

Operational weather UAS networks: recent developments & outlook

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meteo matics

Meteodrone / Meteobase

Meteodrone for atmospheric profiling up to 20,000 ft AMSL



Meteobase serves as a base for automated and remote Meteodrone operations

Max. Altitude
20,000 ft AMSL

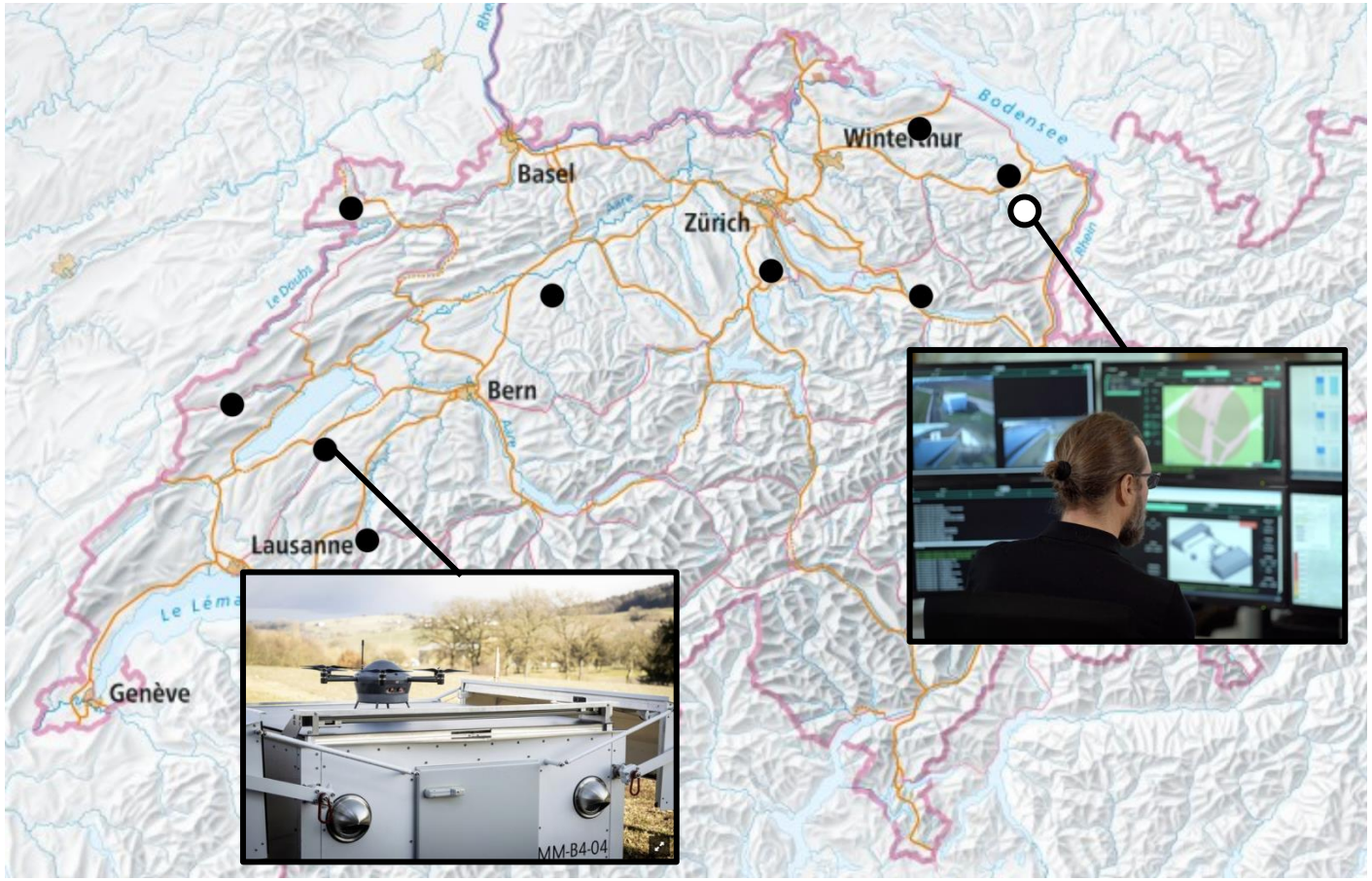
Max. Wind Speed
25 m/s – 50 kts

Inclement Weather
De-icing capability

Vertical Speed
10 m/s – 20 kts

Weather Data
Pressure, temperature, dew point, relative humidity, wind speed & direction, icing layers

Experience From Our European Meteobase Networks





- Fully operational networks in Switzerland and Norway, remotely controlled via the Operations Control Center
- Over 1700 flights completed across Switzerland over a 6-month operational window

FLIGHT OPS UPDATE

Reliability is Increasing

Best signal

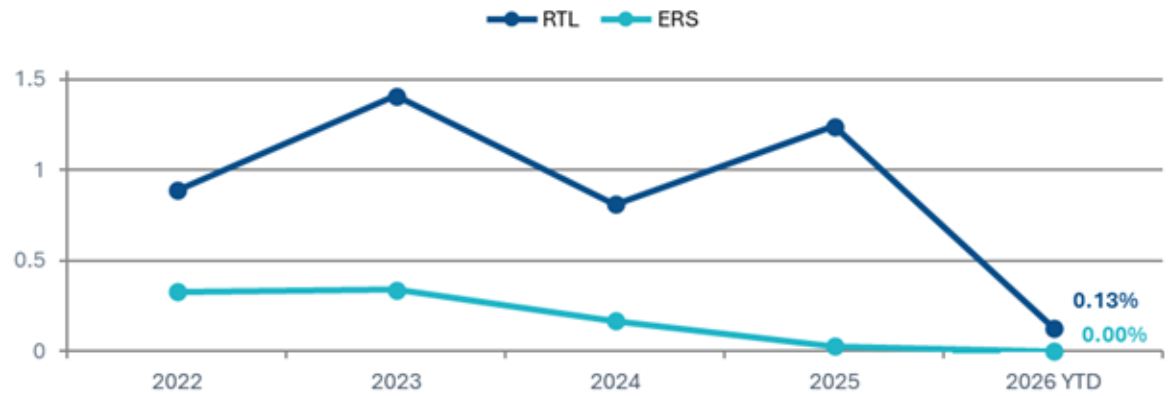
0 ERS

emergency rescue deployments in 2026 YTD

Parachute events fell from 3 in 2022 and 2 in 2025 to none so far this year.

Event rate per regular flight

Sharp reduction in 2026 YTD, especially in emergency rescue events.



Total failsafe rate 2026

0.13%

3 events across 2,247 flights

RTL recovery load

3

return-to-launch events in 2026 YTD

Scale

6.8x

more regular flights in 2025 than in 2022

ERS

0

deployments in 2026 YTD

RTL

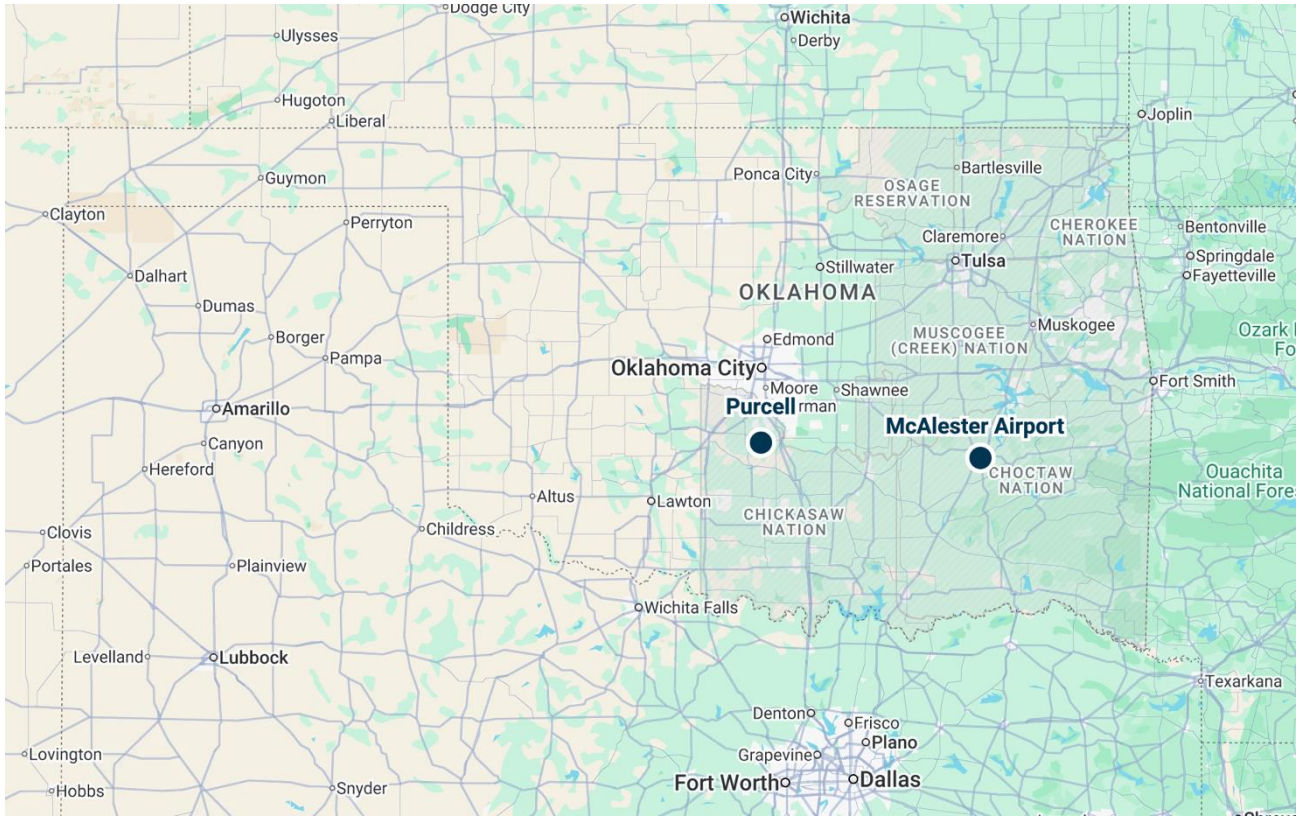
-89%

lower RTL rate vs. 2025

Source: regular flight operations data provided by Flight Ops.

Definitions: RTL = Return to Launch, requiring on-site reset at Meteobase. ERS = Emergency Rescue System, parachute descent and emergency protocol.

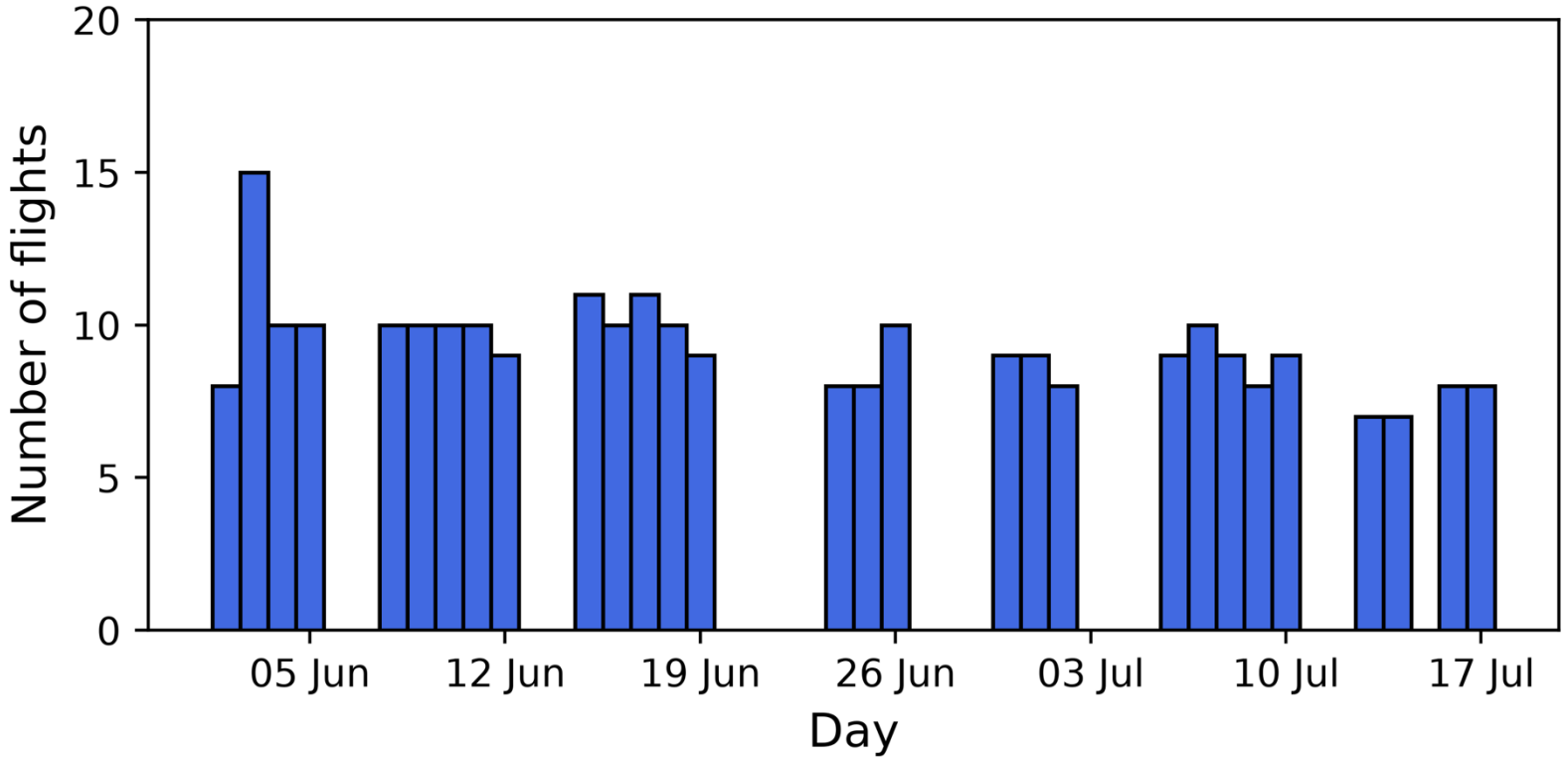
US Network – starting in Oklahoma

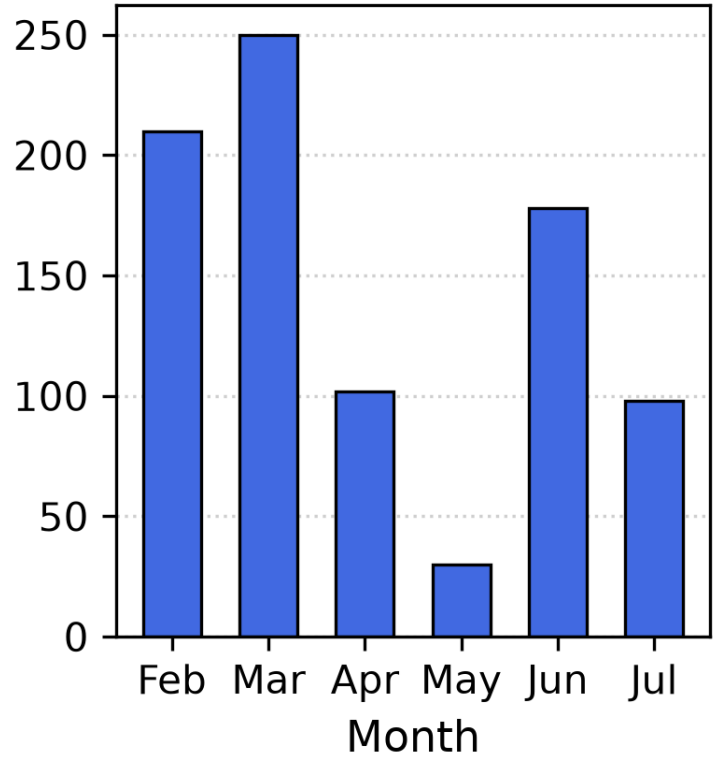




- First site installed near Purcell, OK, now expanding to a second site near McAlester
- Data delivered to NOAA via the National Mesonet Program – scalable model for future expansion

Meteodrone Operations in Oklahoma



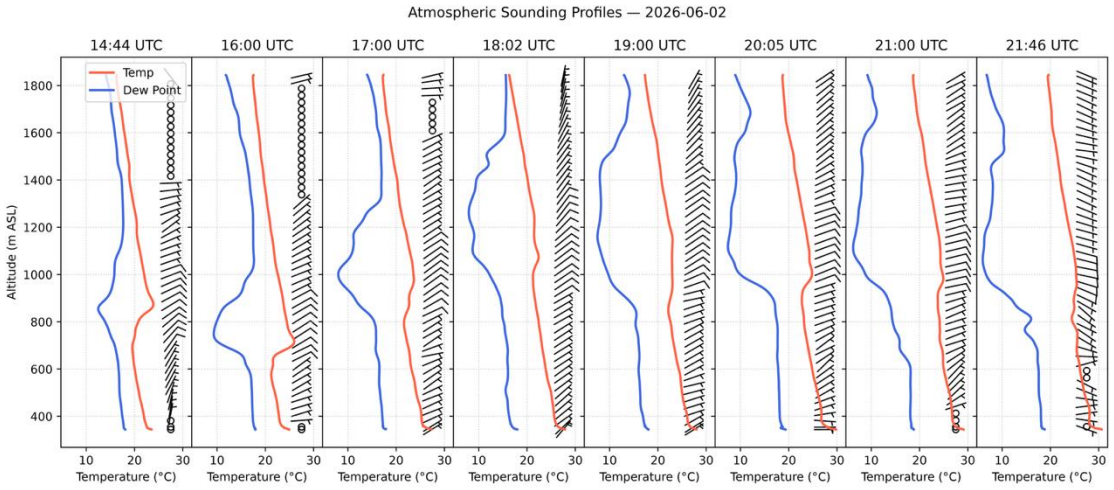


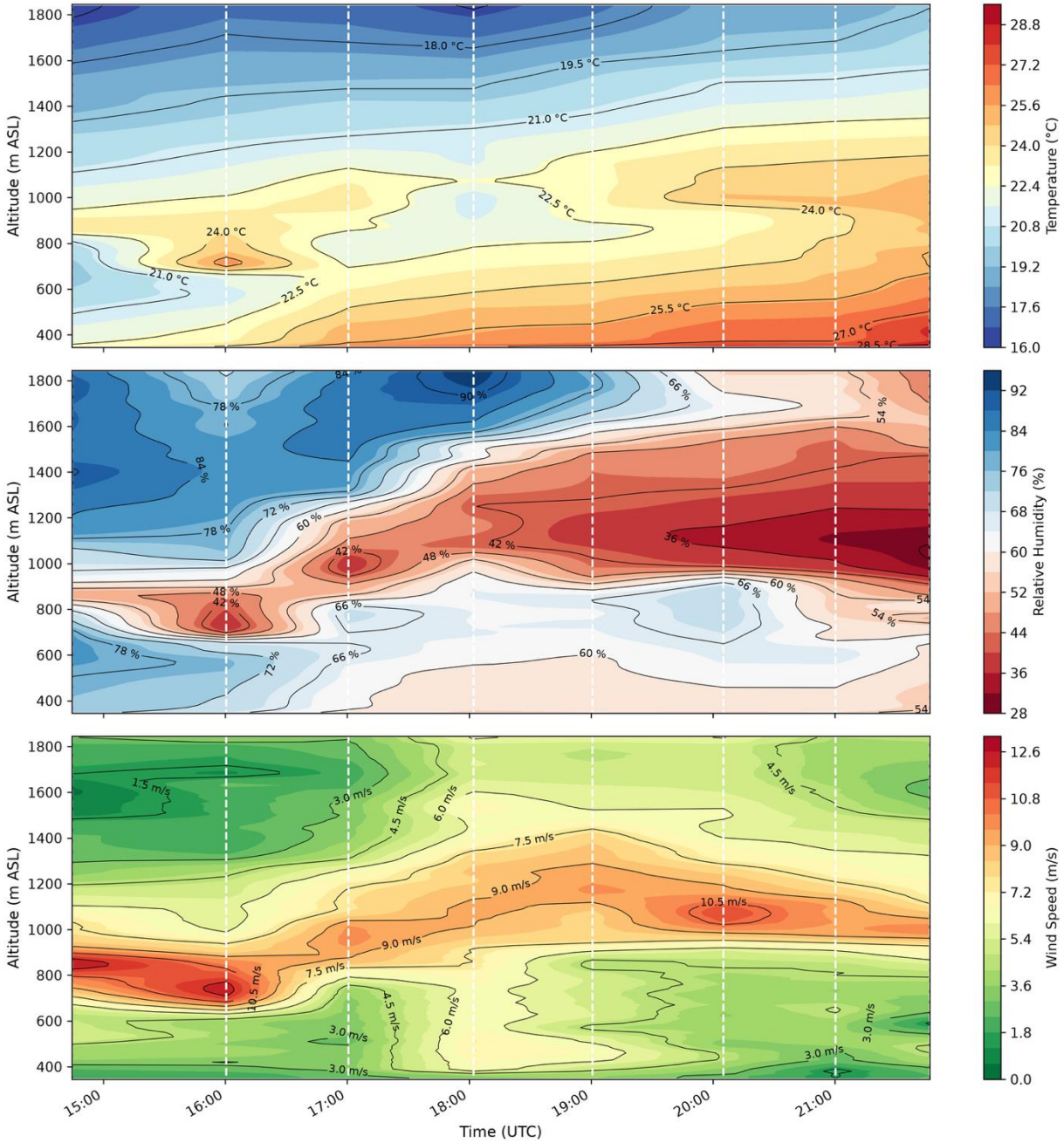
- Over 270 Meteodrone flights conducted at KAEFS in the past 2 months (868 total flights since February 2026)
- Data delivered instantly to NOAA via Synoptic and the National Mesonet Program

High-Resolution Atmospheric Profiling

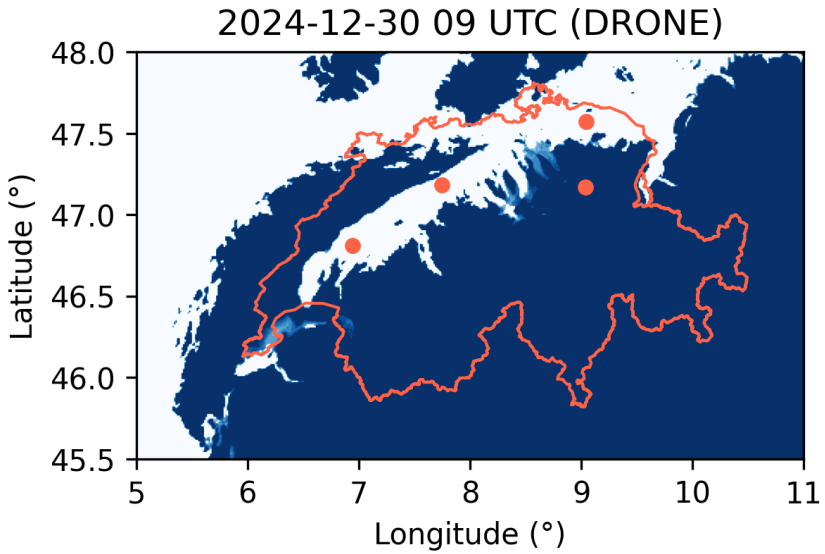
- **Flight frequency:** On average, 8-10 drone profiles per day (hourly intervals)
- **Vertical Coverage:** Altitudes up to 5000 ft AGL

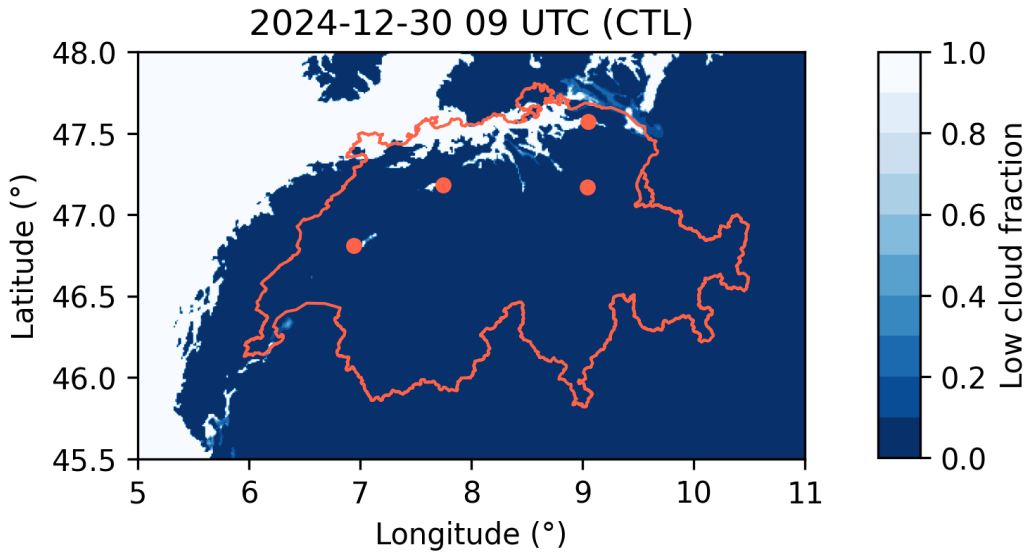
→ **Key Outcome:** This yields a high-resolution time series capturing the diurnal evolution of key atmospheric parameters

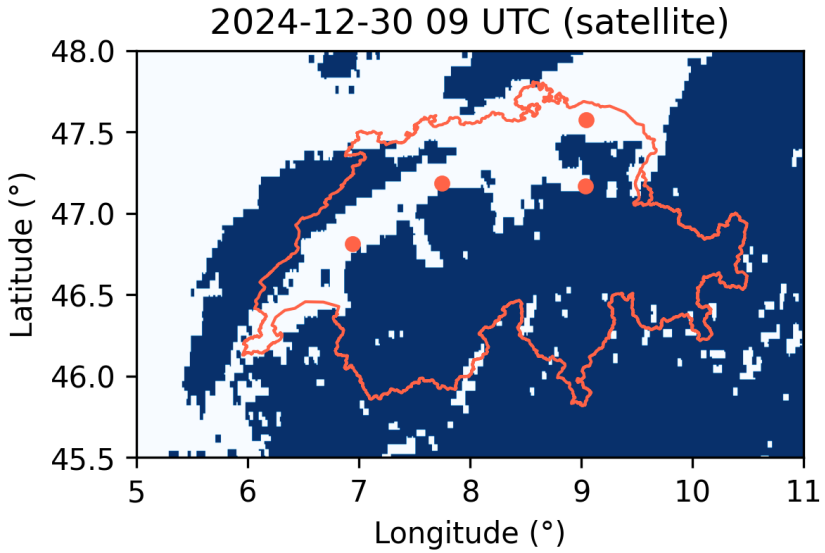




Impact of Drone Data on NWP





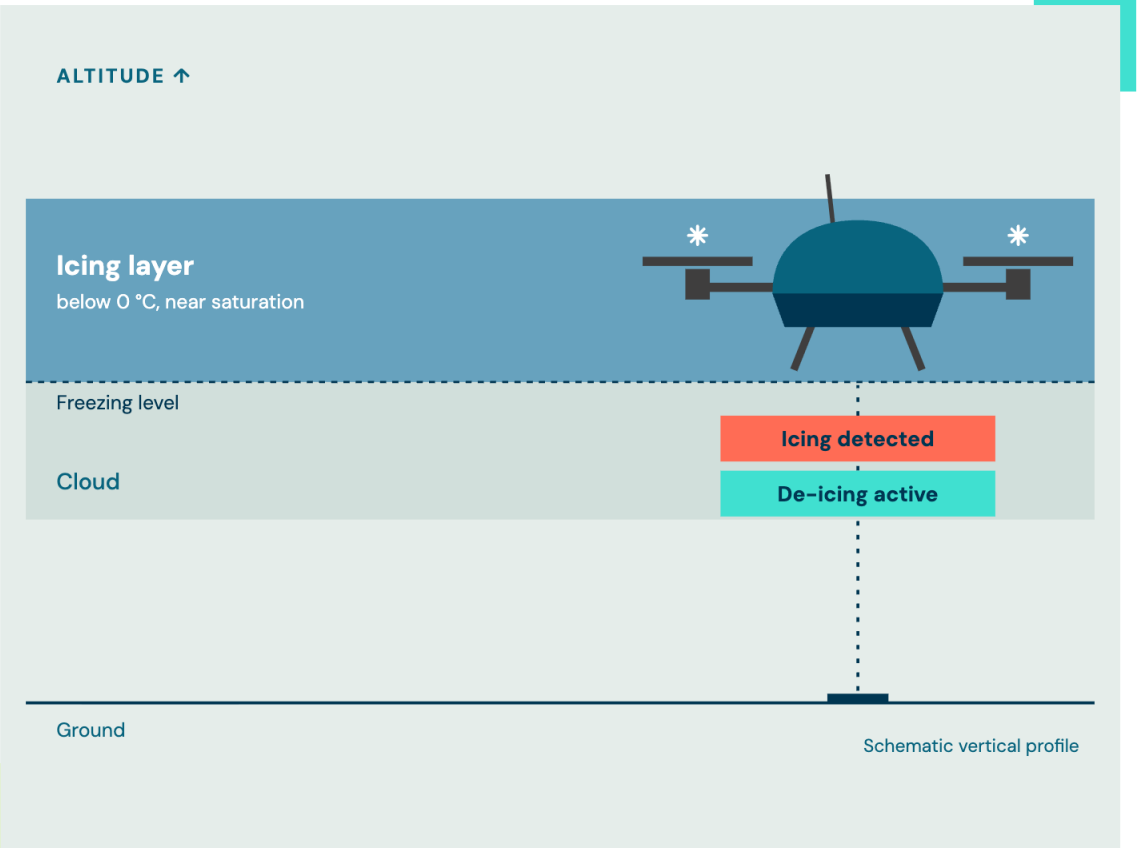


- Compared 1k-model simulations with drone data assimilation (DRONE) against control run without assimilation (CTL)
- Assimilating drone data significantly improves low-level cloud forecasts, with positive impacts persisting for several hours after assimilation ends

→ Highlights the critical value of high-frequency, upper-air observations for predicting localized phenomena like fog and thunderstorms

Icing, measured in flight

The Meteodrone combines flight control data with its own temperature and humidity readings to detect icing layers—and reports them as a parameter.



1

Measure

Temperature and humidity are recorded continuously as the drone climbs. The flight controller logs how hard the drone works to hold its climb.

2

Detect

Air near or below 0 °C, close to saturation, and a drone working harder to stay on profile: the layer is flagged as icing.

3

Act

The de-icing system activates and keeps the drone in the air, so it completes the profile through the icing layer.

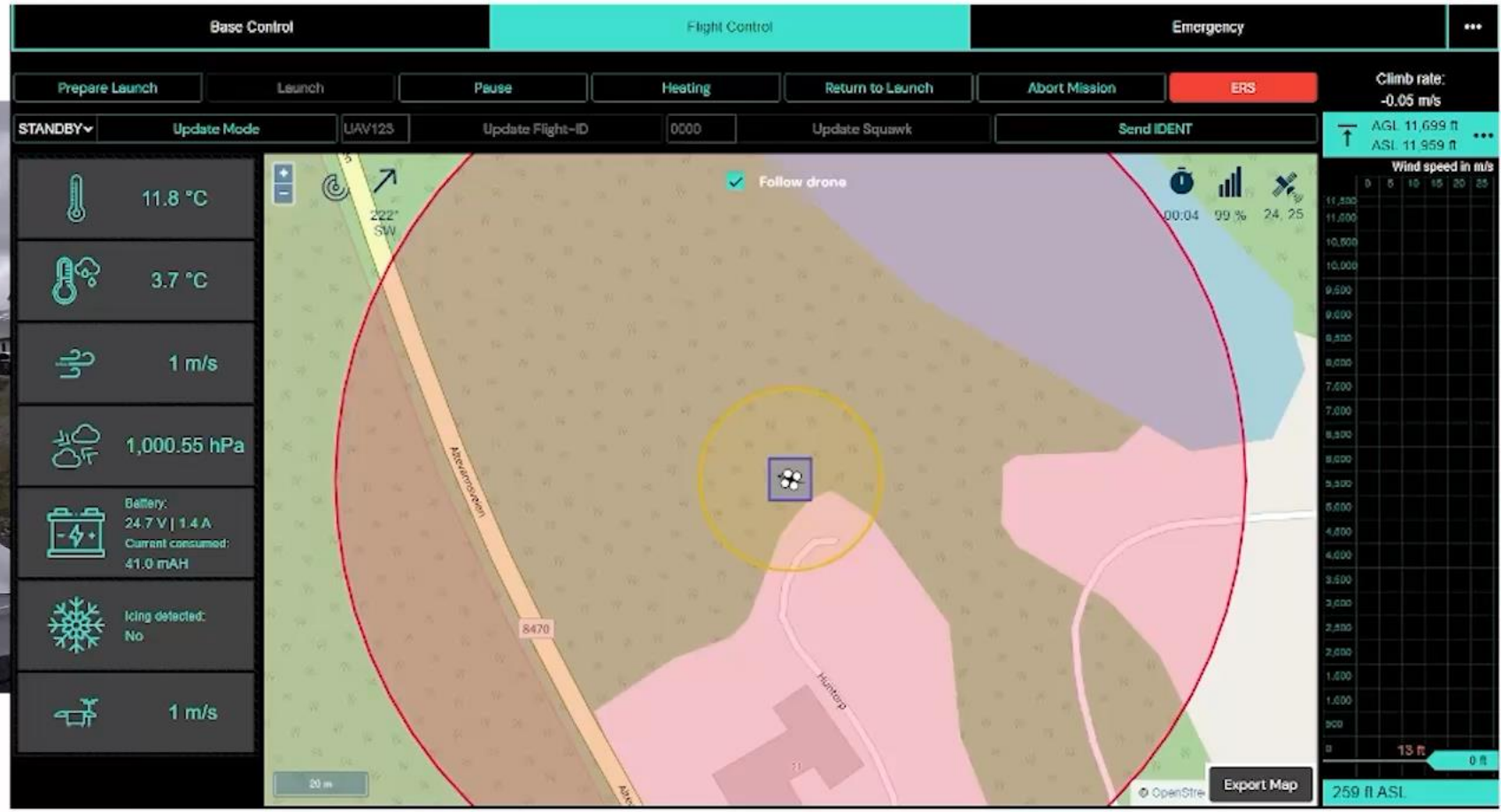
4

Report

The icing layer is delivered as a measured parameter alongside temperature, humidity, and wind.

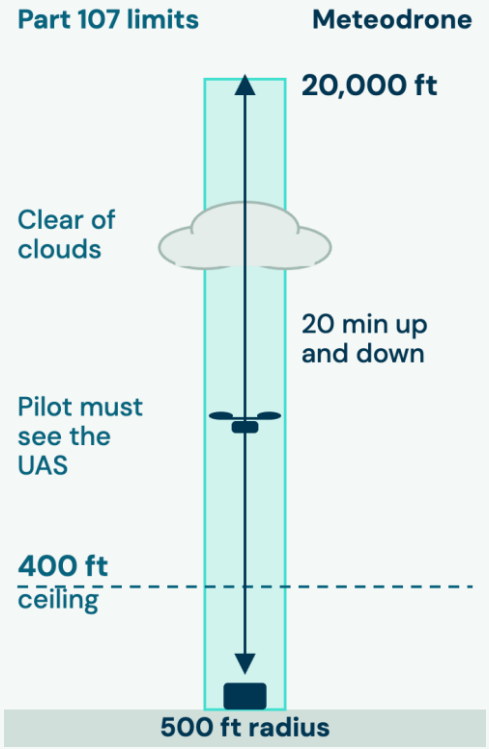
Unique in-situ icing measurements


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MM-B4-14-CAM 4


Base Control
Flight Control
Emergency
Prepare Launch
Launch
Pause
Heating
Return to Launch
Abort Mission
ERS
Climb rate:
-0.05 m/s
STANDBY
Update Mode
UAV123
Update Flight-ID
0000
Update Squawk
Send IDENT
AGL 11,699 ft
ASL 11,959 ft
11.8 °C
3.7 °C
1 m/s
1,000.55 hPa
Battery:
24.7 V | 1.4 A
Current consumed:
41.0 mAH
Icing detected:
No
1 m/s
Follow drone
222°
SW
00:04
99 %
24, 25
Wind speed in m/s
8470
Export Map
259 ft ASL

Scaling Meteodrone operations in the US

The aircraft is ready. Airspace approvals are the bottleneck.



Among the safest UAS in the sky

- Simple vertical profile
- Position always known
- Geofenced
- Parachute recovery

Scaling runs into the Part 107 waiver process

The rules assume a horizontal flight path with a pilot watching. Each step beyond them needs its own waiver, case by case and site by site.

- Above 400 ft
- Beyond visual line of sight
- In clouds
- Remote, no observer on site

What would help us scale

Regulatory simplification

Part 108, the BVLOS rule now in final federal review, is a welcome step. Separately, we would advocate for a framework that recognises short, vertical-only profiles, closer to how weather balloons are treated.

Your input

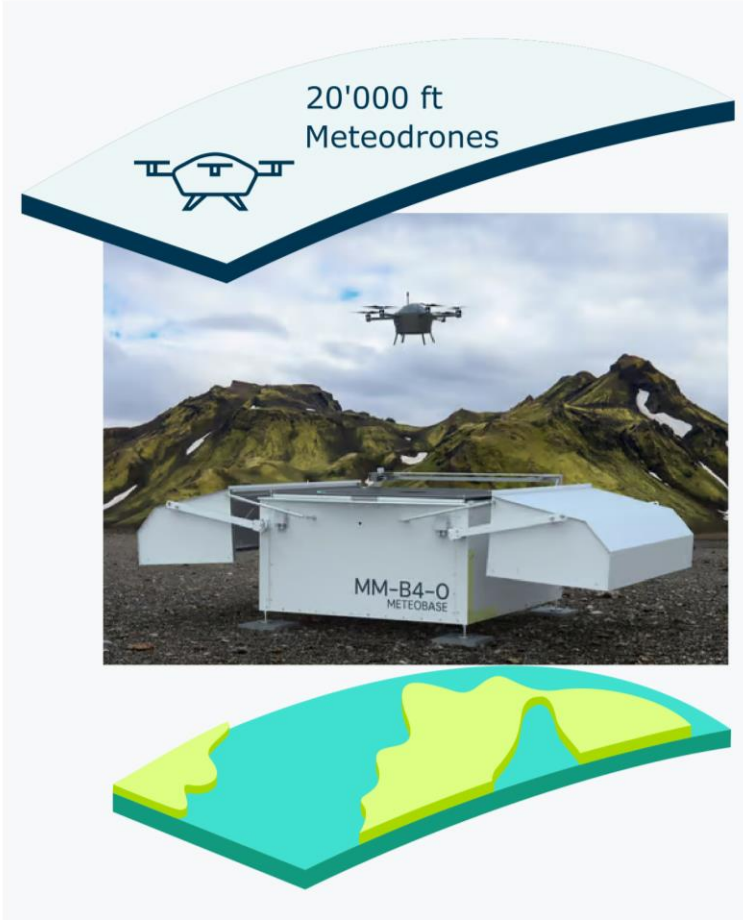
Operational experience, letters of support and airspace coordination to help us reach routine, large-scale integration.

The data benefits every airspace user. Help us bring it into the sky at scale.

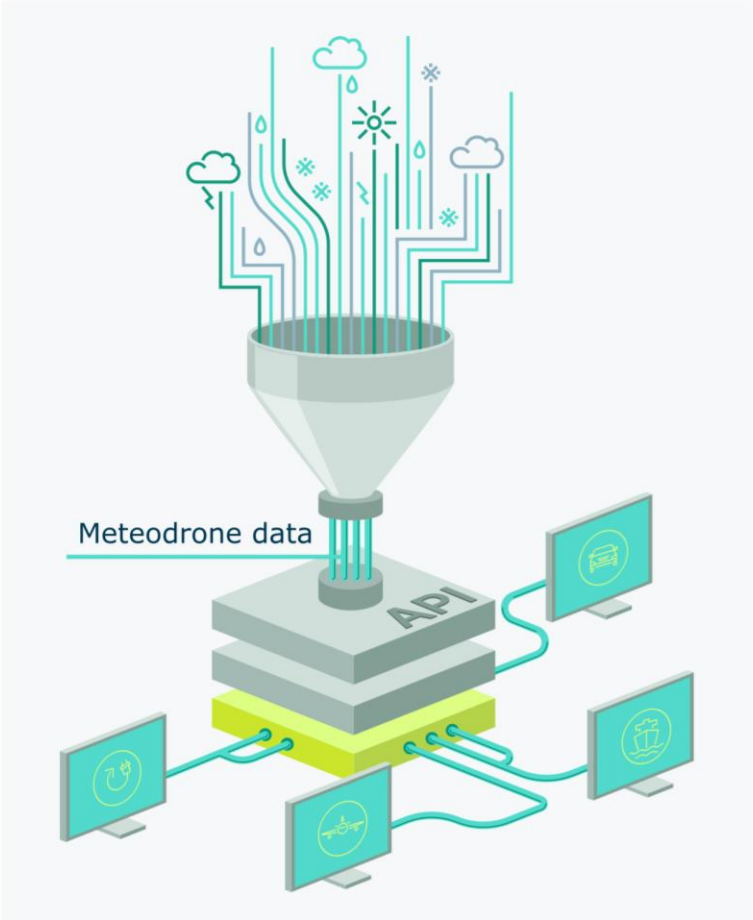
Vision in the U.S.



Install a Meteobase network in the U.S. that operates autonomously



Collect high-resolution upper-air drone observations of key weather parameters



Provide collected drone data to NOAA to improve weather forecasting & warnings

