Making Ireland Weather and Climate Prepared

Crowdsourced Weather Observations

IMS Field trip
Michael Davitt Museum
Straide
May 2023

An Roinn Tithíochta, Pleanála agus Rialtais Áitiúil
Department of Housing, Planning and Local Government

Conor Lally

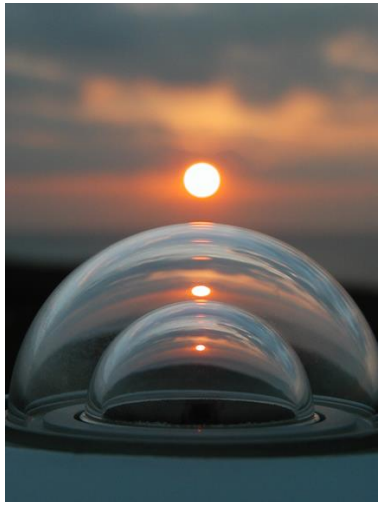
Applications Meteorologist
Data Unit Lead
Observations Division
Met Éireann

An Roinn Tithíochta,
Pleanála agus Rialtais Áitiúil
Department of Housing,
Planning and Local Government

Good weather forecasts begin with high quality meteorological observations

All of Met Eireann core activities are underpinned by environmental and hydrological measurements.

What We Measure



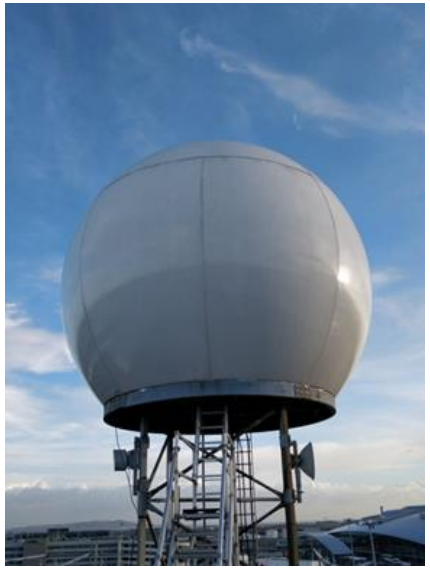
- Air, grass, soil and earth temperatures.
- Humidity.
- Pressure.
- Wind speed and direction.
- Present weather & visibility.
- Rainfall.
- Snow depth.
- Cloud height and amount.
- Solar radiation & sunshine duration

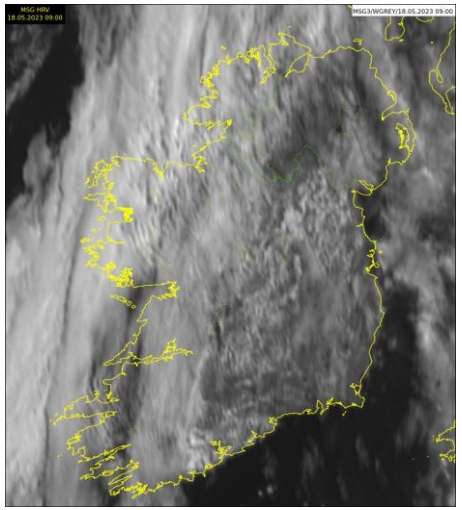
Pop Quiz:

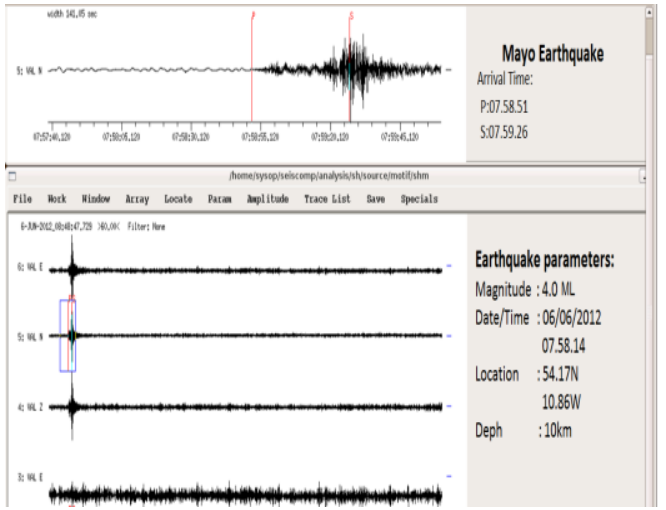
Link the instrument to the weather its measuring

And lots lots more….

- Radar Observations
- Marine Observations
- Air and Rainwater Pollution
- Radioactive Monitoring
- Satellite Remote Sensing
- Upper Air Observations
- Aerosol Optical Depth
- Geomagnetism
- Phenology
- Seismology
- …..

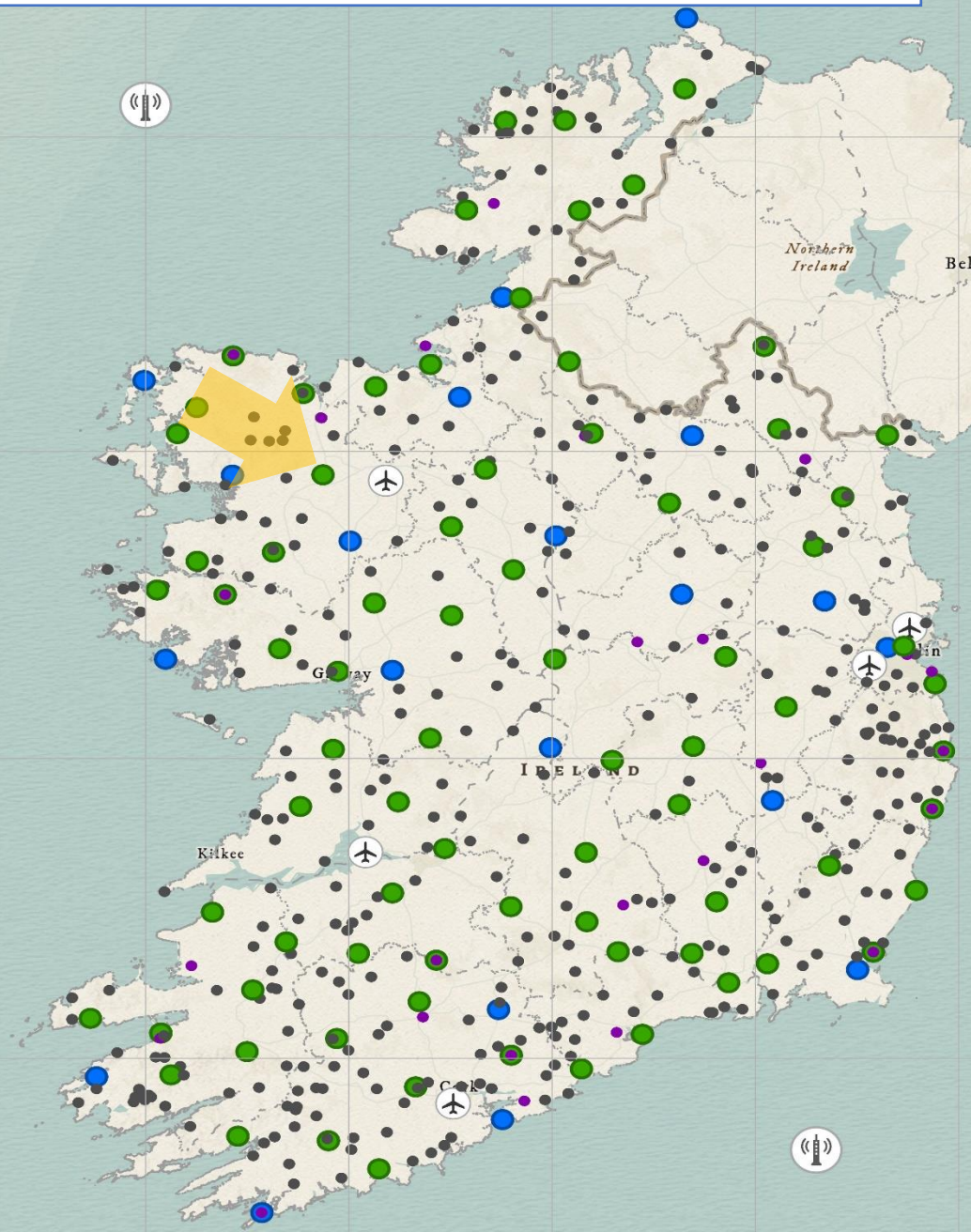






Core Surface Observation Network

Met Éireann Stations	Number of stations
Manual Climate stations	25 (Approx)
Manual Rainfall stations	400 (Approx)
Tucson stations	20
Automatic climate stations (CAMP)	78
Airport Stations	5
Buoys	5
Counties	



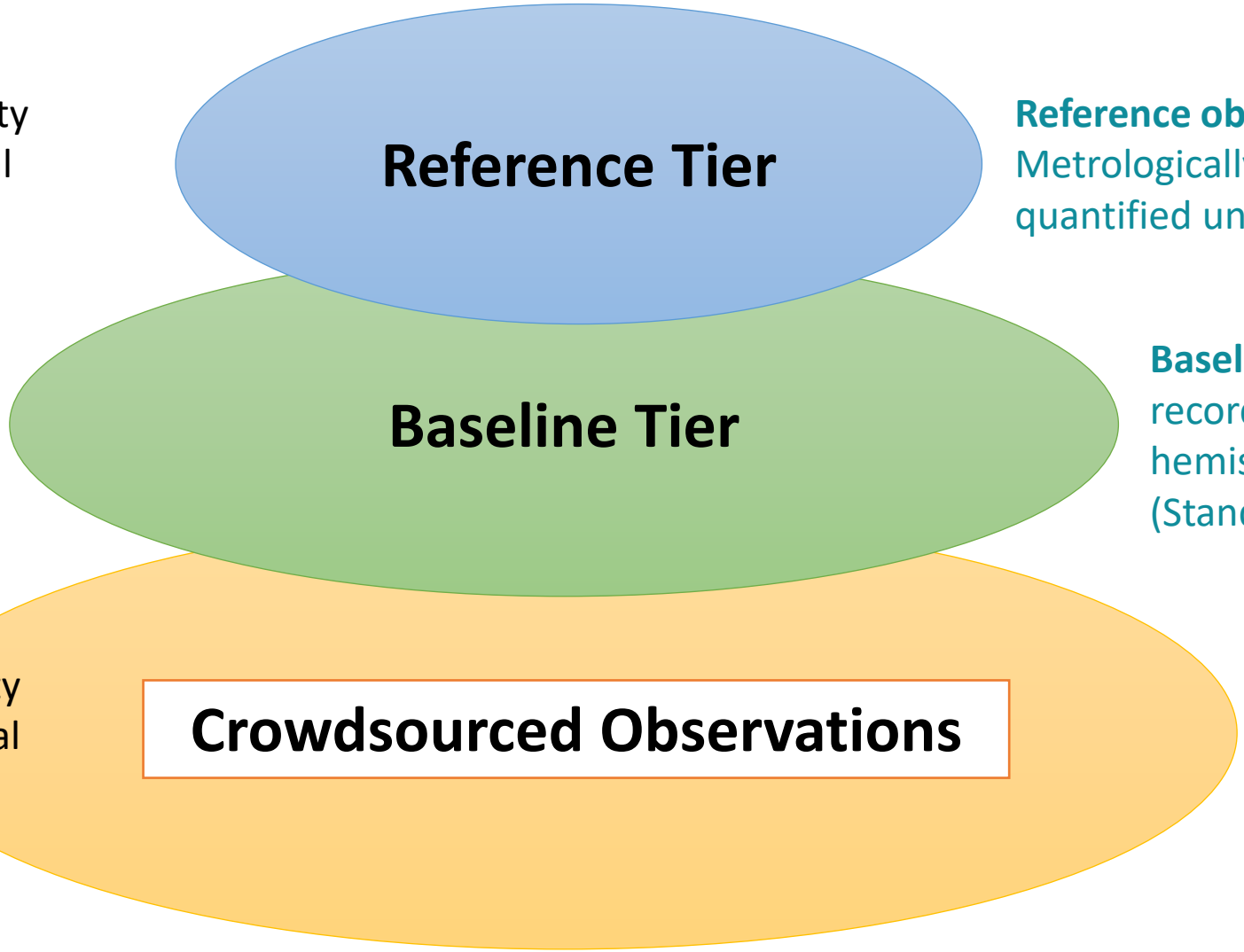
Planned Developments

- Costal visibility
- Nearshore weather buoys
- Soil moisture
- ….
- Open data
- Improved timeliness

N

Tiered Network Approach

- High Quality
- Low Spatial Resolution



- Low Quality
- High Spatial Resolution

Reference observing networks: Metrologically traceable observations, with quantified uncertainty (Gold standard)

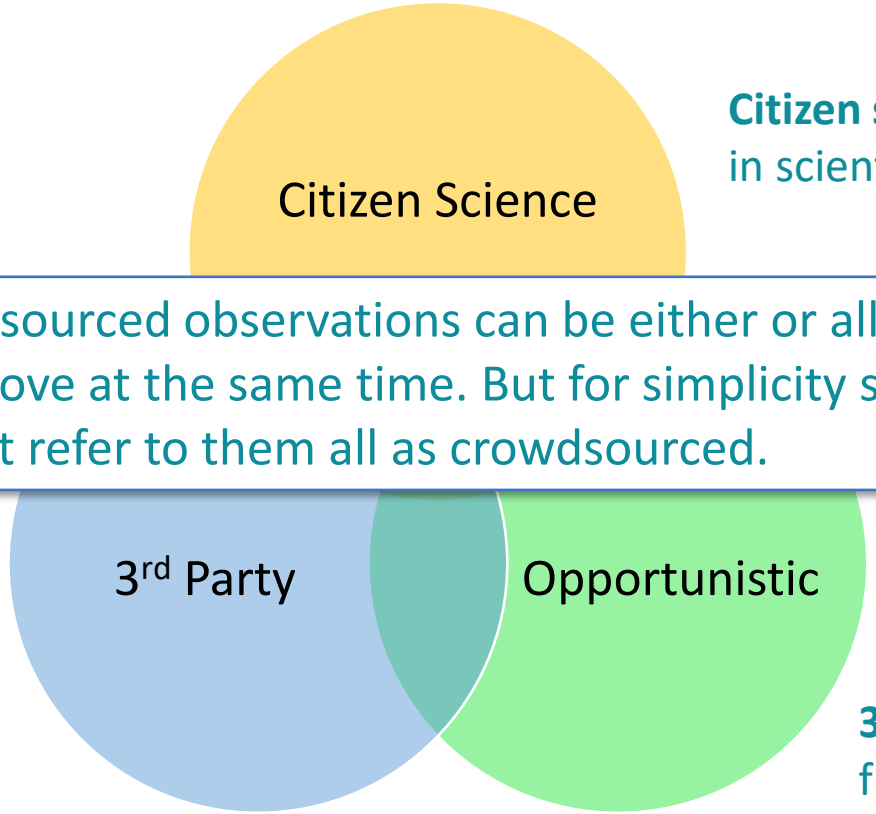
Baseline observing network: long-term records that characterise regional, hemispheric and global-scale features. (Standard)

Additional observing networks: Low cost and low quality observations obtained from other sources (Bog standard)

crowdsourcing noun

crowd·sourc·ing ˈkraůd-ˌsȯr-siŋ

: the practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people and especially from the online community rather than from traditional employees or suppliers



Crowdsourced observations can be either or all of the above at the same time. But for simplicity sake we just refer to them all as crowdsourced.

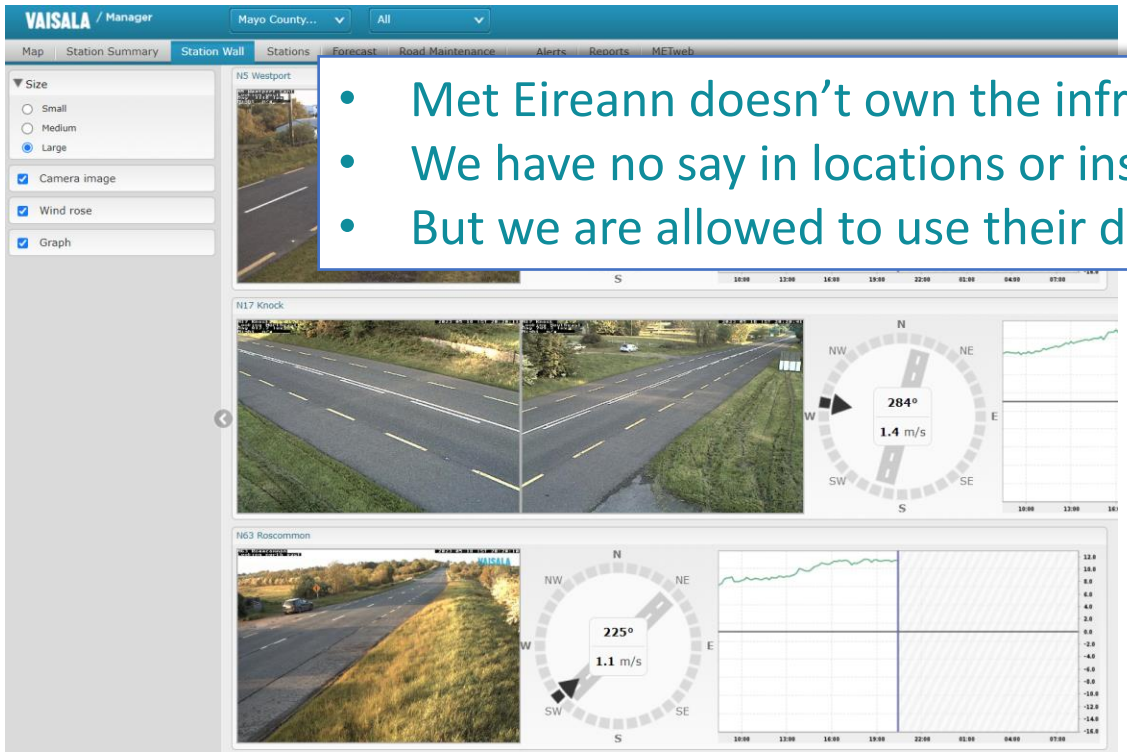
Citizen science: The practice of public participation and collaboration in scientific research to increase scientific knowledge.

unistic observations: Weather observation from networks ces that were not designed or intended for weather monitoring purposes.

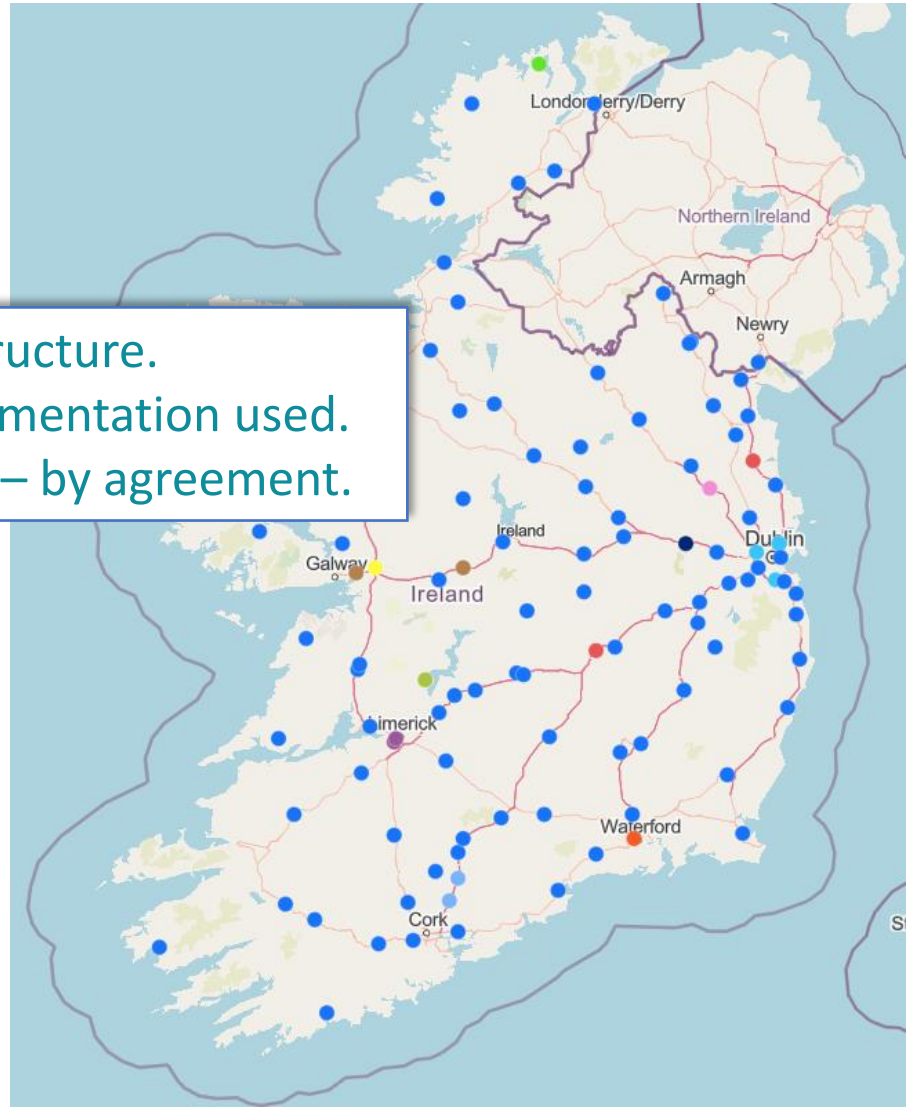
3rd party weather observations: Put simply, weather observations from networks for which we have no control over.

3rd Party Observations - Example

Bonneagar Iompair Éireann
Transport Infrastructure Ireland



- Met Eireann doesn't own the infrastructure.
- We have no say in locations or instrumentation used.
- But we are allowed to use their data – by agreement.



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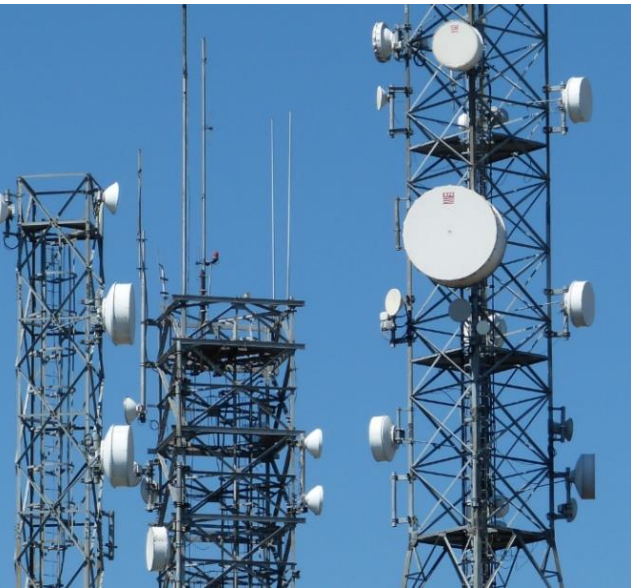
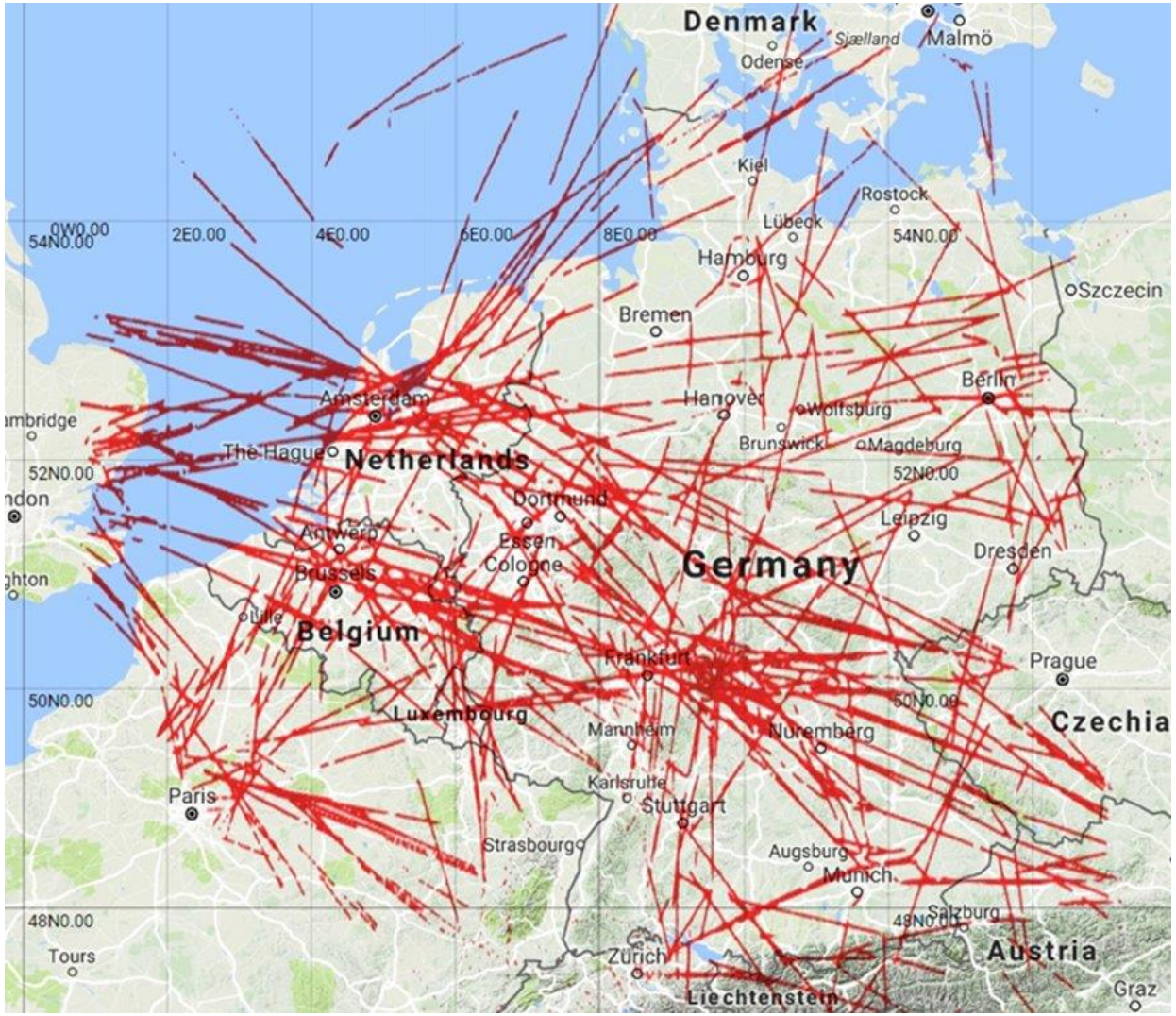


Opportunistic Observations - Examples

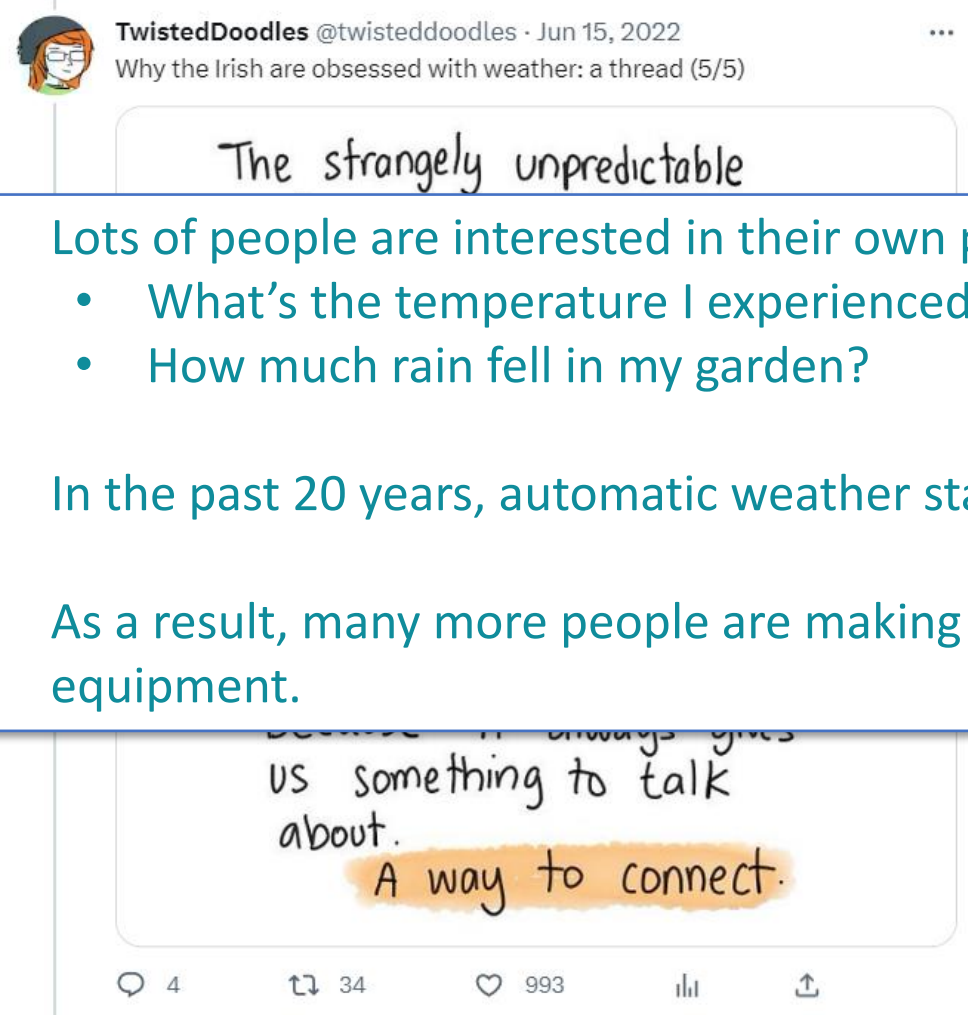
- Data from ships and buoys received via marine navigational broadcasts.
- Rainfall rates from attenuation on mobile-phone networks.
- Temperature and pressure data from sensors built into cars, phones etc.
- Short-wave radiation estimates from solar panel meters.
- Temperature and wind data derived from aircraft transponder messages.

Aircraft Derived Observations

- Aircraft transponder signals, usually used for navigation and air traffic control.
- Captured using off the shelf components.
- Combined together give temperature and wind observations.
- During summer over the UK & Northern Europe up to 9,000,000 additional atmospheric observations per day.

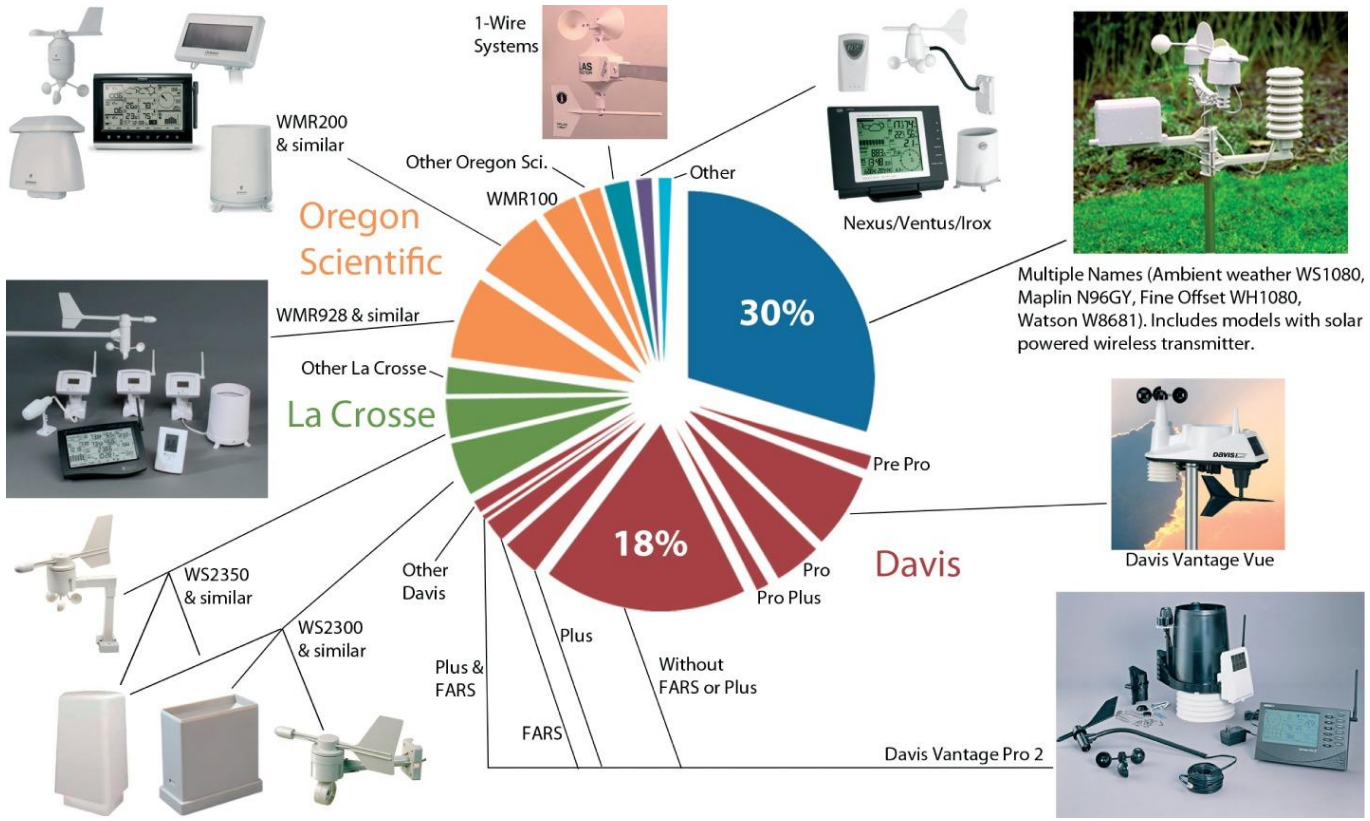


Its fair to say, that In Ireland the weather is a national obsession.



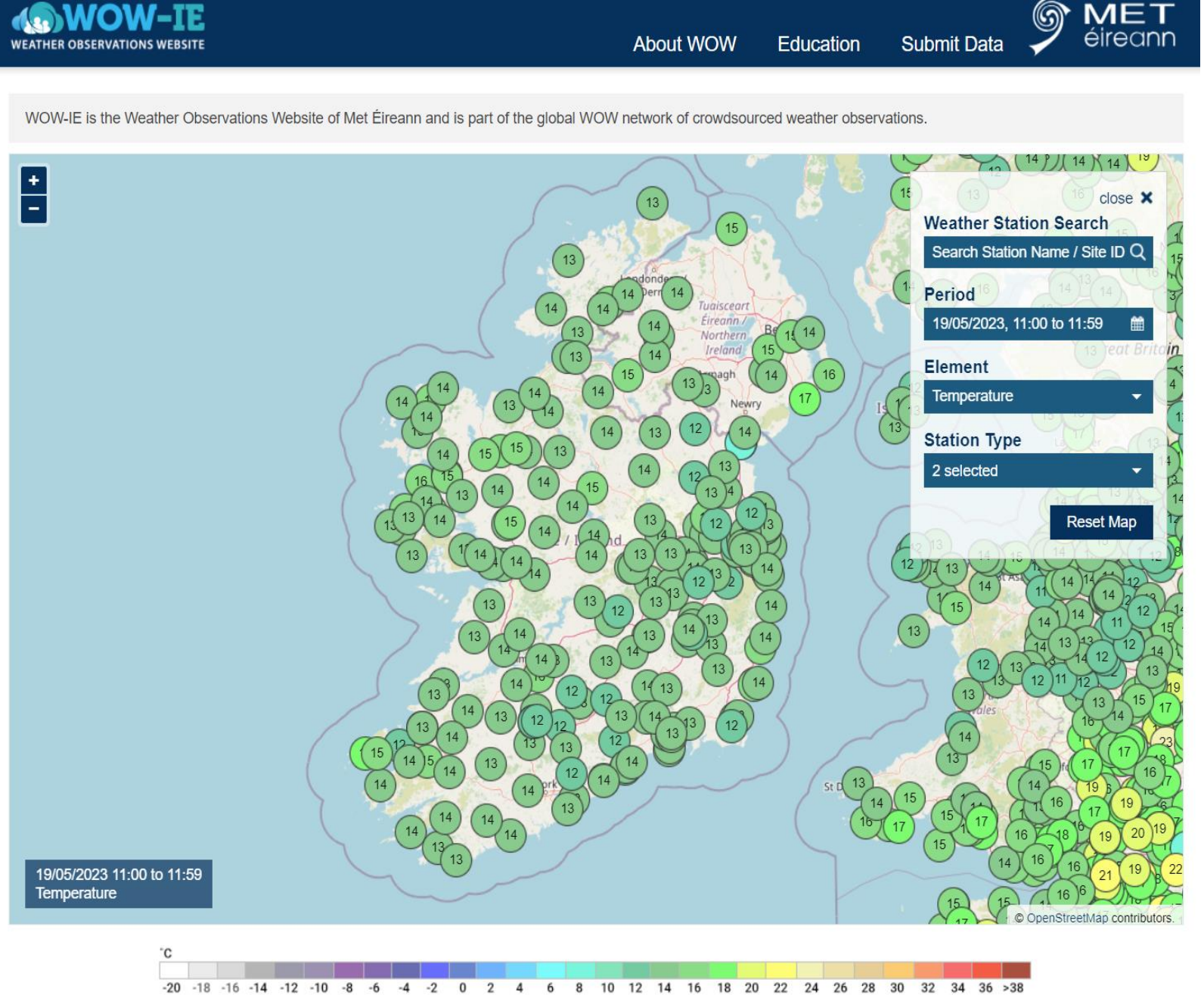
- Lots of people are interested in their own personal weather experience:
  - What's the temperature I experienced today?
  - How much rain fell in my garden?
- In the past 20 years, automatic weather stations have become more affordable and user friendly.
- As a result, many more people are making there own weather observations using this type of equipment.

Private Automatic Weather Stations (AWS)



The state of automated amateur weather observations. from Bell, S., Cornford, D., & Bastin, L. (2013), Weather, 68(2), 36-41. https://doi.org/10.1002/wea.1980. Copyright © 2013 Royal Meteorological Society

- Basic private automatic weather stations measure:
  - Outside air temperature
  - Humidity
  - Barometric pressure
- Observations displayed on an electronic device indoors
- More sophisticated automatic weather stations often have:
  - rain-gauges
  - Anemometers (wind speed and direction)
  - Ground temperature
  - Solar radiation sensors
  - and more…



Introducing WOW

Weather Observations Website.

- Free platform that allows private automatic weather stations owners to post, share & compare their observations.
- Acts as an archive and graphical interface for accessing new & historical data.

wow.met.ie

MET éireann

The Irish Meteorological Service

WOW-ie

WEATHER OBSERVATIONS WEBSITE

DO YOU OWN AN

AUTOMATIC WEATHER STATION?

VISIT MET ÉIREANN'S

WEATHER
OBSERVATIONS
WEBSITE

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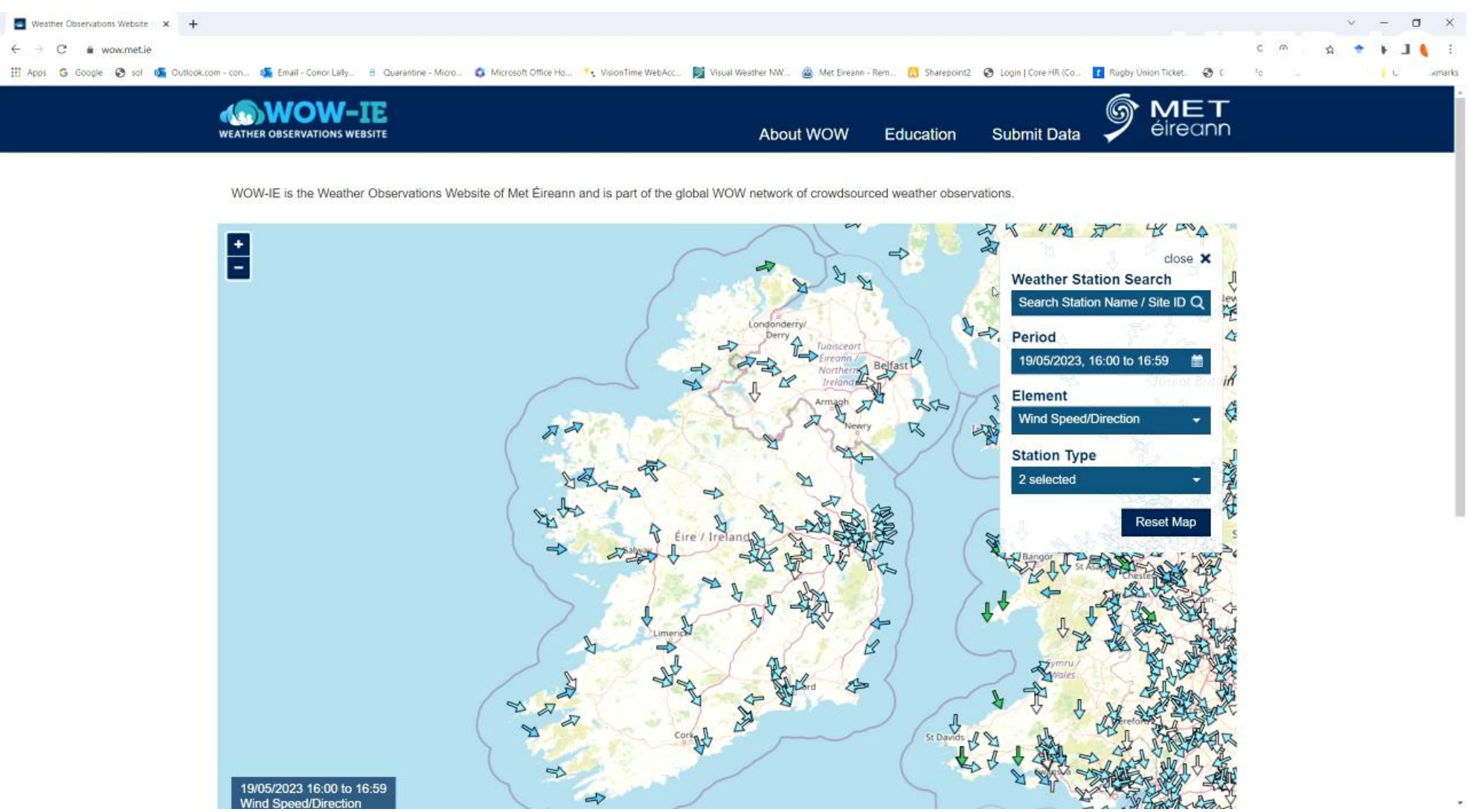


DO YOU OWN AN AUTOMATIC WEATHER STATION?

VISIT MET ÉIREANN'S

WEATHER OBSERVATIONS WEBSITE

wow.met.ie

WOW-ie
WEATHER OBSERVATIONS WEBSITE

Met Éireann

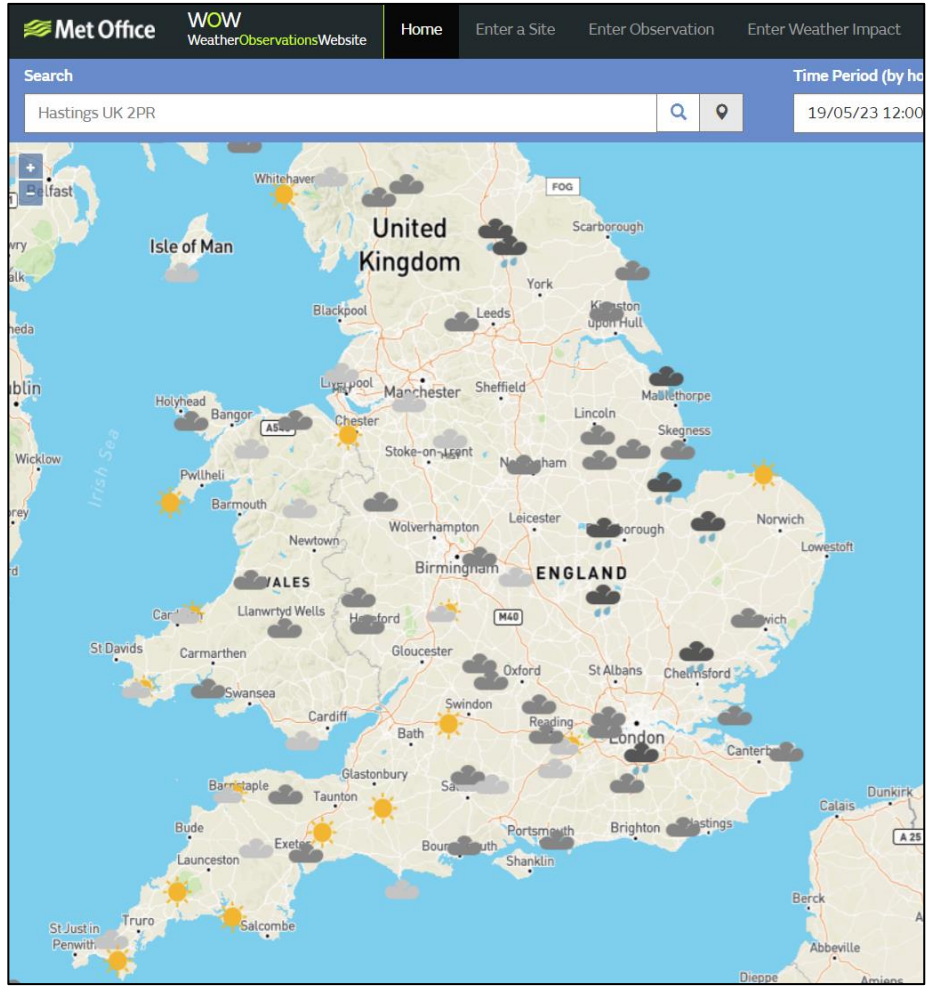
wow.met.ie

RMetS
Royal Meteorological Society

WOW WeatherObservationsWebsite

Met Office

- Originally developed by the Met Office in partnership with the Royal Meteorological Society.
  - Intended to promote citizen science & the amateur weather observing community.
  - Help educate children and others about weather & climate.
  - Provide a valuable additional source of weather observations.
  - Add to the long-term climate record.



WOW-IE is run in collaboration with the UK Met Office and national meteorological services in the Netherlands, Belgium, Sweden, New Zealand and Australia.

SMHI

RMI

MetService
TE RATONGA TIRORANGI

Met Office

Pop Quiz:

Link the country to the logo of its National Met Service

Australian Government
Bureau of Meteorology

Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Waterstaat

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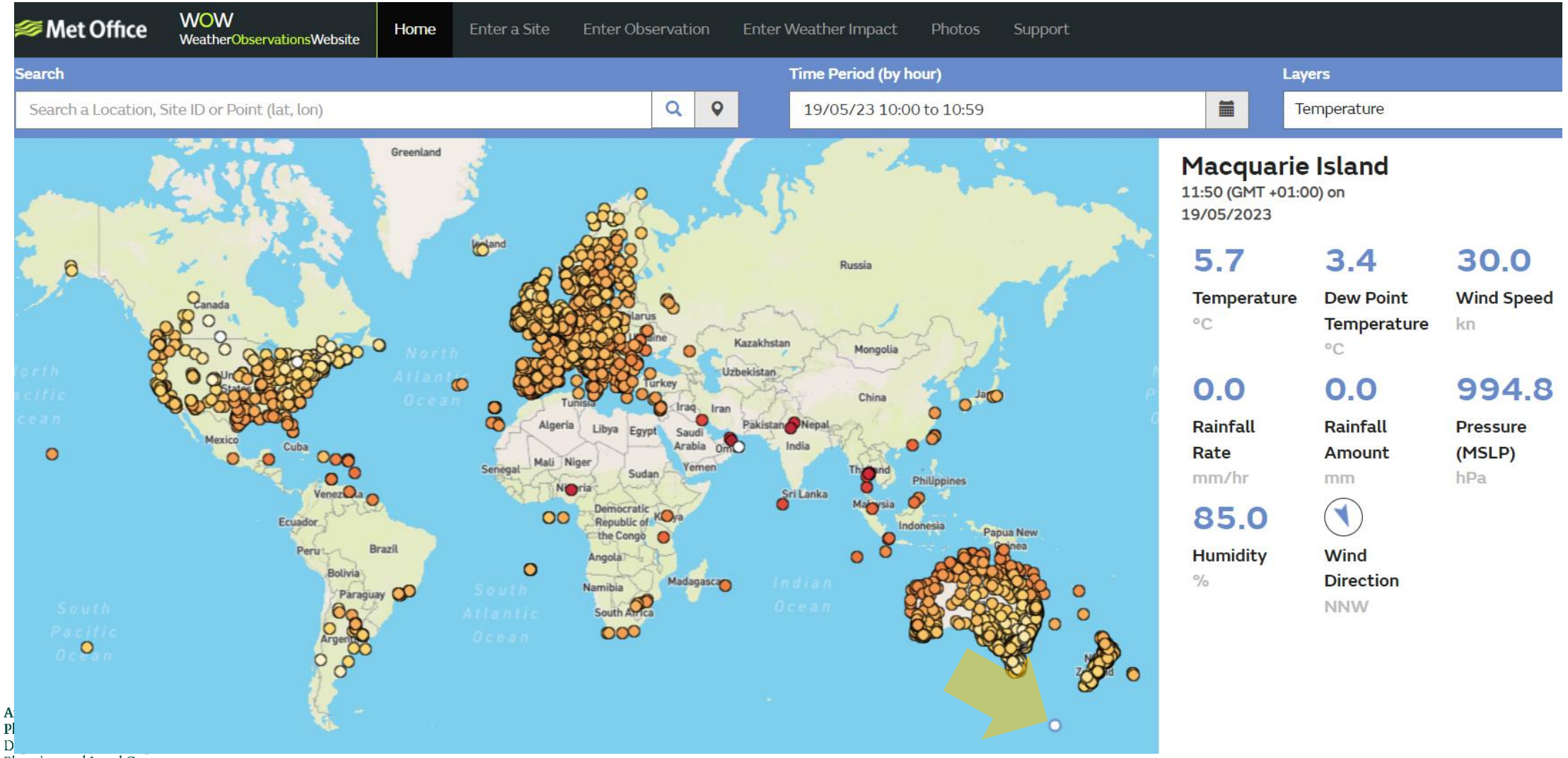
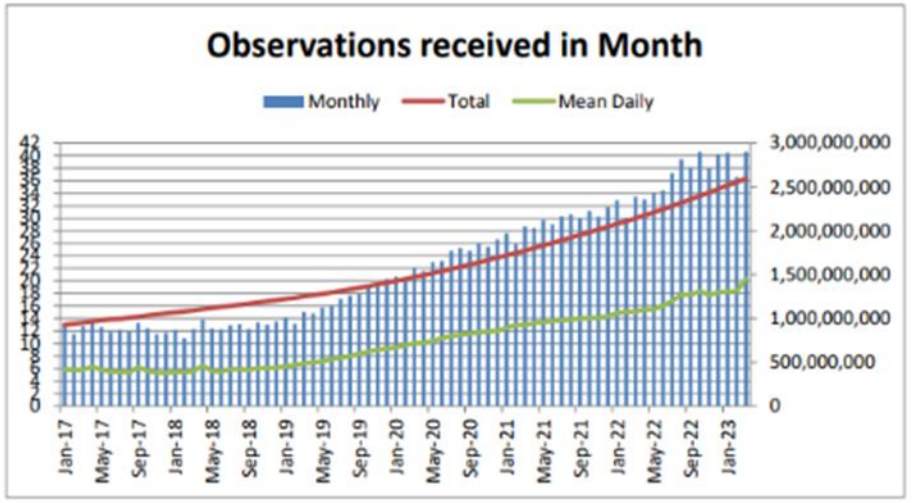
…but it is now truly global!



Met Office

Observations Received

In Month	Total Since Launch
40,649,628	2,594,644,751

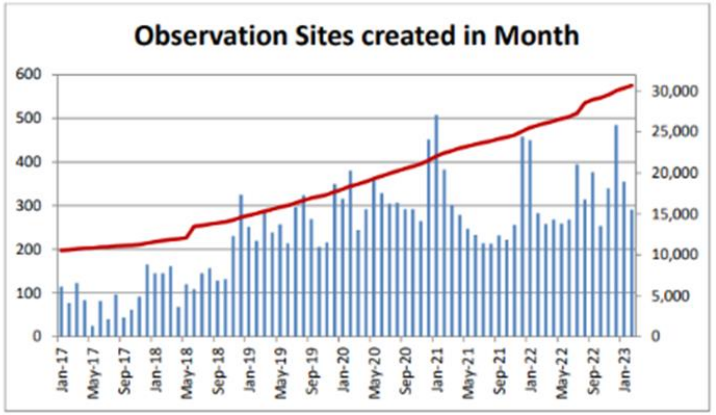


The red line is the running total of observations and the green line is the mean daily number of observations in the month multiplied by a factor of 1,000.

- In total 2.5 billon observations collected.
- 40 million (approx.) per month currently.
- 38 thousand weather stations created.
- 250 new sites every month (approx.).

Sites Created

In Month	Total Since Launch
236	38,625



Awards

European Meteorological Society

Winner: Technology Achievement Award 2022

Winner: Best Use of Cloud Services

Winner: IT Project Demonstrating Most Effective Use of Collaborative Technology

UK IT INDUSTRY AWARDS

WOW-IE
WEATHER OBSERVATIONS WEBSITE

Met Éireann

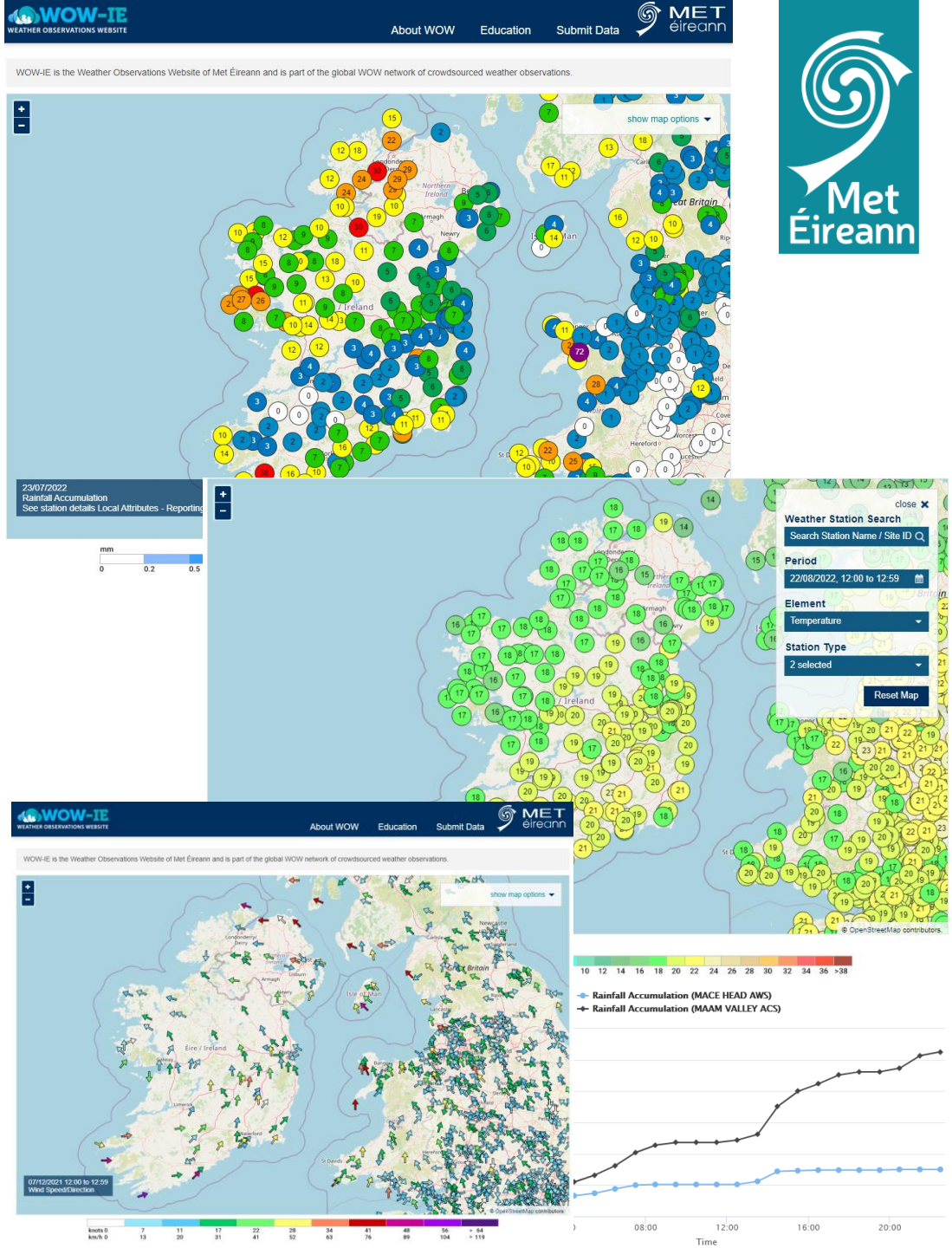
- Popular with the Irish public with over 180k page views since its launch in 2019.
- Views soar during extreme weather events.
- Met Éireann partnered with Fingal county council (Dublin) in 2021 on their ‘Weather Stations for Schools’ project – assist in station model research and installation of 16 weather stations and upload their observations to WOW
- The students check out their schools weather data on WOW-IE to decide on sports activities and teachers use it as weather education and data comparison tool

wow.met.ie

WOW-IE
WEATHER OBSERVATIONS WEBSITE

- Met Éireann weather forecasters check WOW-IE to view observations in locations where we don't have stations.
- Observations from WOW-IE are regularly used on Met Éireann's social media.
- Staff in our Observation Division use WOW-IE to check observations from our rollout of new climate stations.
- Nowcasting applications.

Nowcasting: Short range weather forecasting (< 6 hours) with high spatial resolutions of less than 1km. Nowcasting can help to predict high impact weather events but requires large amounts of observations



Met Éireann

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Department of Housing, Local Government and Heritage

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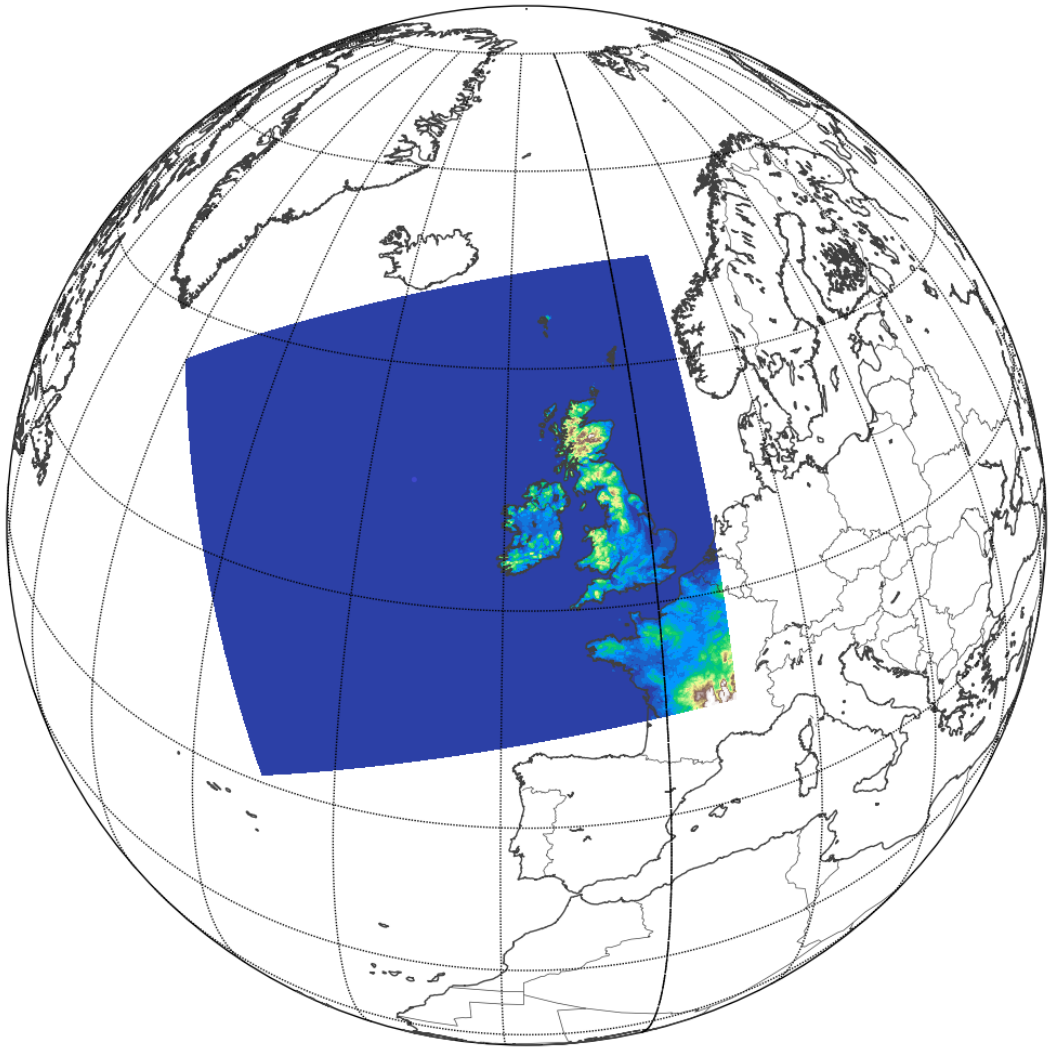
- Met Éireann has ambitions to use wow observations in the production of Numerical Weather Prediction forecasts.
- Because incorrect initial values quicky propagate through the models, this will require better quality control process first.
- Through EUMETNET we are involved with our colleagues in other met services to find new and innovative ways to better quality control crowdsourced observation.

EUMETNET is a grouping of 31 European National Meteorological Services that provides a framework to organise co-operative programmes between its Members in the various fields of basic meteorological activities.



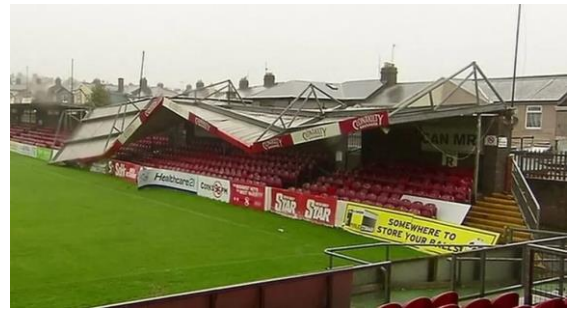
Crowdsourcing Observations from Social Media

- Met Éireann is currently implementing an impact-based forecasting program
- Focuses on forecasting the impacts of weather (fallen trees, road closures etc.) rather than numerical values.
- Requires multiple observations in as near to real time as possible with very high observation density on the ground
- Not all the observations need to be of high quality. Several moderate quality observations are sufficient to give the forecaster a strong 'qualitative impression' of a weather event and its impacts.
- Crowdsourced data can make a significant contribution to this assessment.
- Recording the impacts of severe weather can be improved by combining more traditional weather observations with non-traditional citizen science, social sensing, social media and various other online sources.

I honestly think ophelia is going to hit Morocco." #Ophelia

The A2 Coast Road from Larne to Cushendall has now been cleared and reopened to traffic. #Ophelia

Portion of Turners Cross Stadium collapsed due hurricane. #Ophelia



Wind 25.6 km/h E. Barometer 1016.90 mb, Temperature 13.6. #Ophelia

- Crowdsourcing is a new and exciting way of gathering additional weather observations.
- Properly used it will greatly assist the production of important weather and climate information.
- However, it is no substitute to properly made observations, rather the two complement each other.

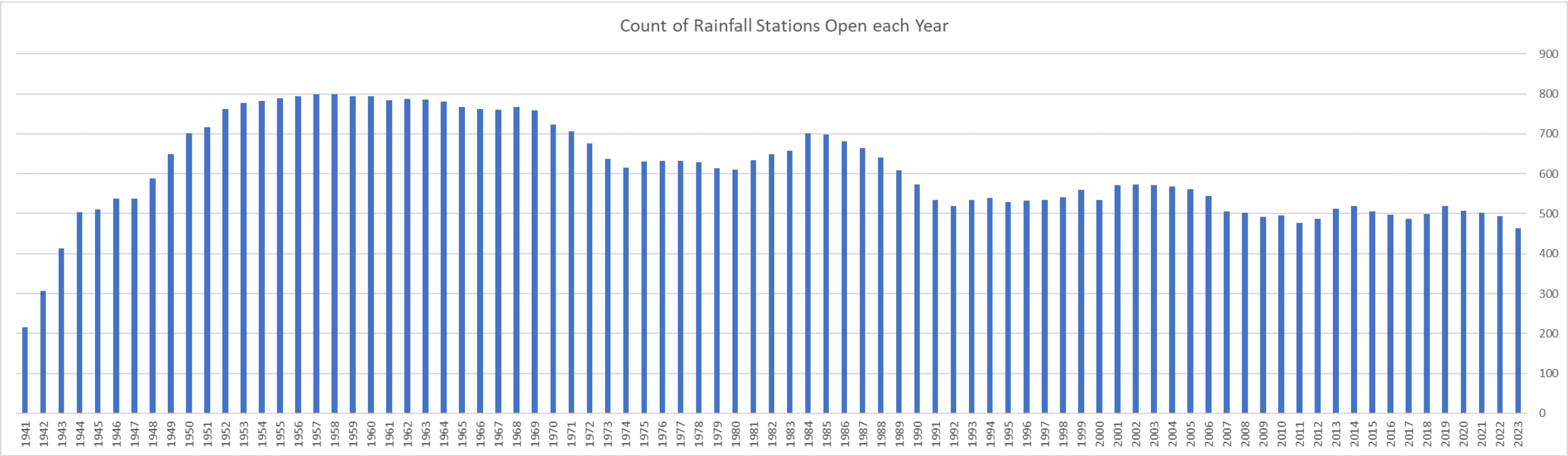
- Delighted to announce that 5 voluntary rainfall stations have been proposed to the WMO as centennial observing stations

- To qualify for centennial status, stations must have continually reported observations for more then 100 years.

Station Name	Year Opened
Athlone O.P.W.	1902
Foulkesmill (Longraigue)	1874
Glengarriff (Illnacullin)	1914
Meelick (Victoria Lock)	1902
Mullingar	1898

President of Ireland, Michael D. Higgins unveiling a plaque marking 100 years of high-quality continuous meteorological measurements being made at Valentia Observatory

- Voluntarily manual weather stations numbers are in decline.
- From a peak of 800, now 400 (approx.)
- We need new ways of encouraging voluntary observers



I wish to take the opportunity to recognise the valuable contribution made by Martin Sweeney to the scientific heritage of this country.

His observations will help meet the needs of current and future generations for long-term high quality climate records.

Thank you.

Questions?