# Weather + Climate

- What is Weather from Microsoft Start?
- Microsoft Forecast Capabilities
- Partnerships
- Climate and Historical Data
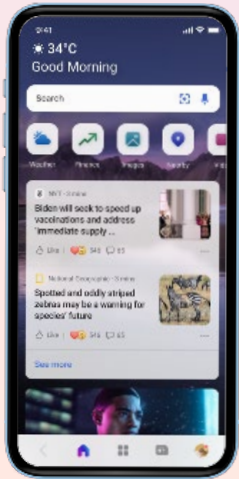- Matt's Soapbox: Global High Density Reference Network

Matt Corey
Senior Product Manager
Microsoft Weather
mattcorey@microsoft.com

Microsoft Start

Microsoft's mission

Empower every person and every organization on the planet to achieve more
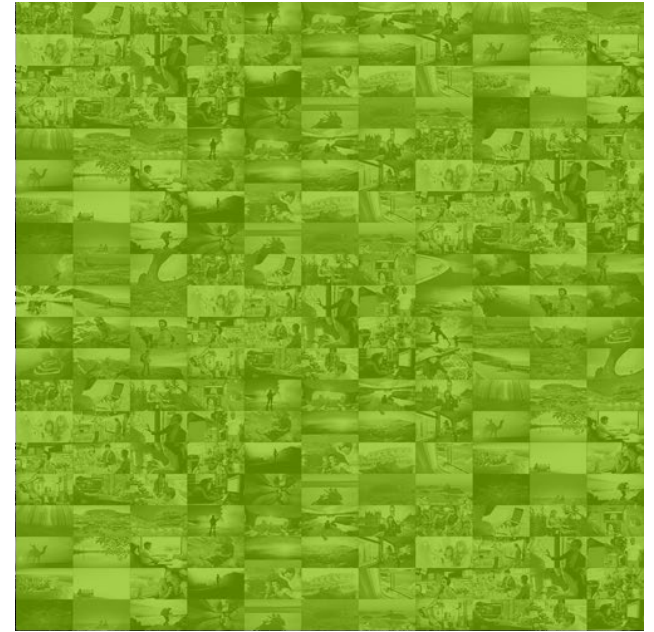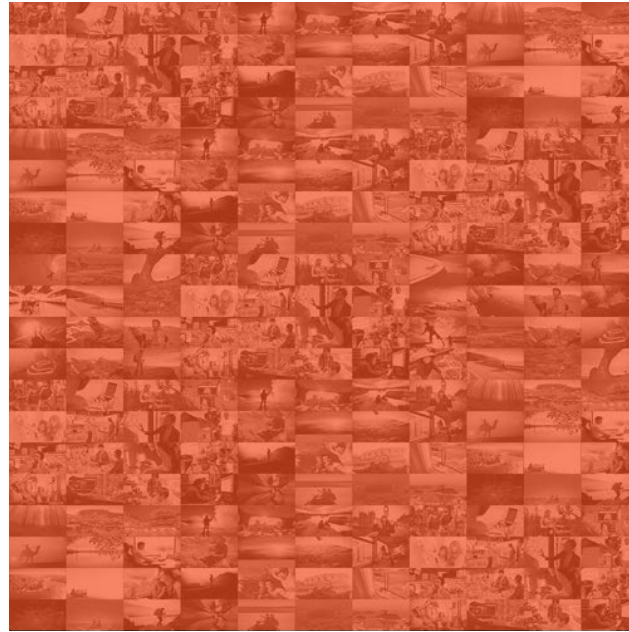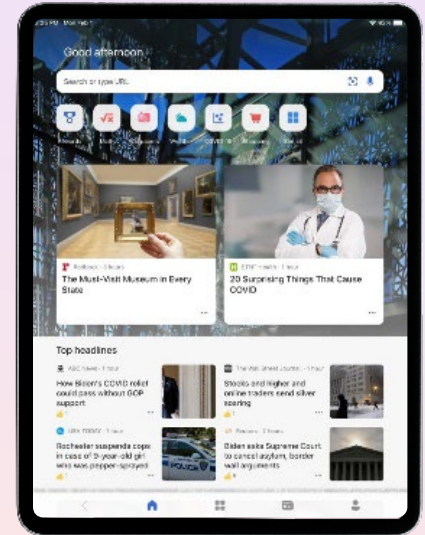
A Multitude of Experiences

Mobile

Desktop

Tablet

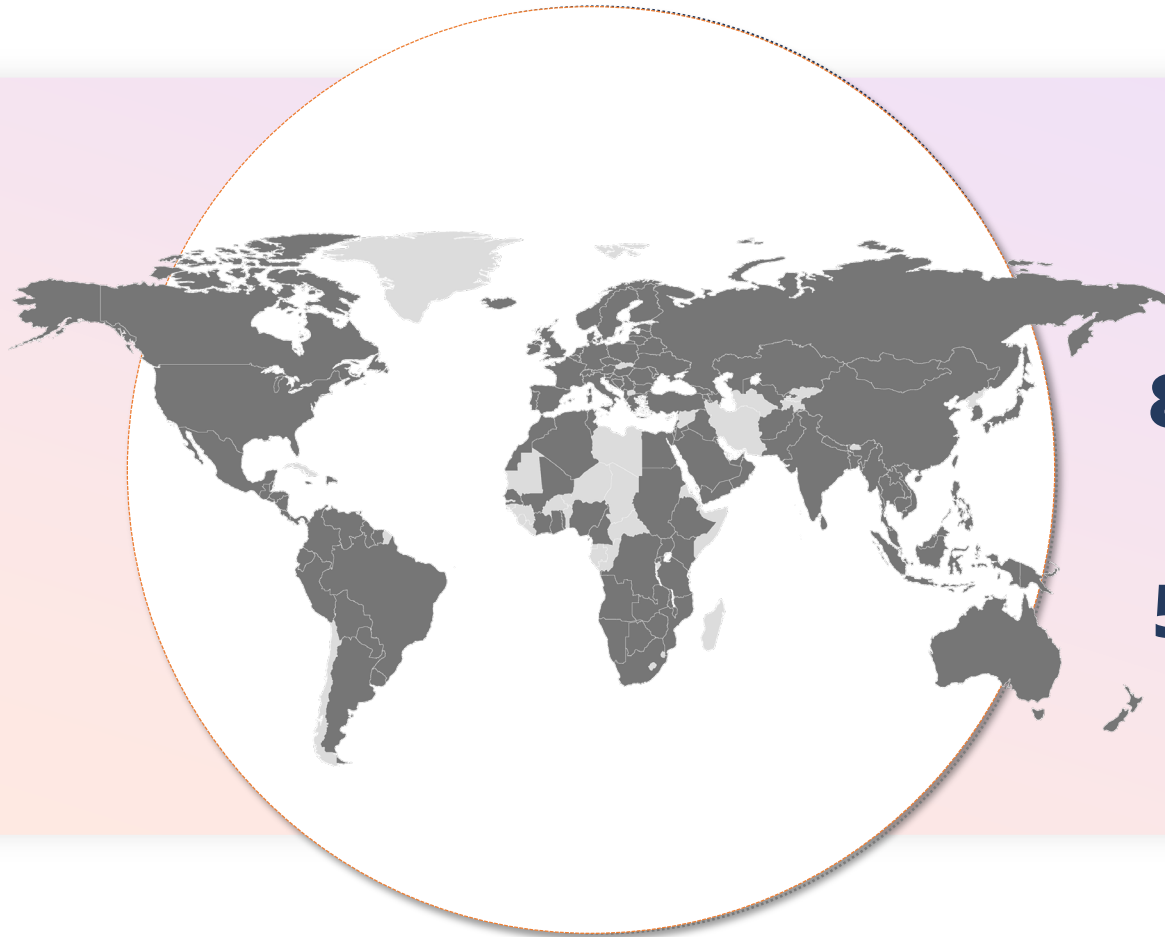# Weather serving users worldwide

180 Countries

31 Languages

1B+ Devices

800M Monthly user interactions

500M Dailly weather impressions

Smart notifications on Windows

Weather-specific detail + alerts built right into Windows
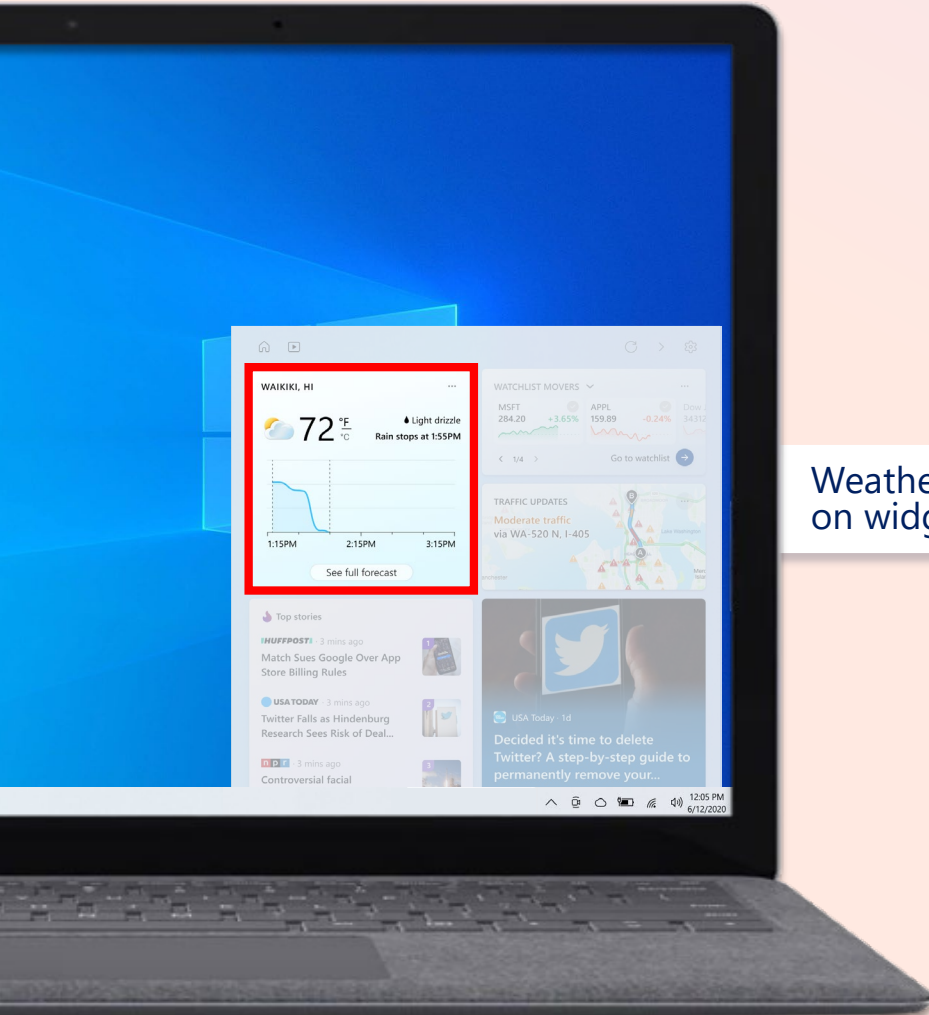
Weather-specific detail on widgets panel

Weather alerts on Taskbar

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Microsoft Confidential   5

Rich & Engaging
Weather Experience

Dynamic Landing Page

A dynamic starting point with rich interactive visuals gives users a view of key weather data + forecasts, updated constantly.

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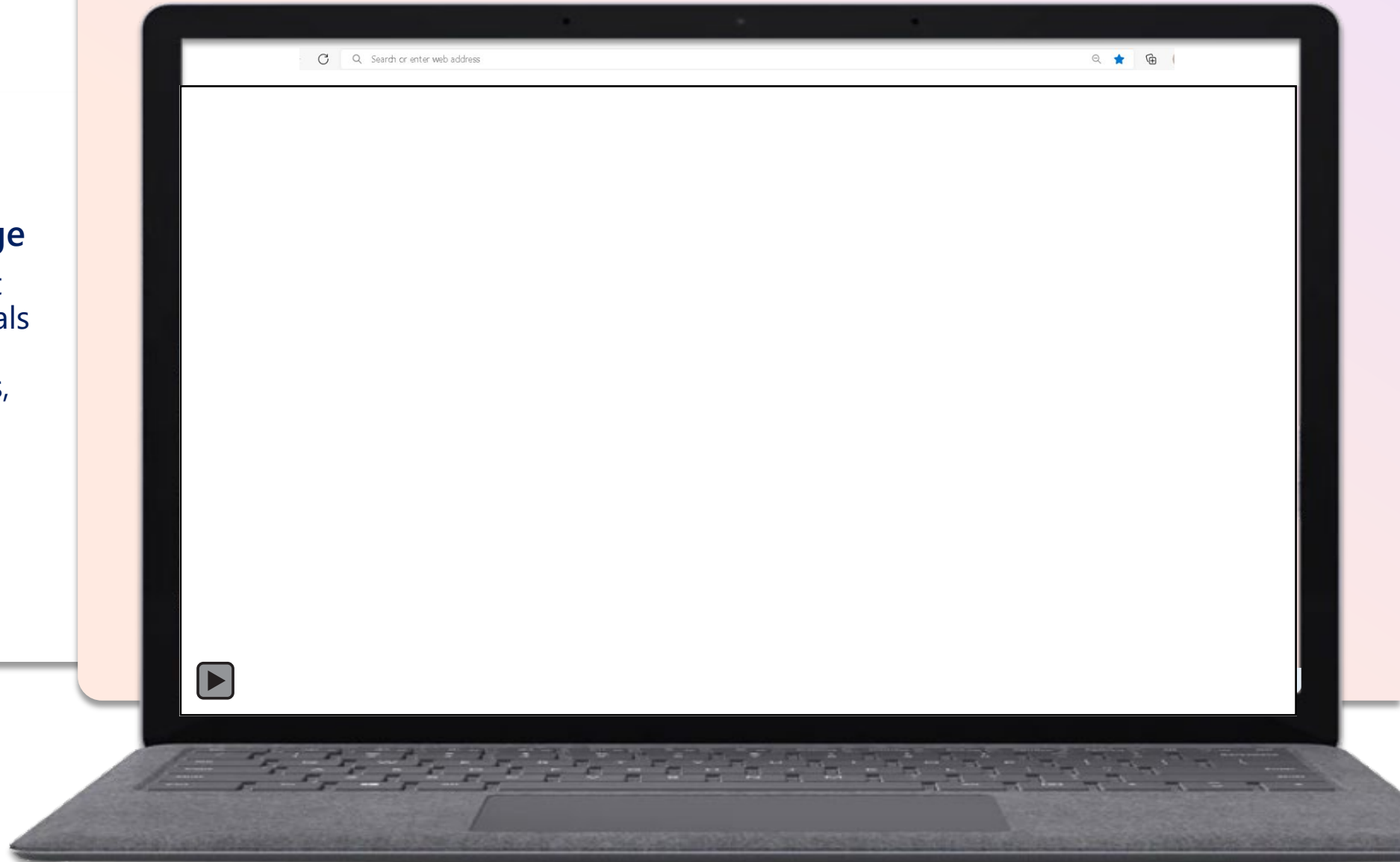
Rich & Engaging Weather Experience

Global Weather Safety

Leveraging proprietary algorithms as well as government warnings, Microsoft empowers users to quickly and effectively find critical weather information to help make informed decisions.

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A strong user-centric approach

"It is a very accurate forecast, better than other forecasts I have looked at."
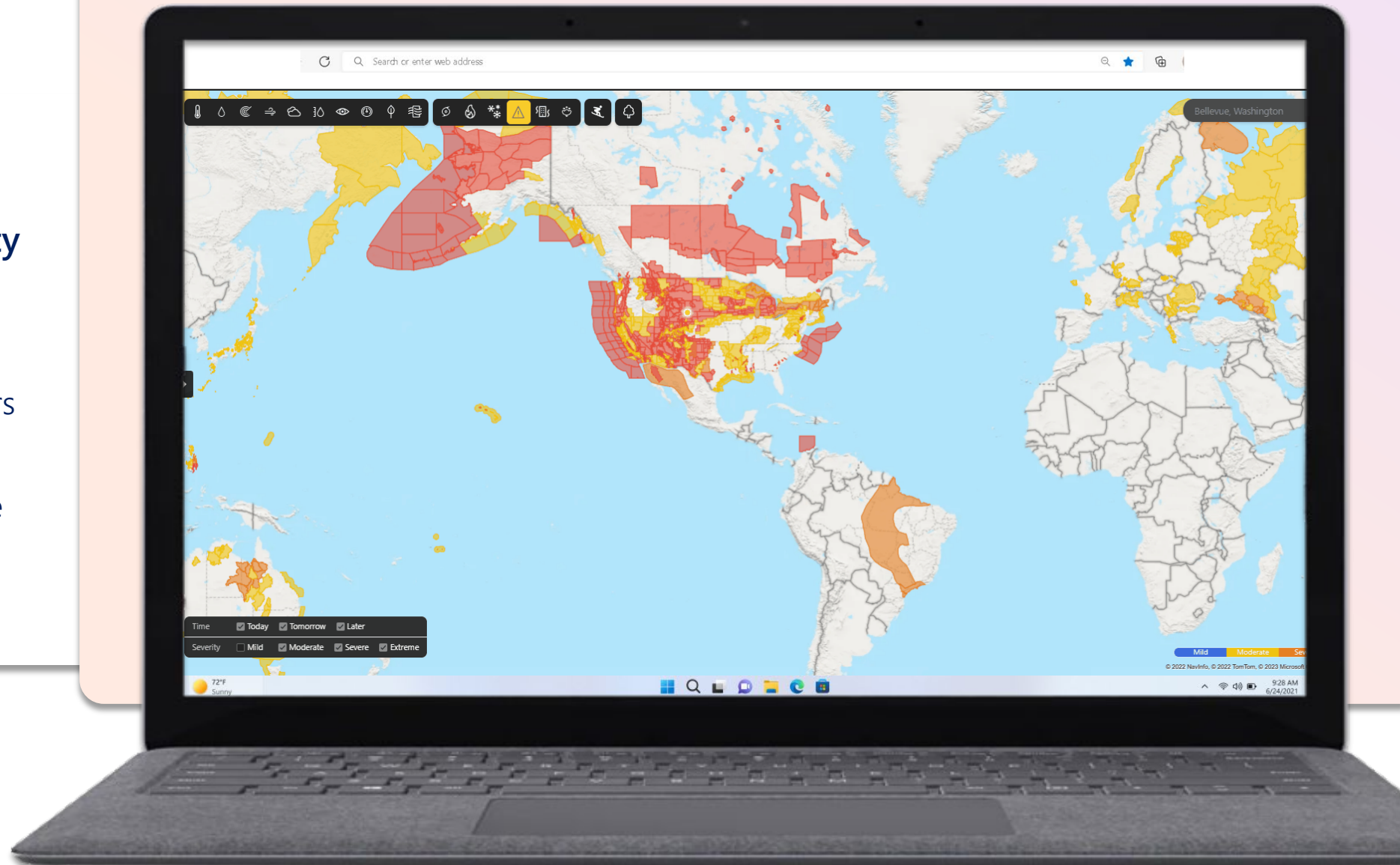
"Your site seems to be better at giving the right weather for my local area."

"More accurate than other daily weather predictions."

"I like that I can get reports from my location - not just general ones"

"Microsoft Start Weather gives me all the weather information I need in one place. I have told several people about it."

"Best weather program ever. Tells you everything you need to know and more."

Global Weather Leader: Confirmed

" *In this analysis, Microsoft was determined to be the overall **most accurate provider globally**, as well as in the metrics of high temperature, low temperature, and wind speed.* "

* Independent Forecast Study

Total Forecast Score for All Parameters
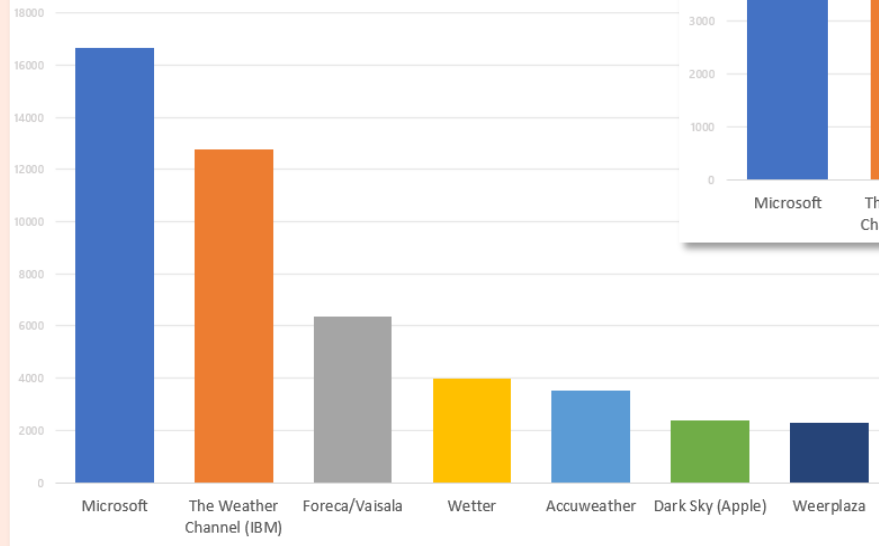
Total Forecast Score for High/Low Temperatures
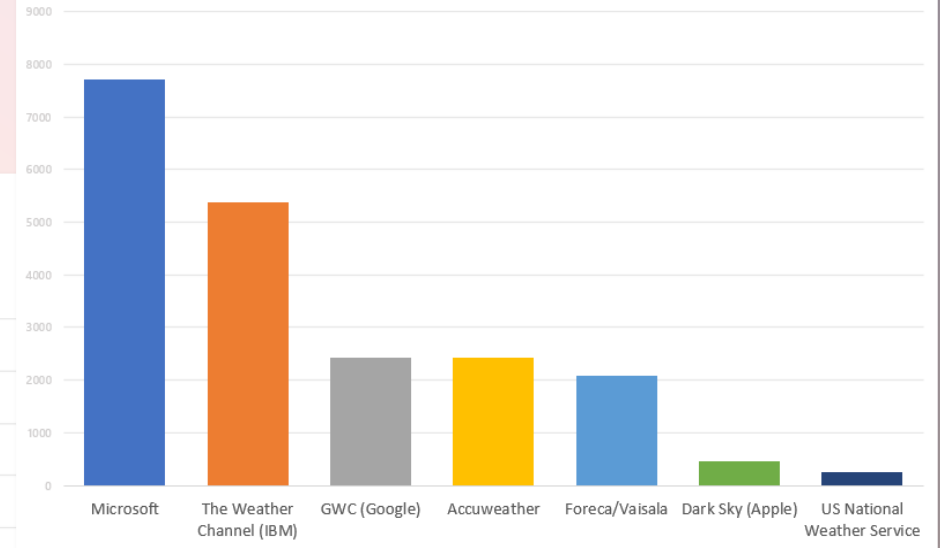
*Analysis compared 24 global weather providers of one to five day out global temperature, wind speed, precipitation, and opacity for January- June 2022 | Intellovations, LLC, www.forecastwatch.com

ML+ Weather: Two strategies

Augmenting NWP

Post-processing and calibration

Super-resolution

New models or replacement

Precipitation nowcasting

Physics-free deep learning models

Augmenting NWP by ML & DL

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┌─────────────────┐   ┌─────────┐   ┌─────────┐   ┌─────────────┐
│  Multi-source   │──▶│   NWP   │──▶│  ML & DL │──▶│  Forecast   │
│ observation data│   │         │   │          │   │  products   │
└─────────────────┘   └─────────┘   └─────────┘   └─────────────┘
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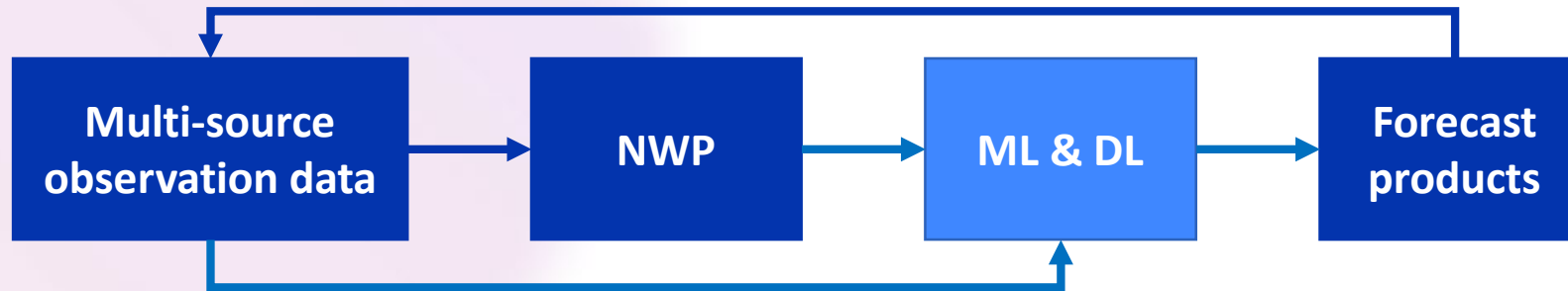
Augment and correct NWP model forecast using
machine learning and **deep learning**

Cutting-edge ML & DL technique
Diverse NWP & observation data
Large-scale global operational system

Large-scale global operational system

Large scale:

- Cover 100k+ locations over the globe
- Update per 30min

All about automation:

- Inference
- Data extraction
- Training
- Evaluation

Improvement in every step:

- Efficient pipeline
- Data quality control
- Model generalization
- Metrics-driven iteration

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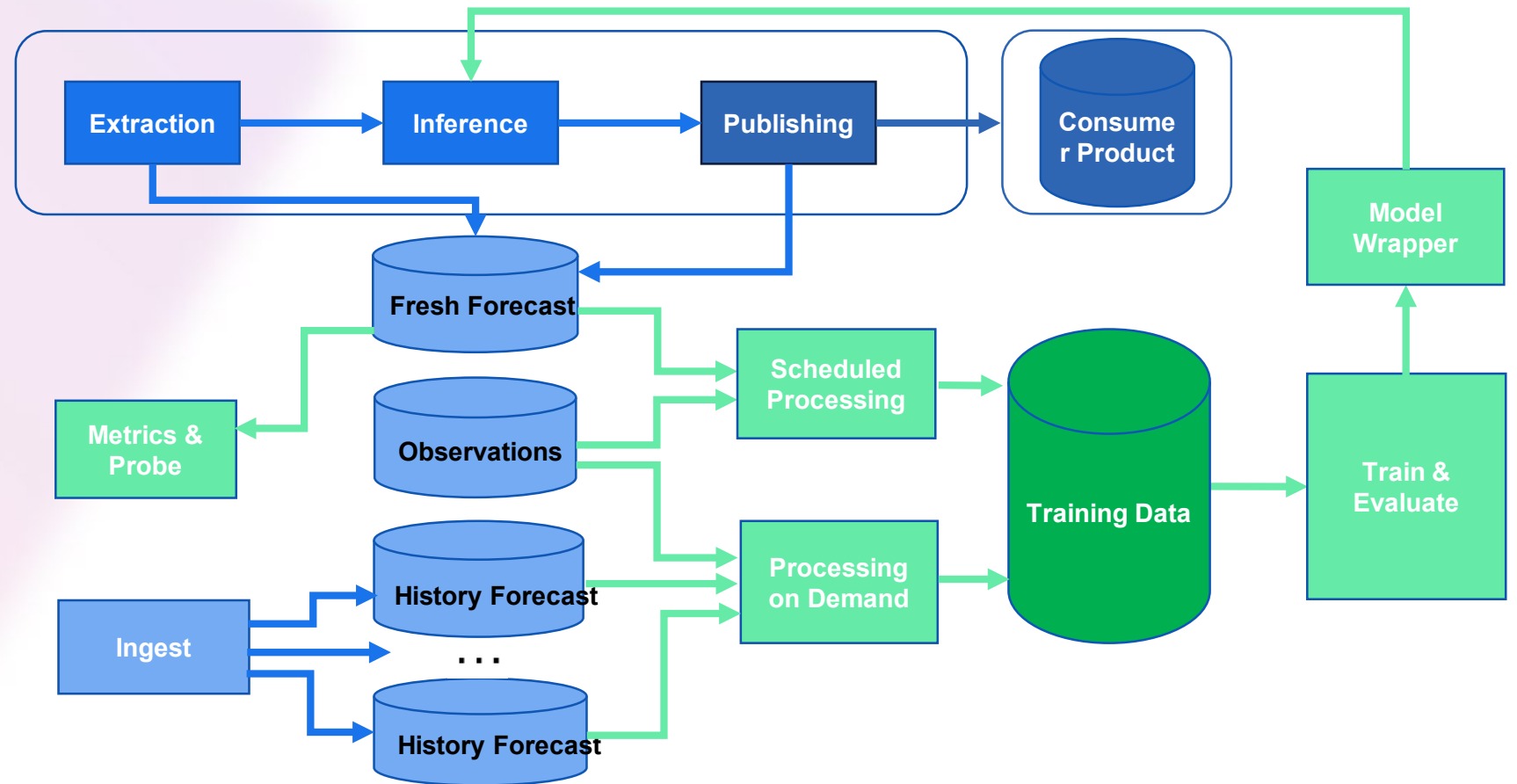
Weather Watcher Initiative
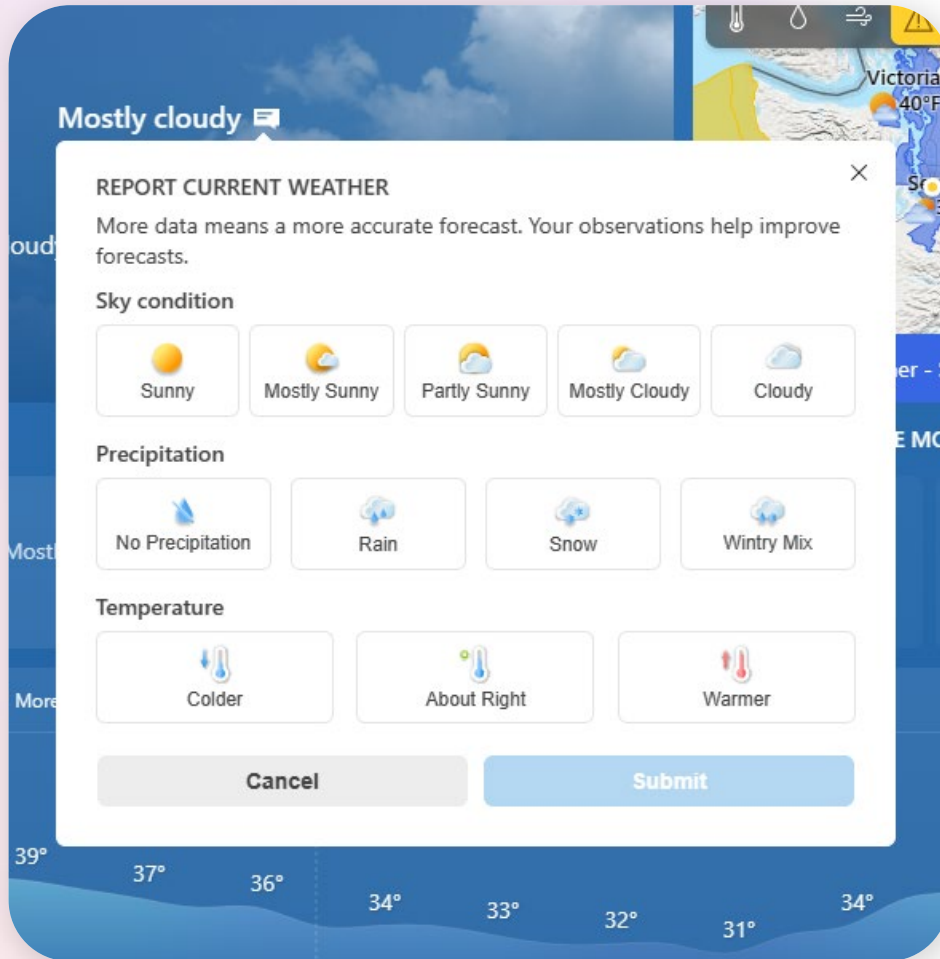
> *Everyone talks about the weather, but nobody does anything about it.*

Mark Twain

- "More accurate than other daily weather predictions."
- "Your site seems to be better at giving the right weather for my local area."
- "All the weather information I need in one place. I have told several people about it."

Weather Ready Nation

A proud member of NOAA's Weather Ready Nation

"Microsoft performs a critical role in making sure the public receives National Weather Service weather warnings."

Ken Graham, director of NOAA's National Weather Service

LIGHTNING SAFETY

When you hear thunder, go indoors

Don't touch electrical equipment

Stay away from windows and doors

Tropical Storm Julia has formed in the Caribbean and is likely to hit Central America as a hurricane in the upcoming days. Track the storm with Microsoft Start: msft.it/6015dKRqz #MyStartWeather #MyStartNow #Julia

Note: The cone contains the probable path of the storm center but does not show the size of the storm. Hazardous conditions can occur outside of the cone.

Tropical Storm Julia
Friday October 07, 2022
11 AM EDT Advisory 5
NWS National Hurricane Center

Current information: ✕
Center location 12.7 N 73.1 W
Maximum sustained wind 40 mph
Movement W at 18 mph

Forecast positions:
● Tropical Cyclone ○ Post/Potential TC
Sustained winds: D < 39 mph
S 39-73 mph H 74-110 mph M > 110 mph

Potential track area: Day 1-3 Day 4-5
Watches: Hurricane Trop Stm
Warnings: Hurricane Trop Stm
Current wind extent: Hurricane Trop Stm

Climate Ready Nation & Beyond

NOAA, Microsoft team up to advance Climate-Ready Nation

"We are excited about the potential of partnering NOAA's environmental intelligence with Microsoft's cloud computing in hopes of amplifying NOAA's ability to predict climate, weather and ocean changes,"

Rick Spinrad, Ph.D., NOAA Administrator

EARLY WARNINGS FOR ALL

The UN Global Early Warning Initiative for the Implementation of Climate Adaptation
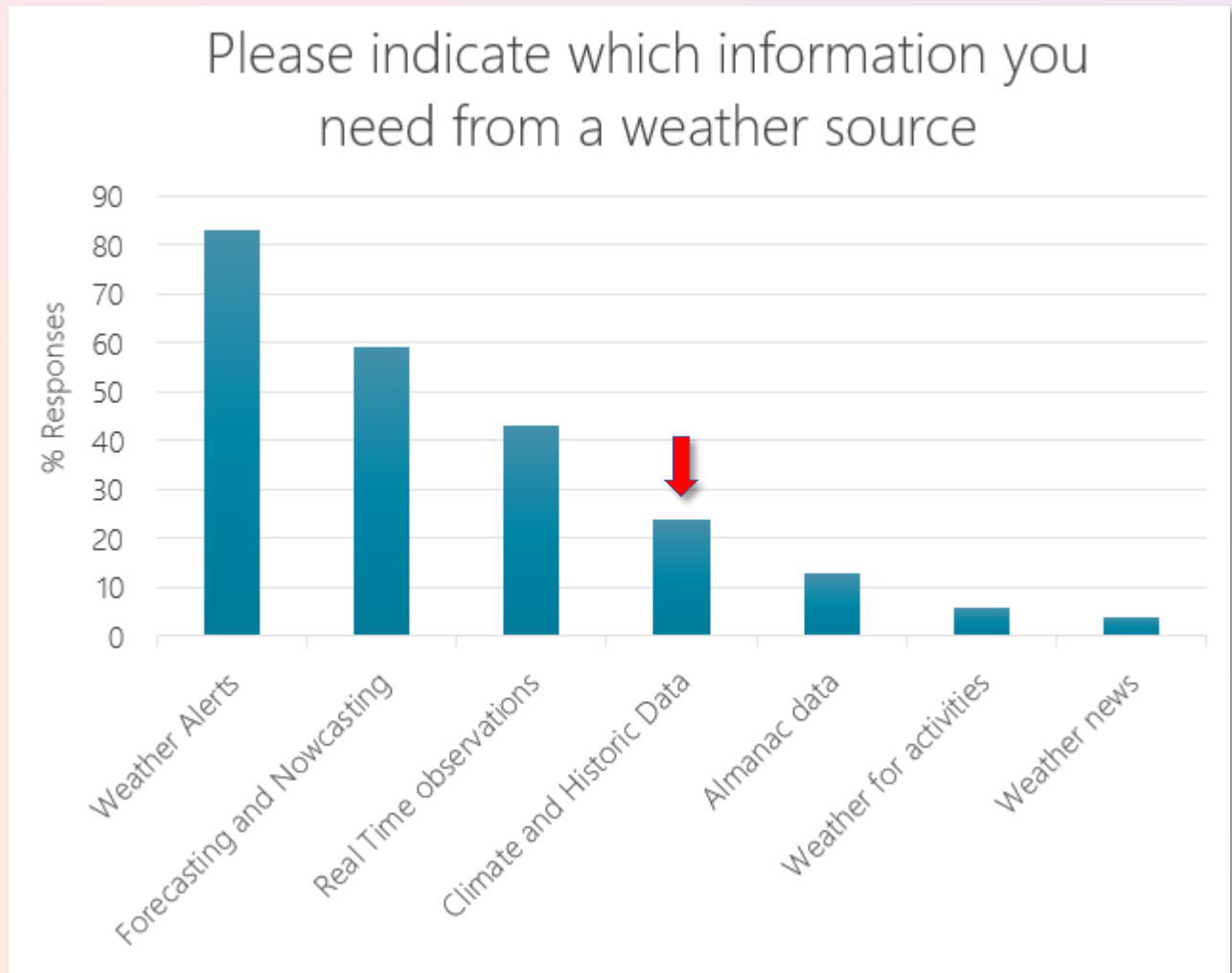
WORLD METEOROLOGICAL ORGANIZATION

COP27 SHARM EL-SHEIKH EGYPT 2022

Climate and Historical Data

User Centric Approach

2020 User Study

Climate and Historical Data Scored #4 from users as "information needed"

Please indicate which information you need from a weather source

*Weather Survey Report July 2020- Microsoft

Rich & Engaging
Weather Experience

Climate & Historic Data

Historical averages:
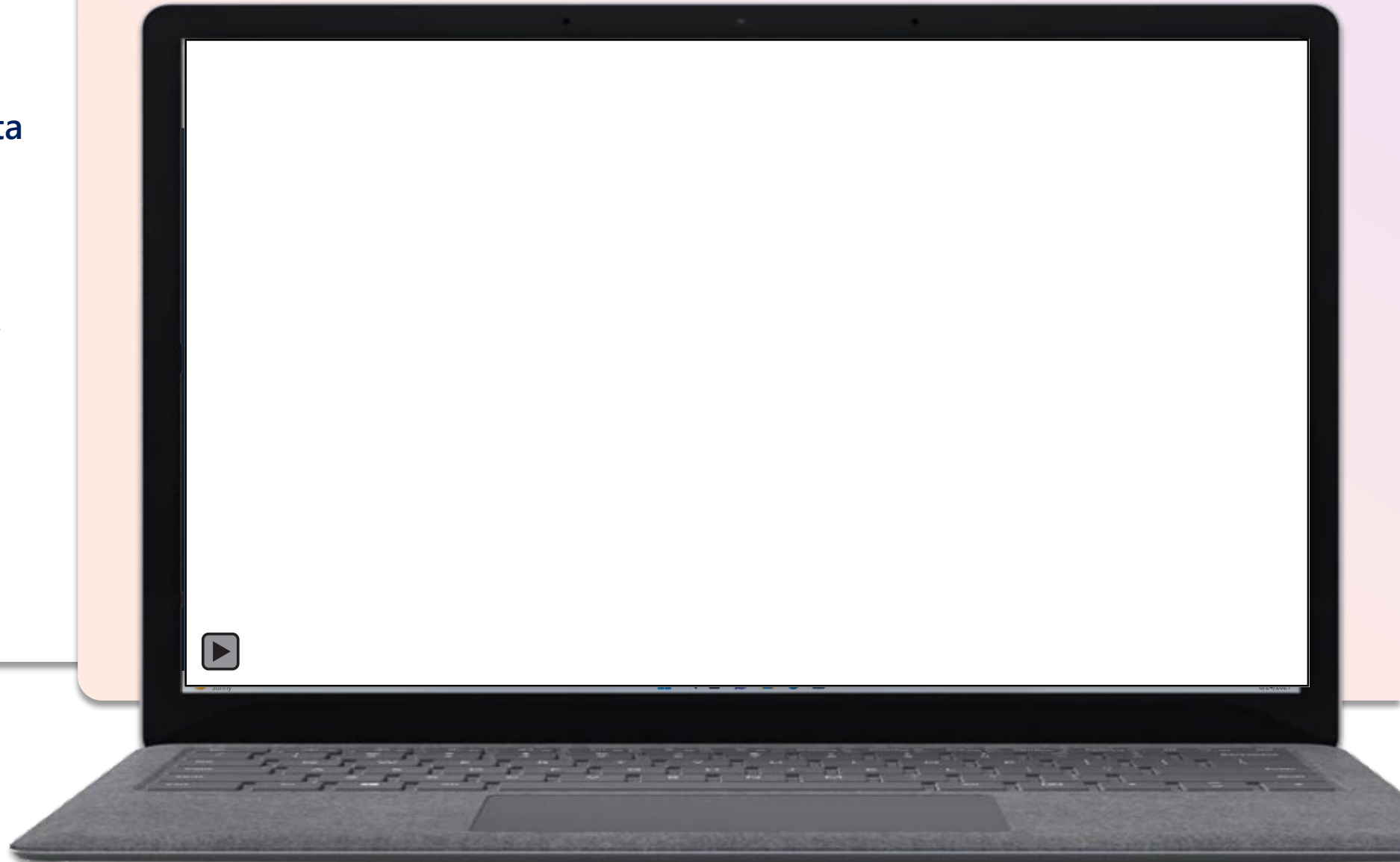
- High and Low temperatures
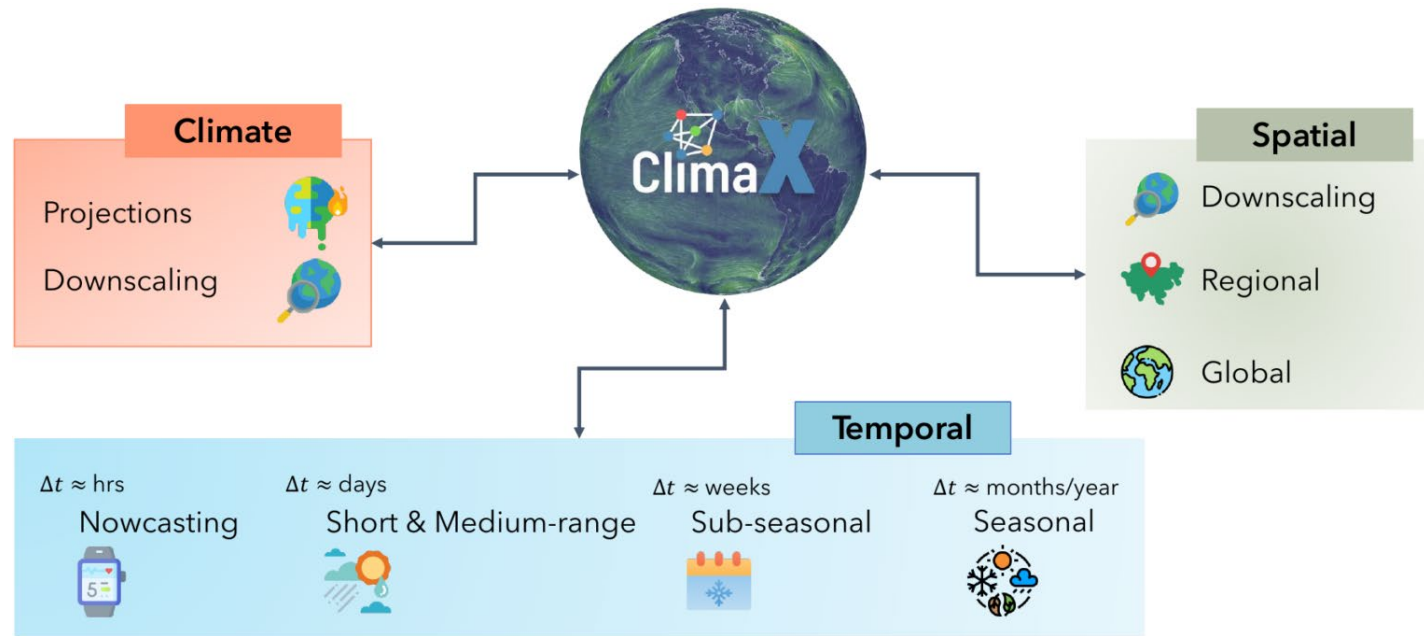
- Precipitation & Snow Days

Month by Month

- Temp, Precip

Daily averages

- Temp, cloud, precip

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The ClimaX idea

- ClimaX is trained using several **heterogeneous datasets** spanning many **weather variables** at **multiple spatio-temporal resolutions**.
- ClimaX can be fine-tuned **on a wide variety of climate and weather tasks**, including those that involve variables and spatio-temporal granularities unseen during pretraining.
- GitHub - microsoft/ClimaX: Foundation model for weather & climate

Matt's Soapbox

Global High Density
Reference Network

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Most Valuable Forecast Tool: Mesonets

Courtesy: Weatherflow.com: windalert
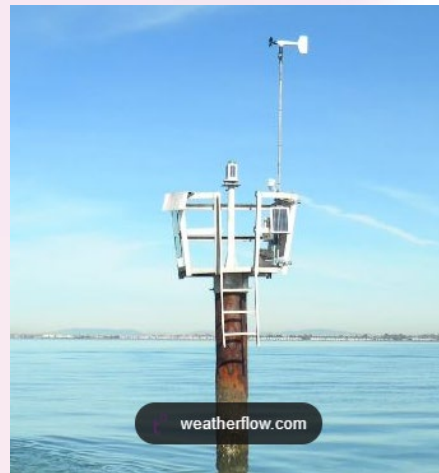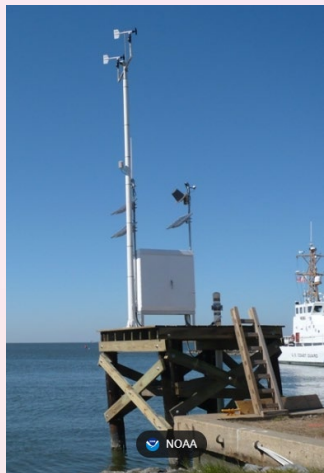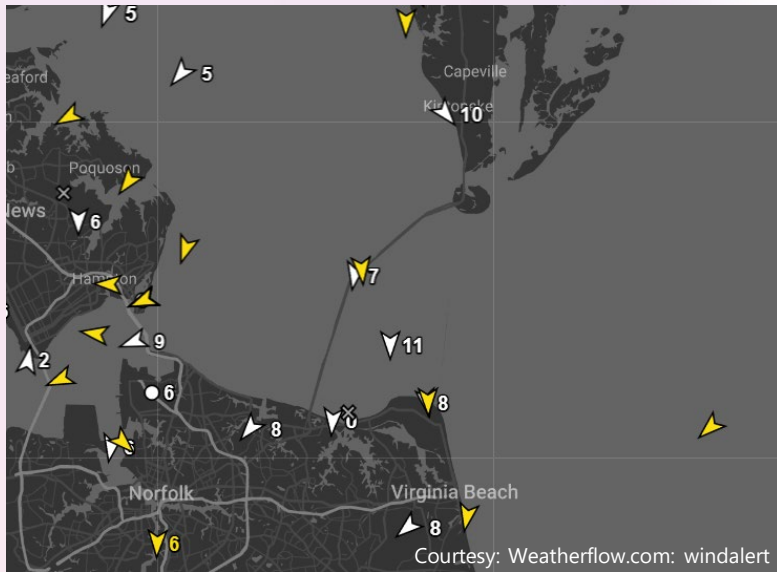
> ## *How do you know you are right?*
>
> Matt Corey

- 20 years as a Chief Meteorologist at WeatherFlow

- Professionally sited and maintained weather stations placed where our customers are located

- Learning from our mistakes= unparalleled forecast accuracy

- Worked with increasingly higher profile partners who recognized our expertise in these regions

What can we learn from Product Management?

Customer Centric Design.... always starts with research to find out what the end-customers need and what the business and technology requirements are."
(sofokus.com)

Gemba

Gemba (現場) is the Japanese term for "actual place," often used for the shop floor or any place where value-creating work actually occurs. Lean Thinkers use it to mean the place where value is created.   Japanese companies often supplement gemba with the related term "genchi gembutsu" — essentially "go and see" — to stress the importance of empiricism.

A gemba walk is a management practice for grasping the current situation through **direct observation and inquiry before taking action.**

Industry	Example Gemba
Manufacturing	Factory floor
Hospital	Operating room
Hospitality	Kitchen, dining room
Construction	Job site
Software	Software code

Source: www.lean.org

Add: Weather/Climate Research   →   Reliably sample where people are

Tragic example: Marshall Fire: Dec 30, 2021

The Most Destructive fire in Colorado History

- Driven by winds gusting to 115 mph, this fire destroyed 1084 structures, killed 2 people, and cost $2 Billion.

- AMS Summer presentation: there were weather stations 'up canyon' that recorded the winds

- These weren't official stations, nor trusted to use in model training

- Some forecast models hinted at the wind potential but none to the extremes that occurred

- **How are our models going to improve if we don't train them with actual conditions from where our citizens are?**

Global High Density Reference Network
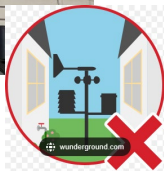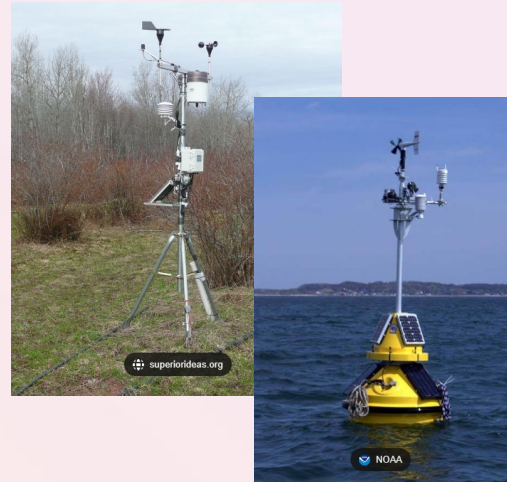
> ❝ *How do you know you are right?*
> Matt Corey ❞

- ML/AI emerging technologies are strongly reliant on the quality of the training data.   Garbage in= Garbage out.

- ASOS and AWOS represents the "gold standard" but too costly

- IoT, PWS, Big Data to the rescue?   How do we trust the data?   QC challenges

- National Mesonet is a good start but we need more investment in data collection, standards, and QC

- **Today's weather data is tomorrow's climate record**

■■ Microsoft Start

Summary

- Microsoft Start as a powerful global platform for weather and climate decisions
- Microsoft's world leading forecast accuracy
- Value of Climate and Historical Data
- Partnerships
- Matt's Pitch: Global High Density Reference Network

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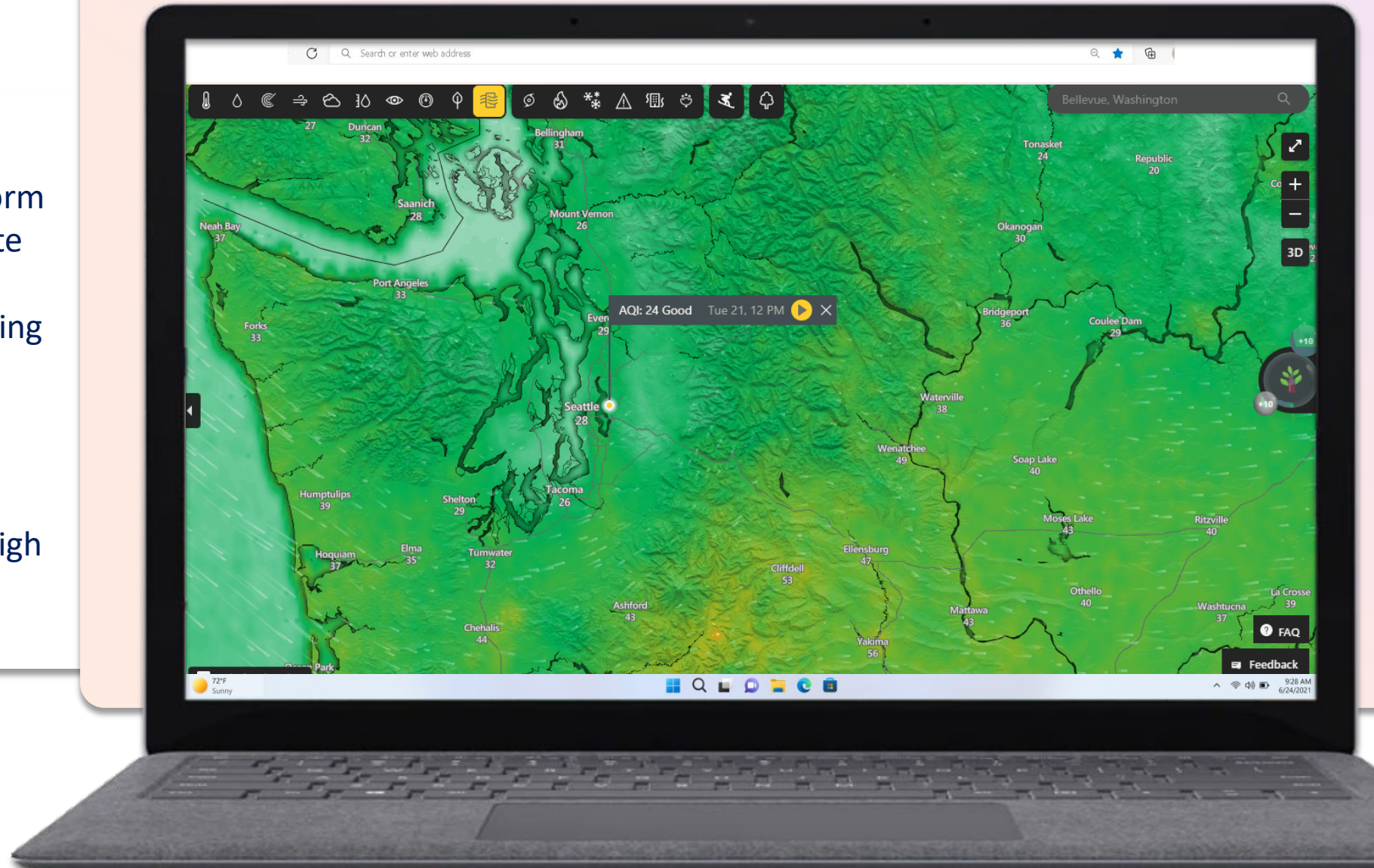
Thank you

Matt Corey
Senior Product Manager
Microsoft Weather
mattcorey@microsoft.com