- Analysis was carried out on 101 stations compared to 89 last year as the road monitoring network continues to expand.

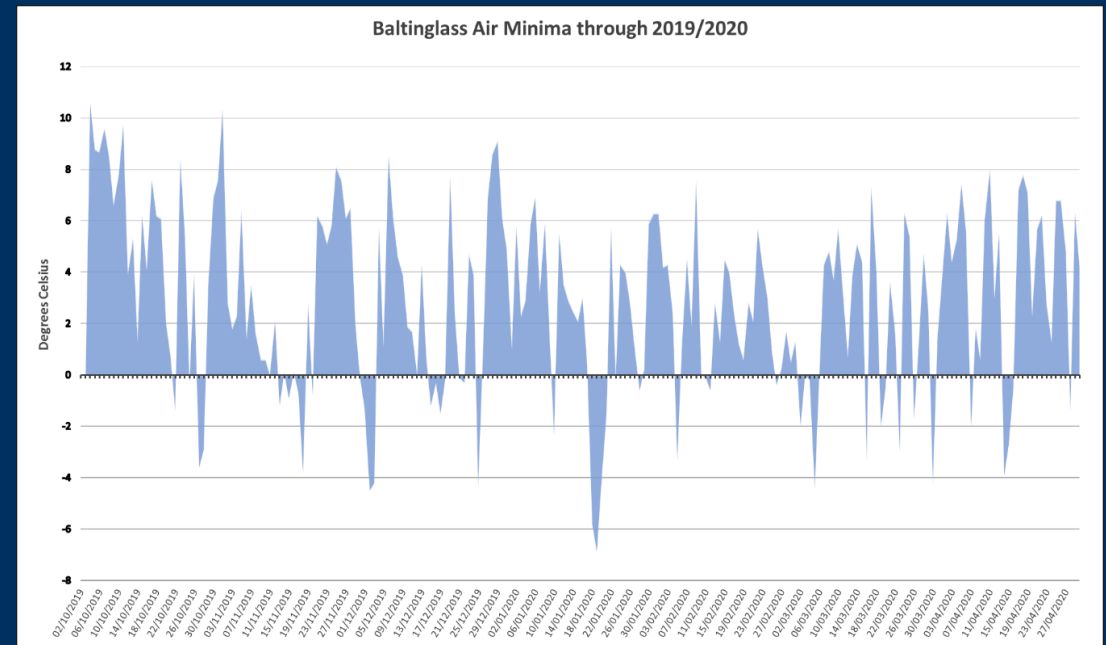


The lowest road temperature of the season was -6.4°C .



Coldest night for Road & Air temperature

- 19th January 2019
- Lowest Road Surface Temperature was $-6.4\text{ }^{\circ}\text{C}$ recorded at Milltown Pass in Co. Westmeath
- Lowest Air Temperature $-6.9\text{ }^{\circ}\text{C}$ was reported at Baltinglass Co. Wicklow



The Season of 2019/2020



Aftermath of hail shower at Birdhill in County Tipperary which caused multi car collisions on 11th December 2019 courtesy of James O'Dwyer via Stephen Smyth.

The Season of 2019/2020



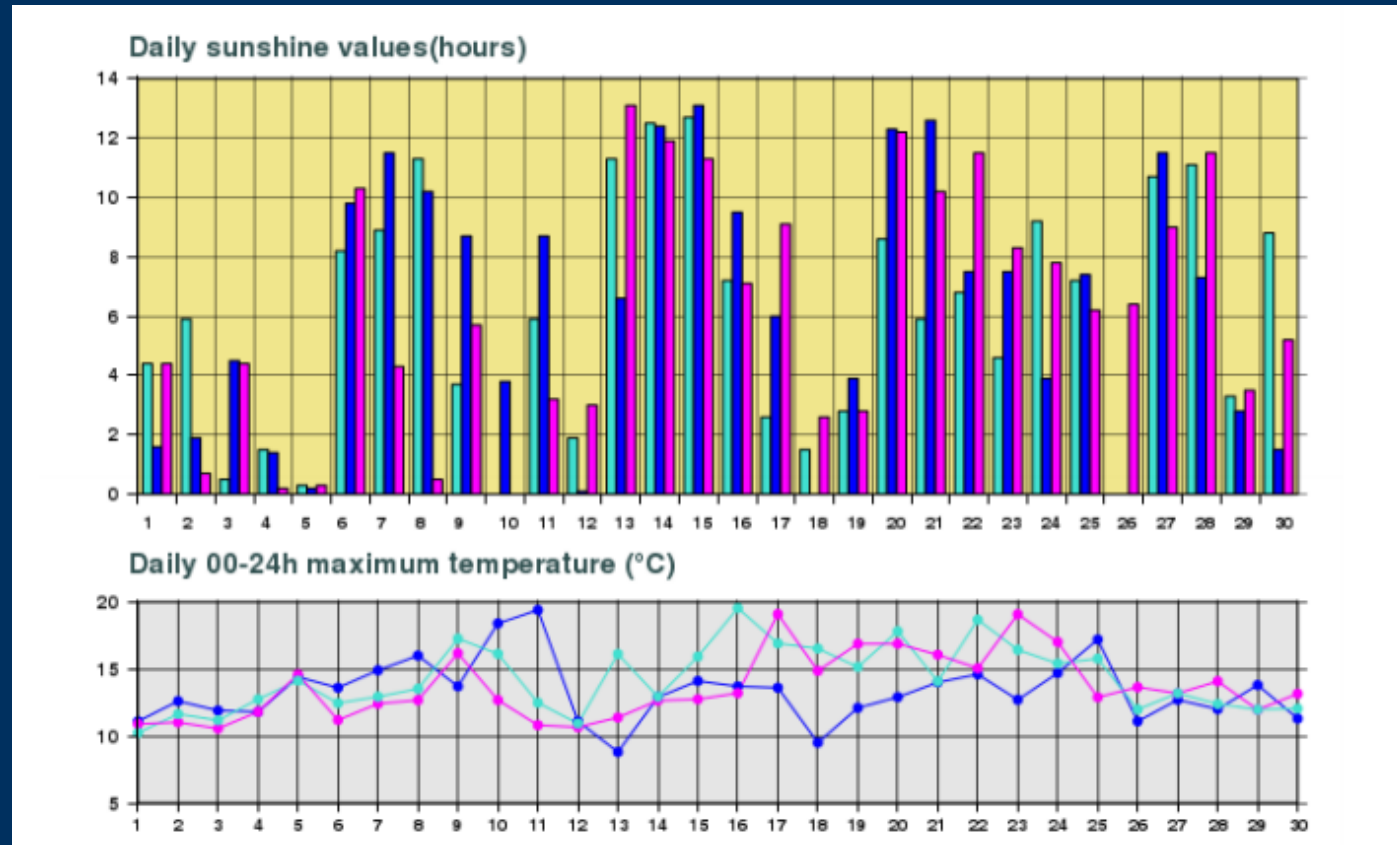
Snow lying at Knock Airport on Jan 27th 2020 courtesy of Ireland West Airport Twitter Page

The Season of 2019/2020



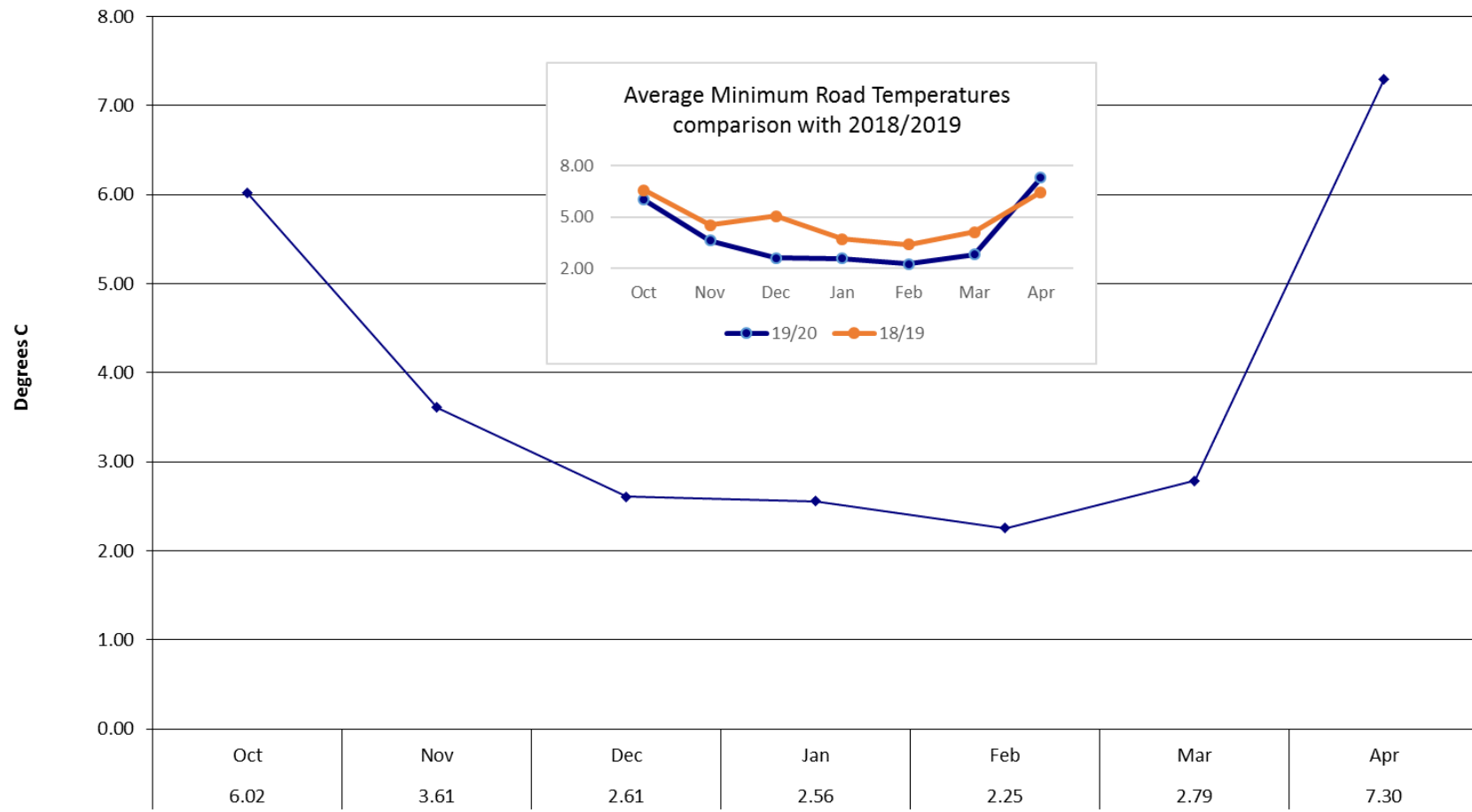
*Tree down near Fermoy during the passage of Storm Brendan on
Jan 13th 2020*

The Season of 2019/2020



How did that translate to RSTs?

Average Minimum Road Temperatures 2019/2020



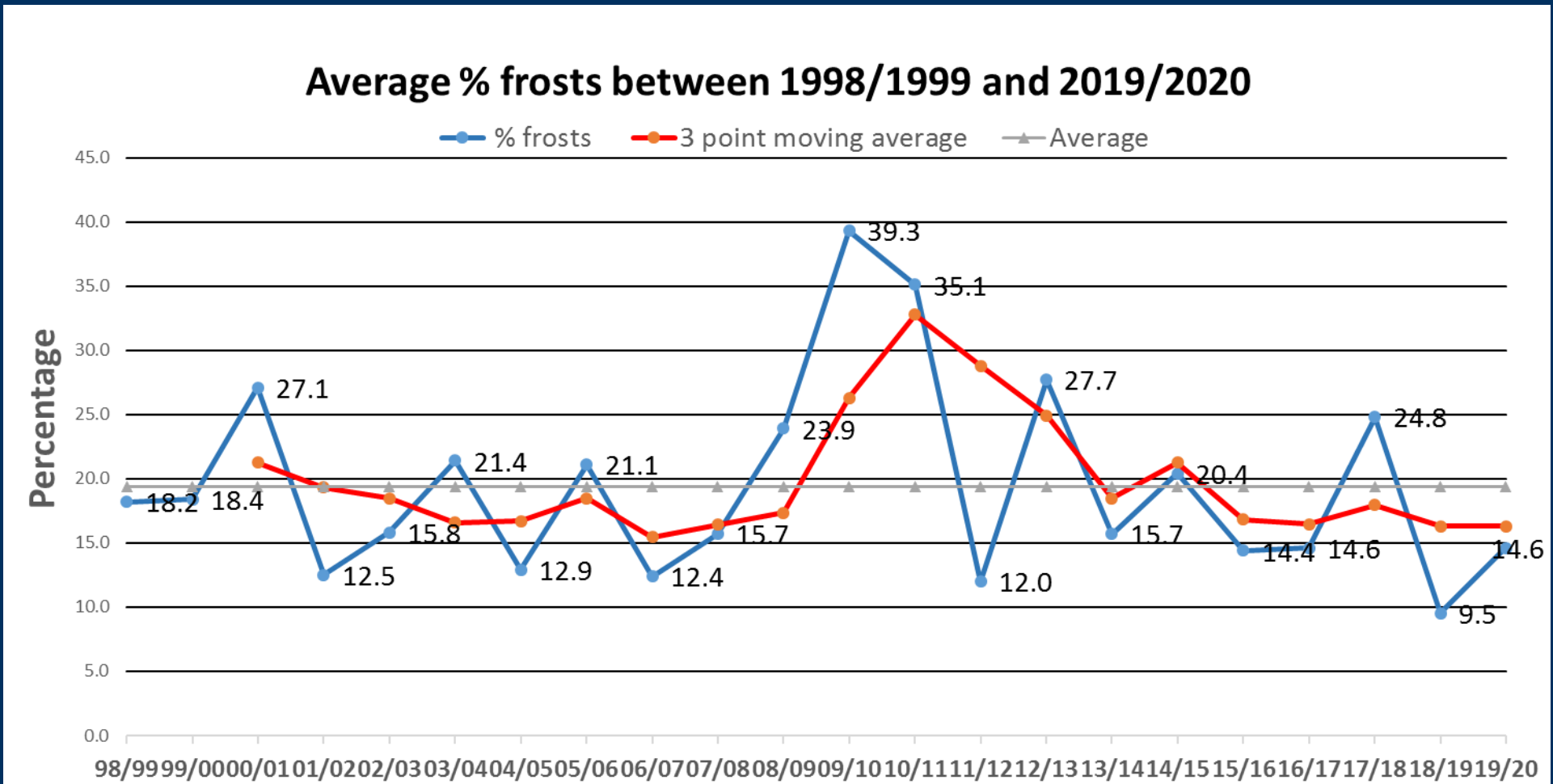
Instances of Frost

- The average percentage frost across the 101 stations examined for 2019/2020 was 14.6%
- Emyvale, Co. Monaghan returned the highest % of night frosts at 31.2% or 63 frost nights over the season.
- Emyvale was followed by Baltinglass, Co. Wicklow (26.9%) and Funshog, Co. Louth (26.1%)
- Comparing to last year 2018/2019: Lough Mourne, Co. Donegal had the highest % of frost nights last year with 20.24%. This year Lough Mourne recorded 22.1% of frost nights.

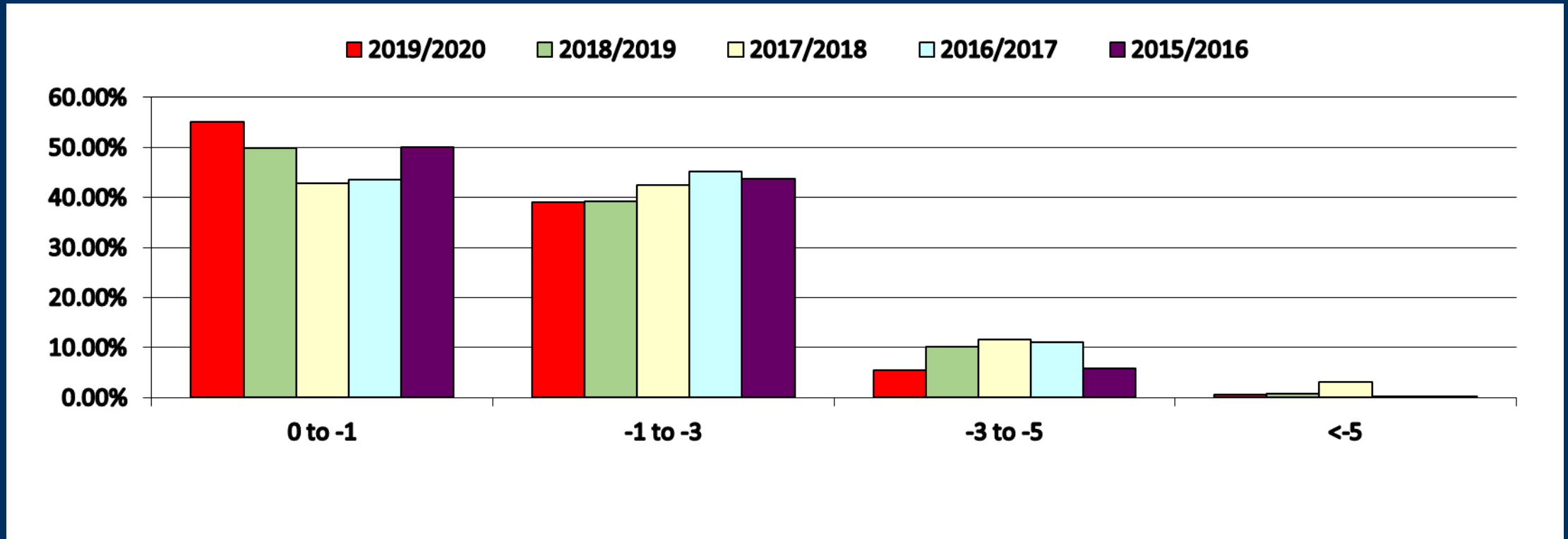
Instances of Frost ... Continued

- The mildest station was Waterville, Co Kerry which reported just 2.4% of night frosts during the entire season equating to 5 nights.
- Dublin Port Tunnel, Limerick Tunnel, Bunratty, Co. Clare, Dublin Airport M50 and Dublin Airport M1 all reported less than 5% of night frosts (they all had either 9 or 10 frost nights over the entire season).
- Waterville, Limerick Tunnel and Bunratty were among the mildest stations last year also.

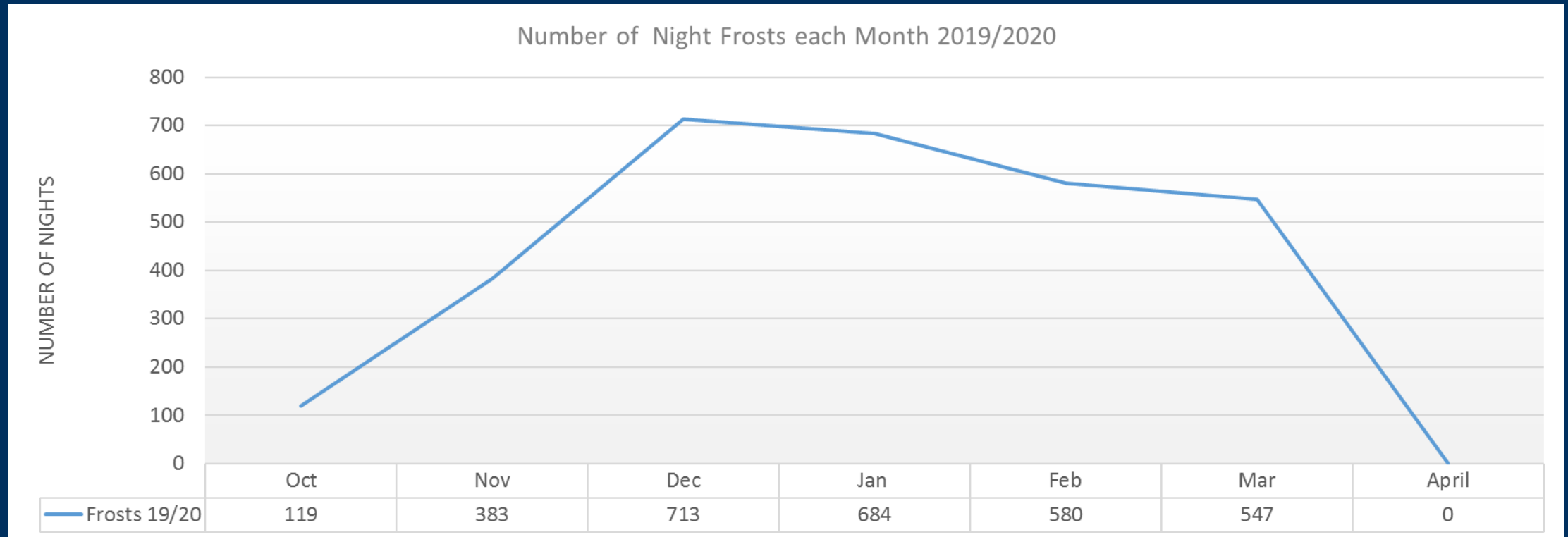
Graph of % frosts



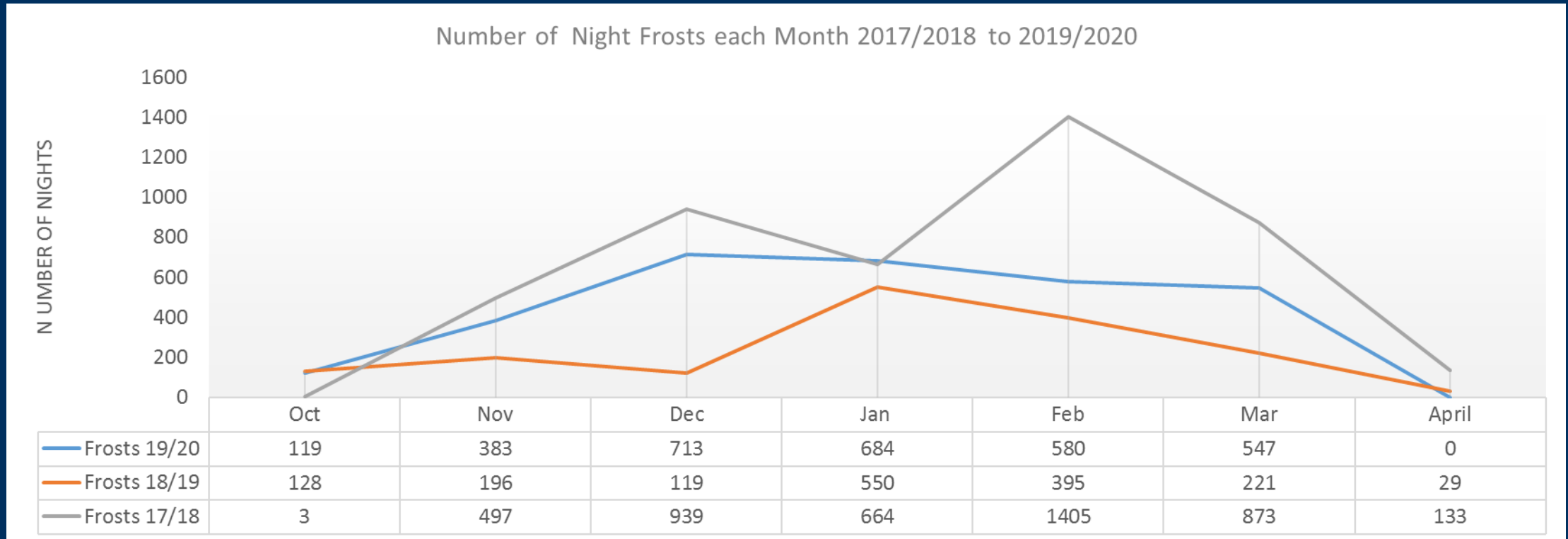
Frequency of Night Frosts in different temperature ranges over the last 5 years



Monthly Breakdown of frosts across the Network



Comparing that to last couple of years....



Marginal Nights – when RSTs of less than 2°C were observed.

- 2019/2020 had the highest number of marginal nights in the last 5 years.
- 3051 nights or 19% of nights were in the 0 to +2 degrees Celsius range
- Compared with 12.8% in 2018/2019 , the mildest season in the series, and 16.7% in 2017/2018, the coldest season in the last 5 years.

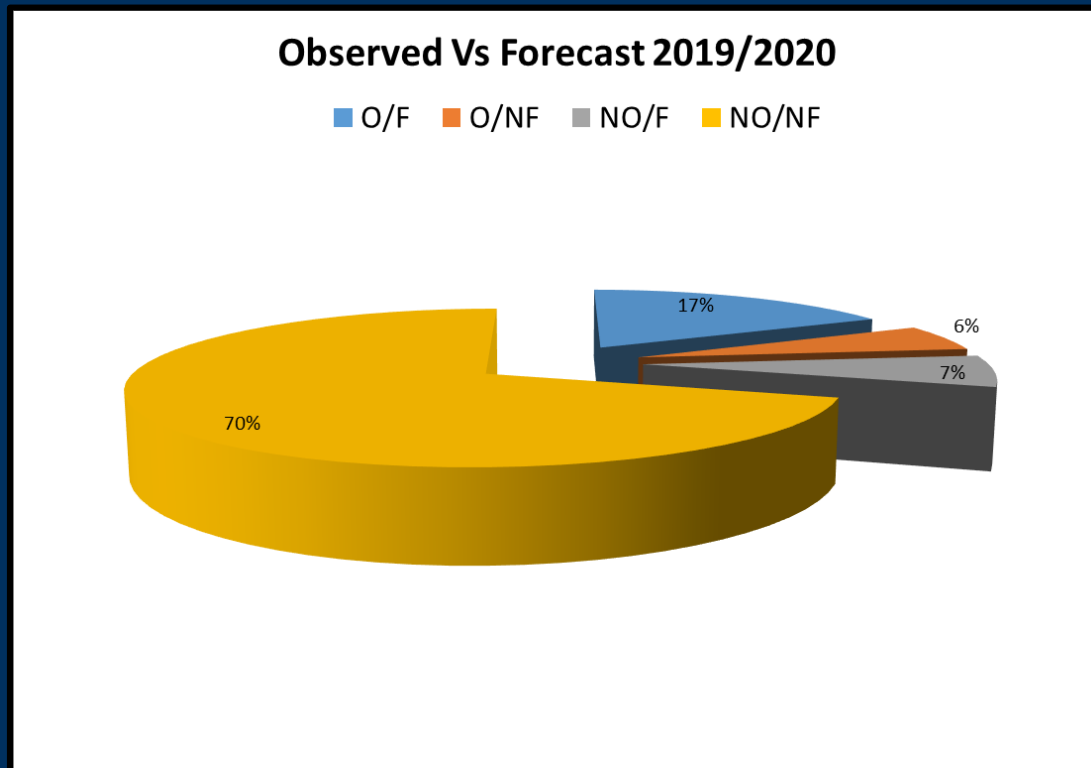


Statistical Analysis of 2019/2020 Season

- The analysis was performed between October 1st 2019 and April 30th 2020
- A total of 212 days across 101 sites
- 20,746 observational days
- The season returned 3,026 site frosts – resulting in an average of 30 frost days per station across the network.



The Statistical Analysis was executed only on “Critical Site Days”

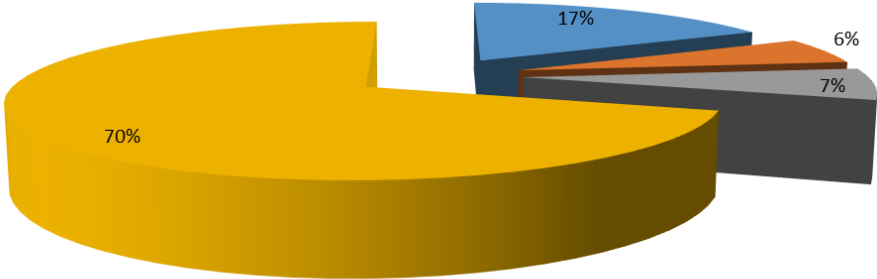


- Critical Site Days refer to days when the RST < 5 °C
- There were 13,211 Critical Days or 63.2% of valid days during the period
- On 3,951 or 19% of all valid nights, the minimum RST lay between 0 and 2 °C – marginal nights

Forecast versus Persistence

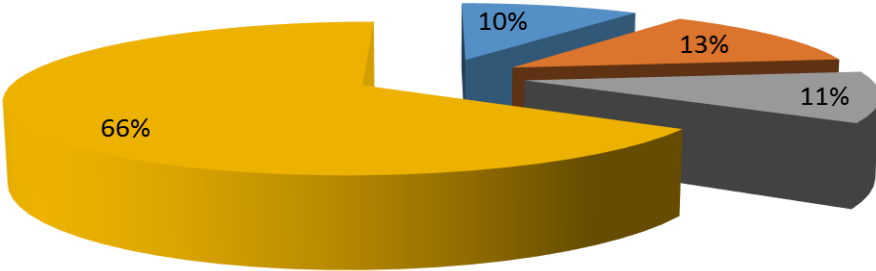
Observed Vs Forecast 2019/2020

O/F O/NF NO/F NO/NF



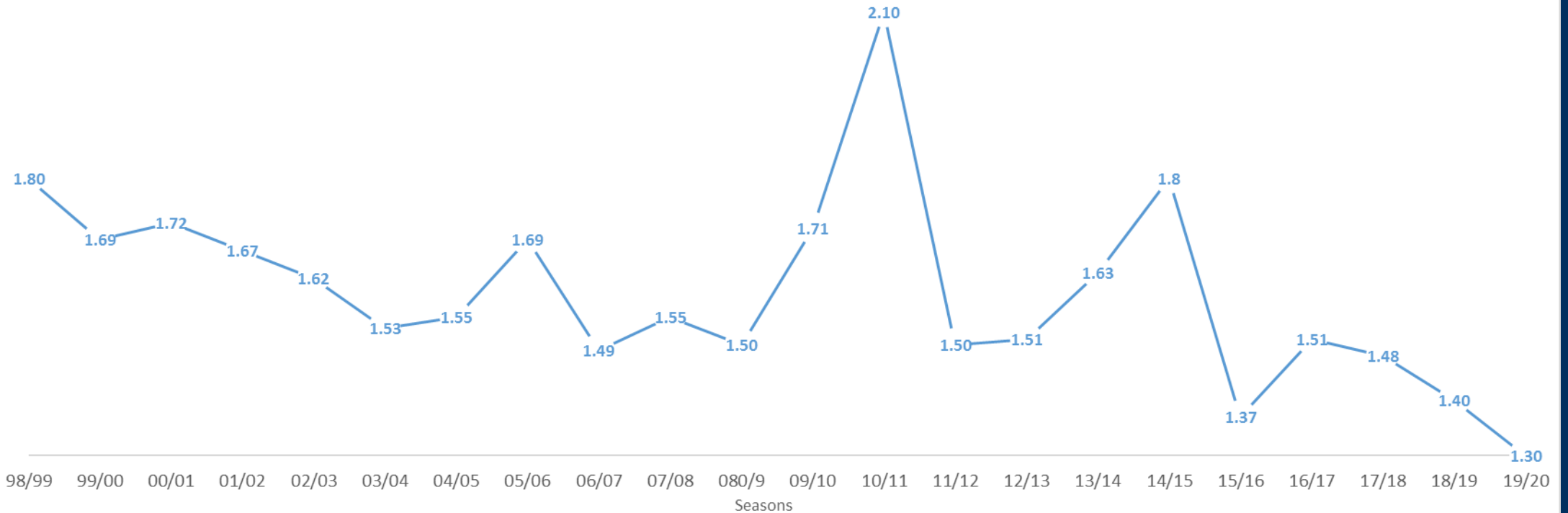
Observed Vs Persistence 2019/2020

O/F O/NF NO/F NO/NF



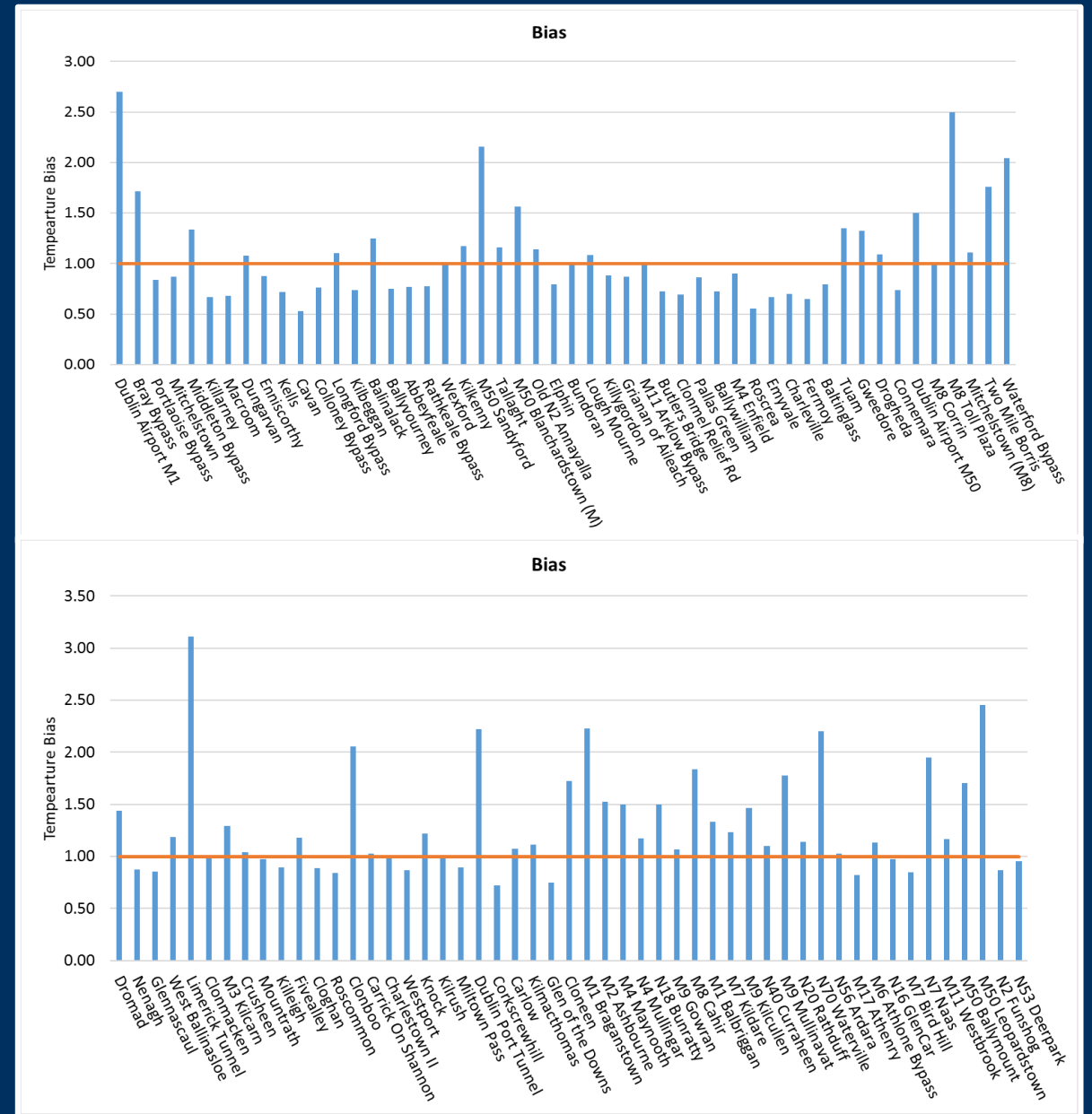
Statistically how did the forecast perform?

RMSE SCORES 1998/1999 TO 2019/2020



Bias

- The average bias across the 101 stations was 1.19 (optimal value is 1)
- 53 stations had a bias >1 (over forecasting of frost)
- 41 stations had a bias <1 (under forecasting of frost)
- 7 stations had no bias = 1



Summary of statistical results

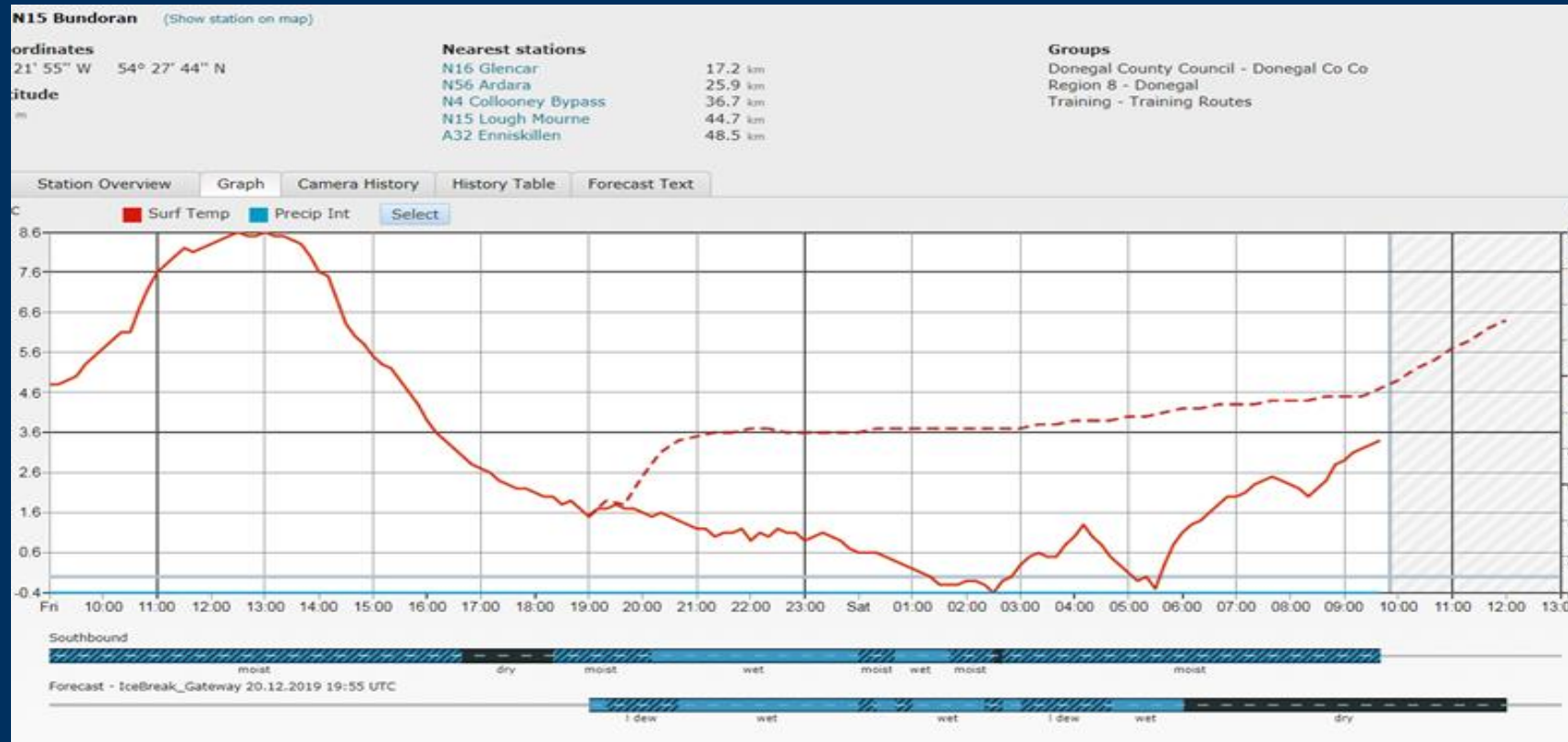
- Percentage Correct = 87.7%
- Mean Square error (MSE) = 76%
- False Alarm Rate (FAR) = 8.6%
- Probability of Detection (POD) = 77%
- Critical Success Indicator (CSI) = 57.8%
- True Skill Statistic = 68.6%
- Mean Error = 0.01

Factors not captured in the Statistical Analysis

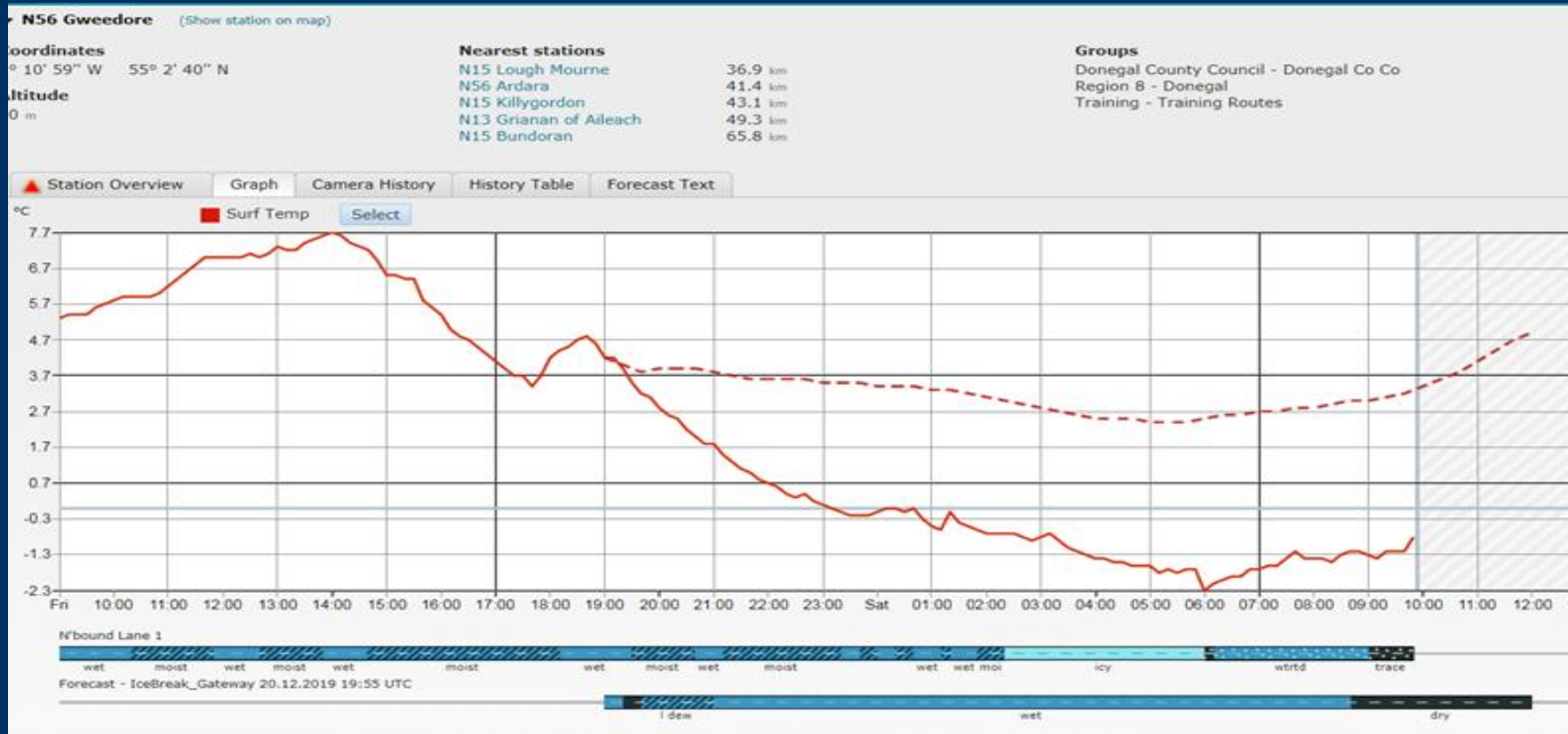
- No evaluation of tabular hazard matrix and text
- No assessment of the consultancy service
- No validation was made of the thermal maps

(On marginal nights , the thermal maps will generally produce lower temperatures (often below zero) over a contiguous sections of road)

Case from last December...



And Gweedore.....



Hazard Matrix

24 Hour Area Forecast for region8

Counties: Donegal

Issue Time 20th of December 2019 at 12:49 UTC

Forecaster Commentary: Assessment of Site-Specific Data

Graphs may be underestimating the frost risk tonight due to the model over-estimating fog. Monitoring is advised. There is a slight risk of RSTs going below zero.

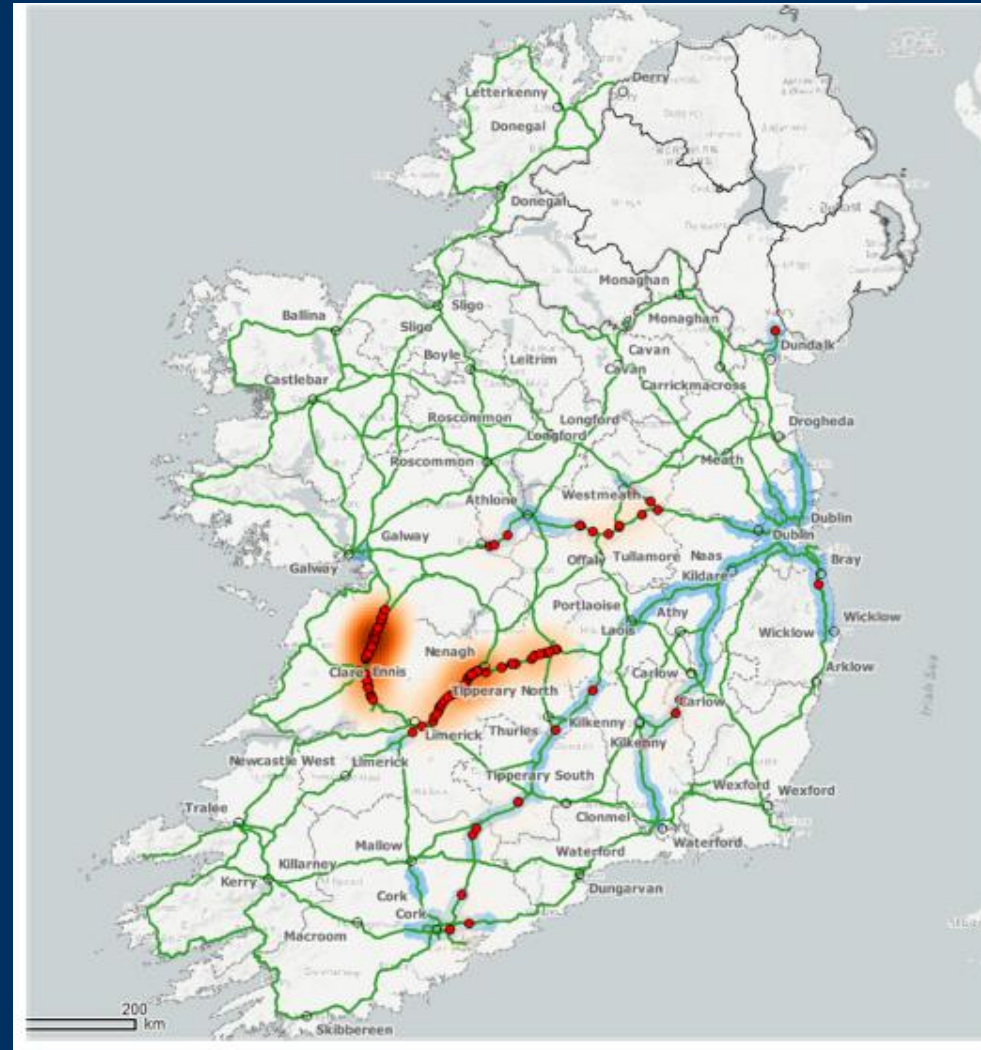
Readiness Colour

YELLOW

Hazard Summary

Element	Y/N	Confidence	Details
Ice	N	M	
Hoar Frost	Y	M	Frost patches may occur.
Snow	N	H	
Hail	N	H	
Fog	Y	H	Fog patches forecast
Strong Wind	N	H	
Rain	N	H	

A quick look at Hail Events

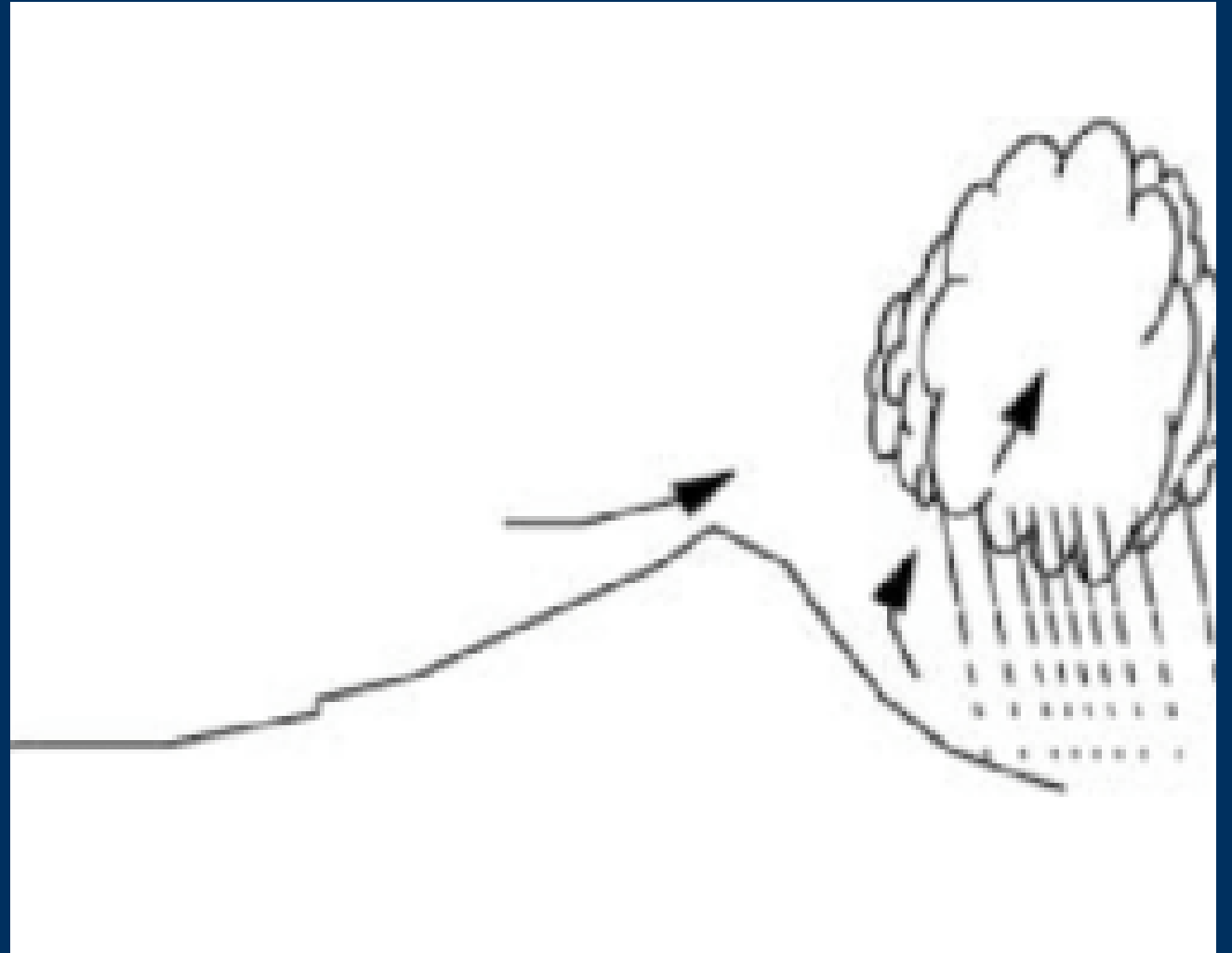


Where & When do we get hail?

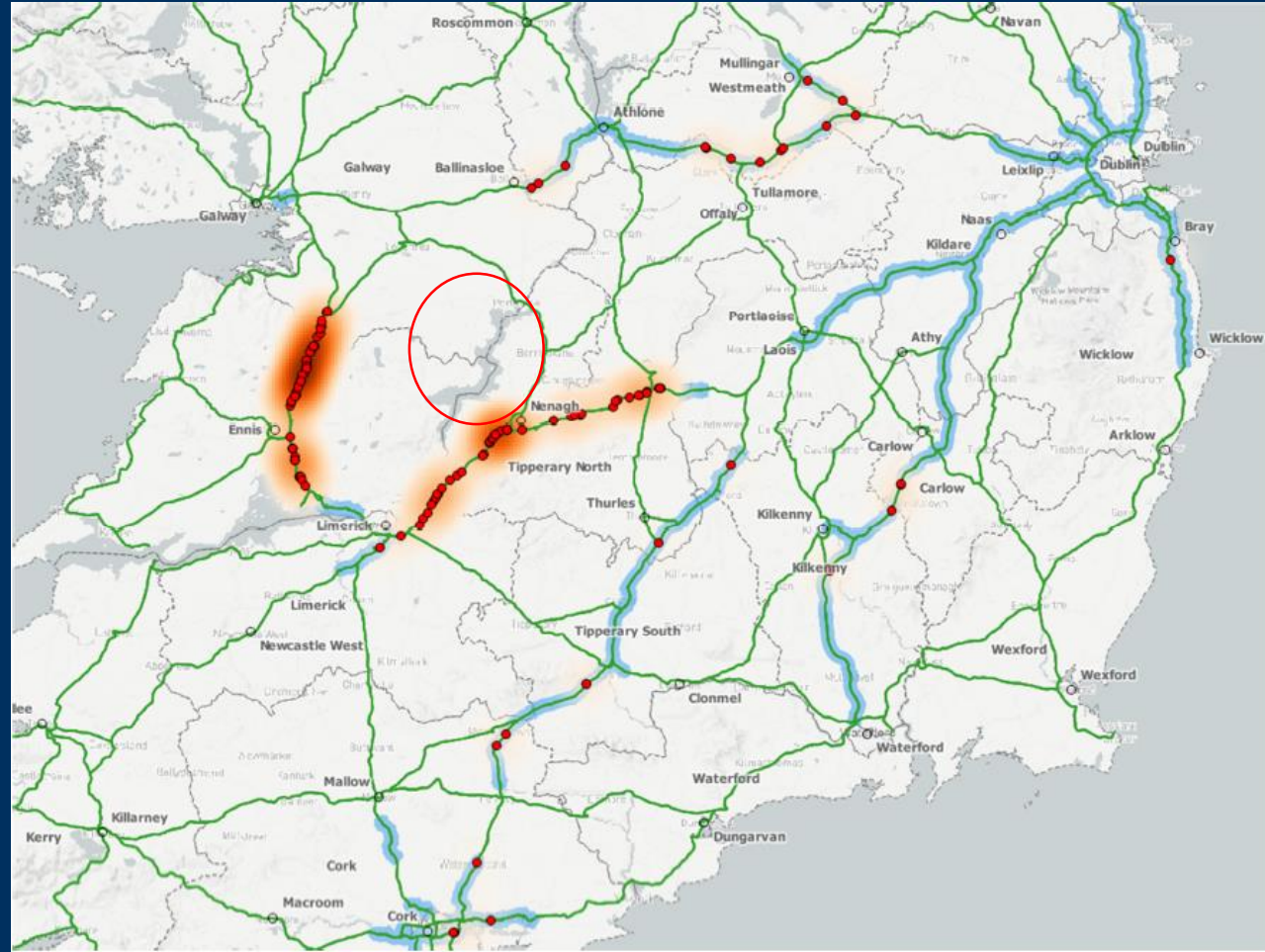
- Most common in western parts of Ireland where it occurs most frequently in winter and early spring.
- The land is cold compared to the sea at this time of year so showers form over the North Atlantic driven by the heat energy of the sea.
- Once the showers reach the cold land they tend to lose their driving force (the relatively warmer sea) so there will tend to die out before they get too far inland.

Where do we get hail?

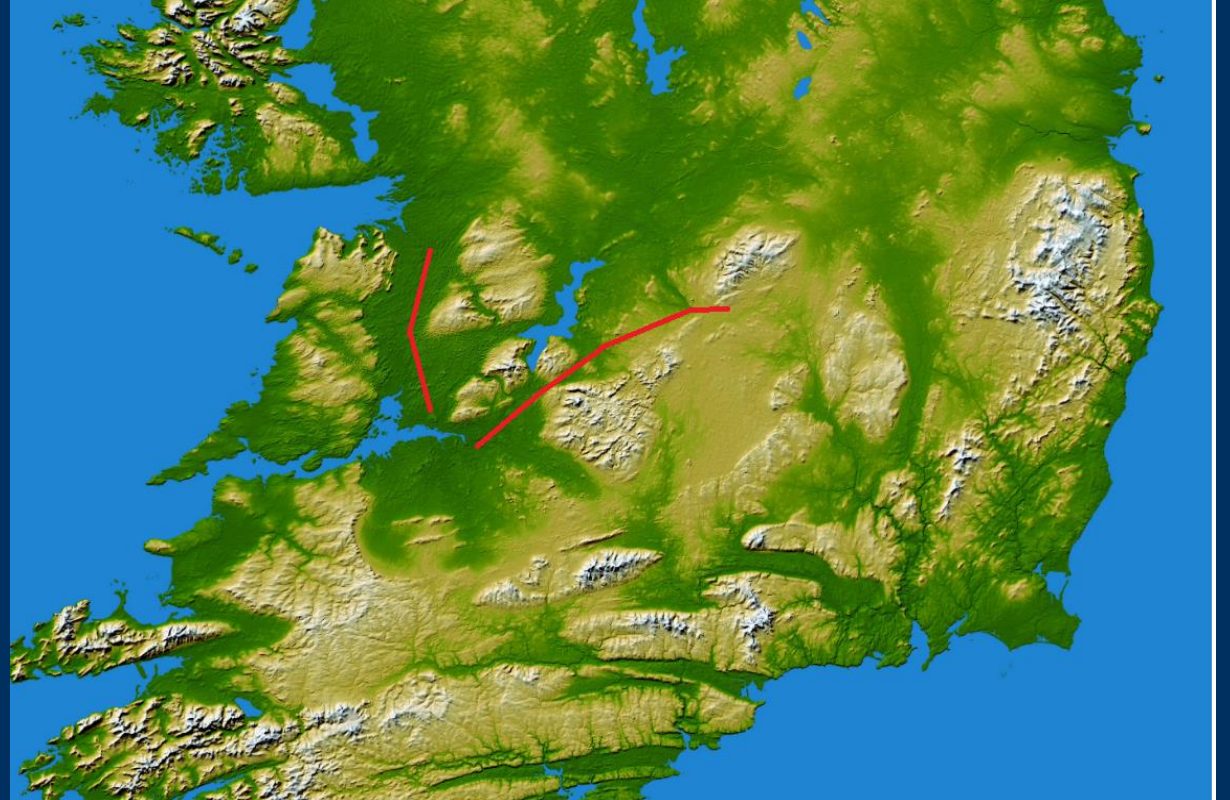
- However, sometimes if the atmospheric conditions are right higher up in the air, the showers can continue even over the cold land and may affect central and eastern parts of Ireland too.
- Showers (not just hail showers!) will often form over hills where moving air is forced to rise over them



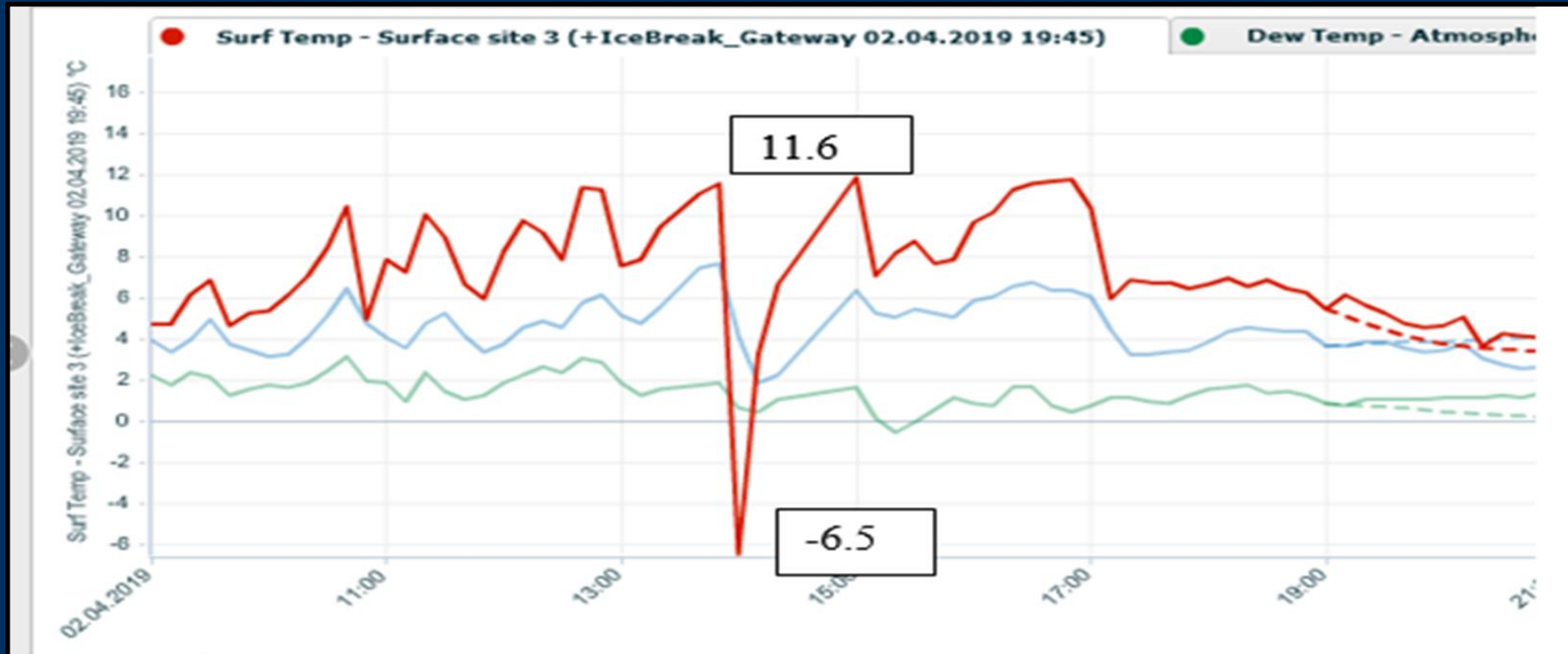
Zooming in on this area



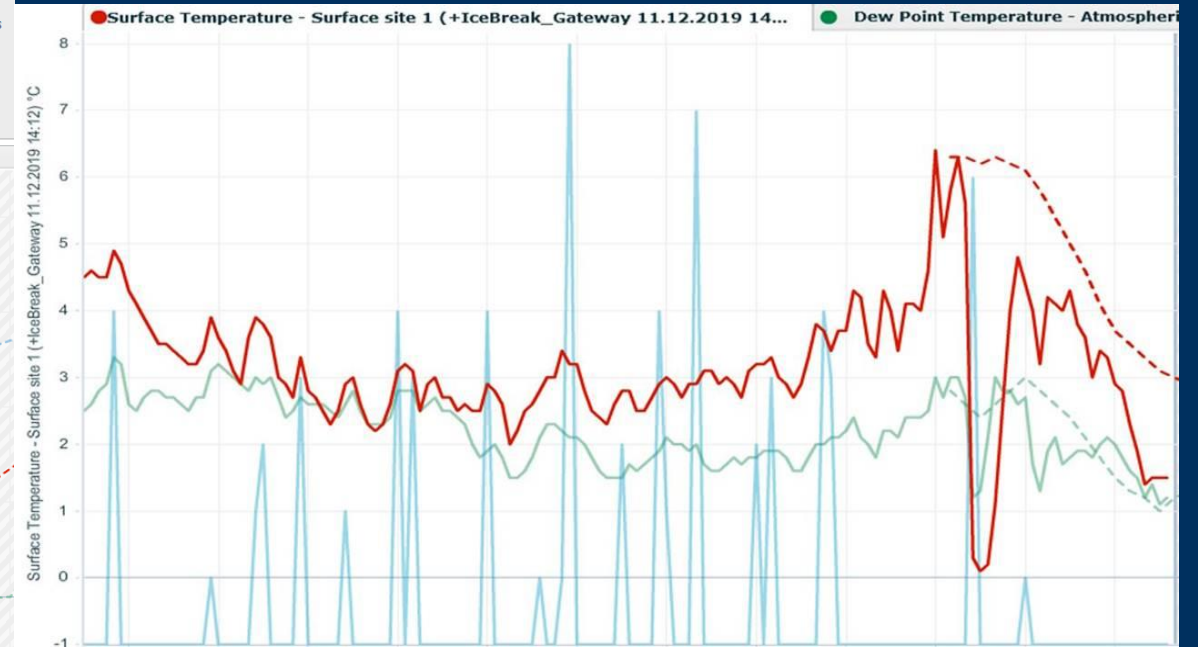
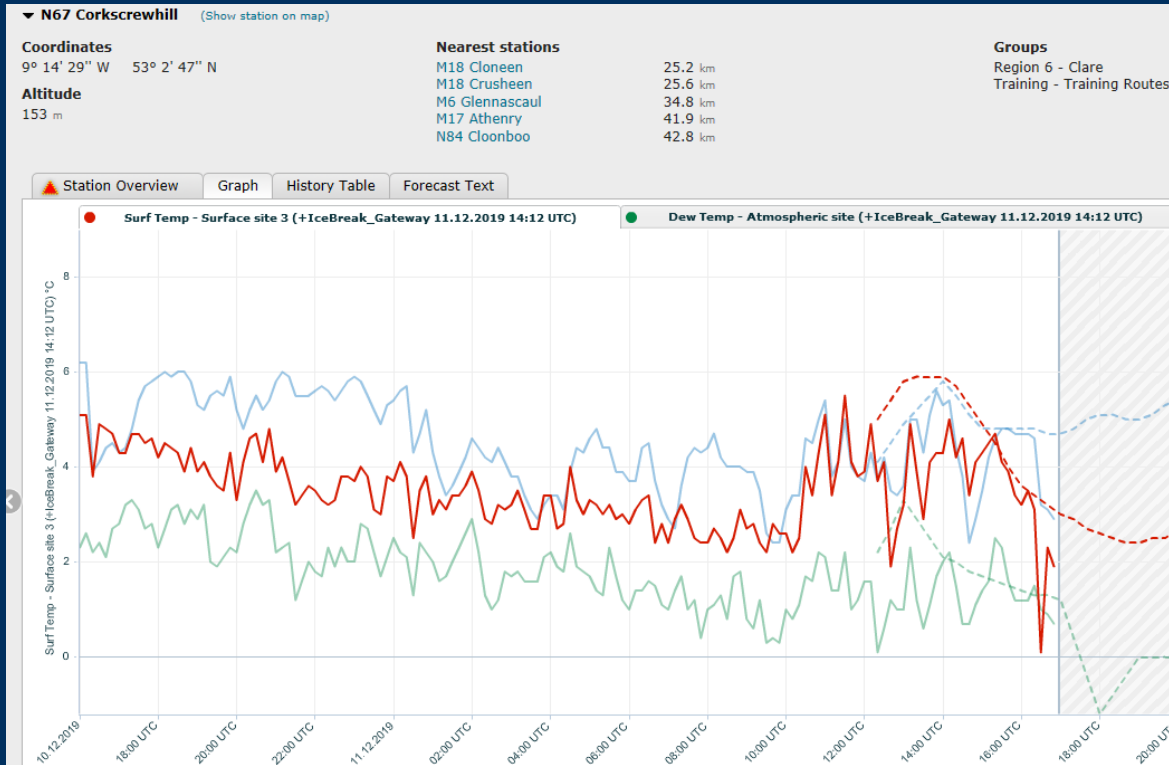
Relief Map



What does a hail shower look like in a graph?



Other examples



How does it look for this Winter?

- La Nina is established in the tropical Pacific. Models agree that La Nina conditions will continue well into the winter, with some predicting a strong event.
- Correlations between Euro-Atlantic climate and ENSO yield only weak and inconclusive results – but the evidence suggests a positive NAO is favoured.

Monthly Forecast from ECMWF

- Drier conditions over the coming week, especially in the west.
- Colder than average by between 1 to 2 degrees in a predominantly northerly airflow.
- Week 2 suggests low pressure to the south of Ireland steering a more southerly airflow in, so temperatures likely returning to normal.
- No strong signal for week 3
- Wetter than average in the north and west during week 4 (start of Nov) with average temperatures

Thank you for
your attention.

