

ambee[•]

Technology & Data Guide

Cupertino, CA, USA

37.3230° N, 122.0322° W • Last updated at 1430 hrs UTC on 09/17/2025

● **Moderate**

Weed pollen

Tree ● 72 /m³

Weed ● 58 /m³

Grass ● 0 /m³

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1.

Introduction

QUICK ACCESS:

[Data architecture](#) 

[Intellectual property](#) 

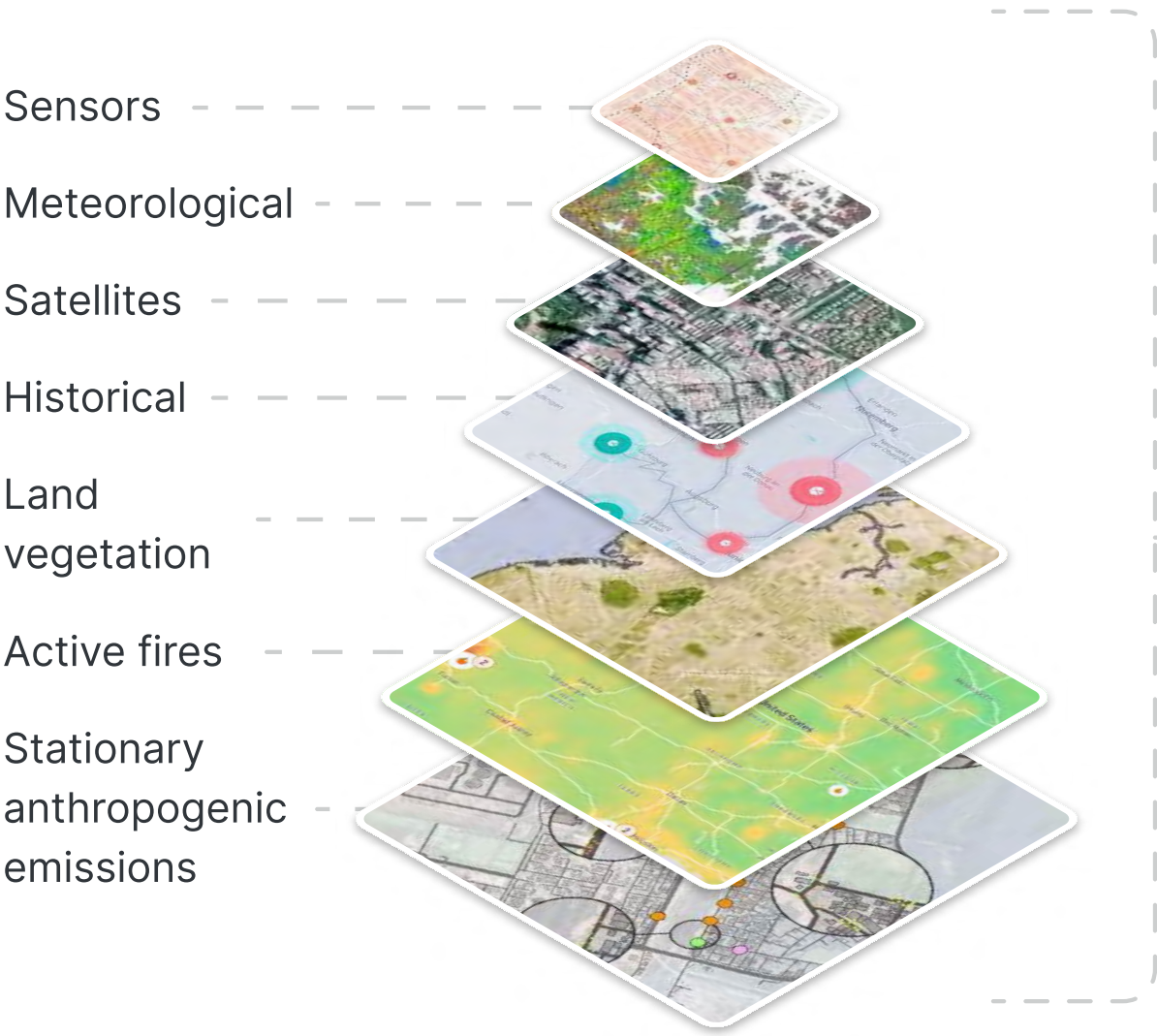
[Accuracy highlights](#) 

[Data security](#) 

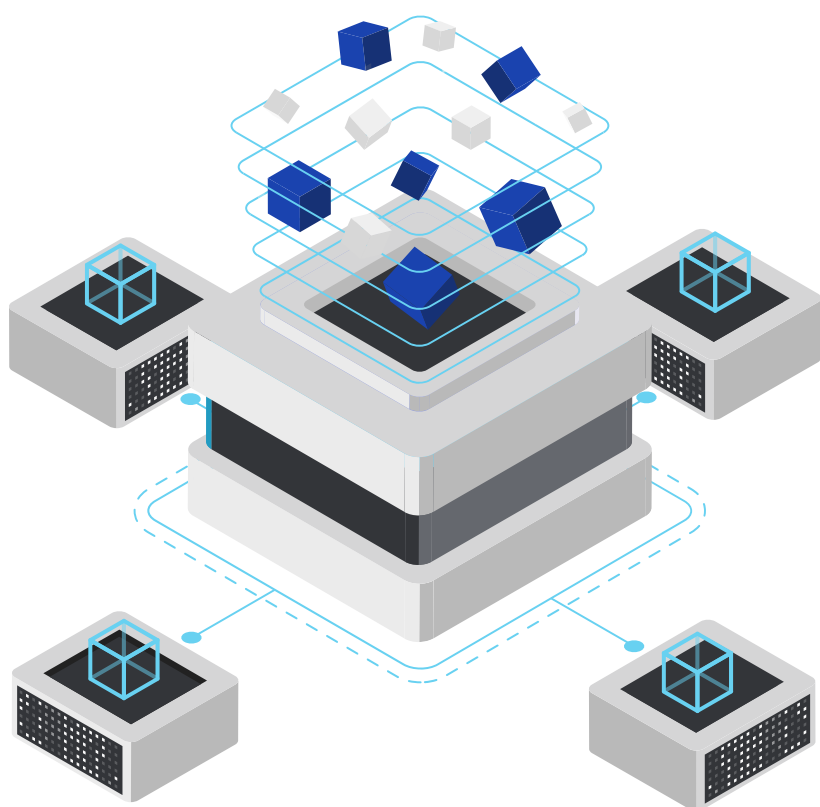
1.1 Data architecture



Our patented AI models —



Measure & own
Raw data collected from multiple sources



Analyze
Multi-model approach applied using proprietary AI and ML techniques



Drive actionable data
Effective decision-making with hyperlocal climate intelligence

FIG. 1 | Architecture of Ambee data

1.2 Intellectual property

Our superior accuracy is a result of patented systems ensuring our climate models are ahead of the curve, incorporating the latest advances in AI and ML.

3

Patents filed

- 2

Air quality
- 1

Pollen



1. WO2022195628 - AN ARTIFICIAL NEURAL NETWORK BASED VIRTUAL AIR MONITORING NETWORK SYSTEM

Artificial neural network to monitor air quality by creating a virtual network of stations and sensors to gather air quality information.

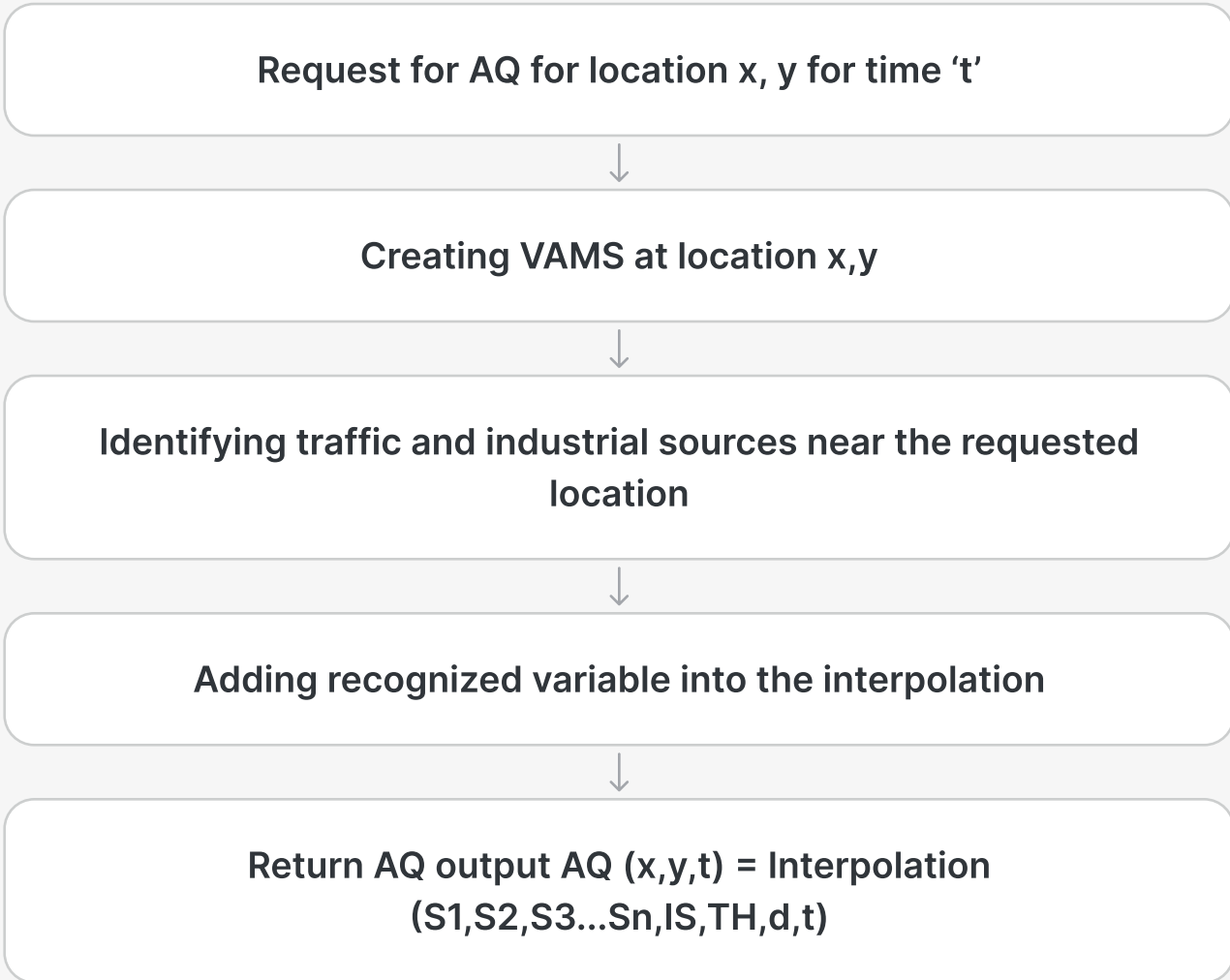


EXHIBIT 1 | Functional overview of the patent

2. SYSTEMS AND METHODS FOR A MULTIMODAL SPATIO-TEMPORAL AIR QUALITY NETWORK (PROVISIONAL)

A comprehensive air quality monitoring network that combines sensor data, satellite imagery, geospatial, and demographic information with machine learning techniques.

3. SYSTEMS AND METHODS FOR WEATHER-BASED POLLEN MONITORING (PROVISIONAL)

A system for precise pollen count predictions across regions and times, utilizing environmental and seasonal data with machine learning. It incorporates phenological inputs and plant peak, start, and end seasons to improve accuracy.

1.3 Accuracy highlights

- Integrity of reference-grade sensor data is maintained.
- Scientific anomalies and errors in reference-grade sensors are effectively managed.
- Missing values are thoroughly handled where stations are offline.
- AI-based algorithms enable precise data interpolation within a **10 km** radius.
- AI-based calibration enhances satellite data accuracy within a **50 km** proximity.



Weighted **anthropogenic** data



Feature-engineered data



10+ years of training data



Multiple algorithms in ETL



Unique models for different geographies

1.4 Data security

Ambee’s cloud infrastructure safeguards data with top industry security standards, backed by SOC 2 Type II and ISO27001 certifications for enterprise-grade protection.



SOC 2 Type II



ISO 27001

EXHIBIT 2 | Ambee’s infosec credentials



Continuous monitoring

Our data infrastructure is continuously monitored for compliance with SOC2 Type II and ISO 27001 requirements.



Reliable uptime

Our fault-tolerant infrastructure ensures availability even during extreme demand.



2. Ambee Pollen

QUICK ACCESS:

[Dataset overview](#) 

[Pollen forecast](#) 

2.1



Dataset overview

Ambee’s pollen dataset

Comprehensive pollen insights for allergy management



PARAMETER	DESCRIPTION
Grass pollen	Provides count for pollen grains from grasses measured in grains/m ³
Tree pollen	Provides count for pollen grains from trees measured in grains/m ³
Weed pollen	Provides count for pollen grains from weeds measured in grains/m ³
Risk	Provides a risk evaluation with levels: Low - Mild-low risk to those with severe respiratory issues. No risk for the general public Moderate - Risky for those with severe respiratory problems. Mild risk for the general public High - Risky for all groups of people Very high - Highly risky for all groups of people
Species	Provides count for species for pollen. Currently available for Europe, North America and ANZ.

TABLE 1 | Response parameters of Ambee’s pollen API

Data specifications



Global
Global coverage with ability to map to any point on Earth



Up to 30 day
Forecast



2015
Historical data available from 2015 with ability to go back further



25km
Highest resolution native grids in the industry with the ability to accommodate resolutions down to <1Km

Risk mapping

RISK LEVEL	TREE	GRASS	WEED
Low	0 - 95	0 - 29	0 - 20
Moderate	96 - 207	30 - 60	21 - 77
High	208 - 703	61 - 341	78 - 266
Very high	704+	342+	267+

TABLE 2 | Risk mapping of Ambee's pollen data



Data coverage

Europe

Tree	hazel, elm, pine, alder, poplar/ cottonwood, oak, plane, birch, cypress
Weed	mugwort, chenopod, ragweed, nettle
Grass	grass

Southern and Western Australia and New Zealand

Tree	Myrtaceae,casuarina, acacia, cypress, pine, elm, willow, oak, olive, alder, birch
Weed	chenopod, sedges, aster, plantago, rumex
Grass	grass

North America

Tree	oak, cypress/juniper/cedar, mulberry, pine, elm, ash, birch, maple, poplar
Weed	ragweed
Grass	grass

Queensland and Northern Australian Territory

Tree	Myrtaceae, casuarina, acacia, cypress, pine
Weed	chenopod, sedges, aster, plantago
Grass	grass

TABLE 3 | Regional coverage of Ambee's pollen API

Data architecture

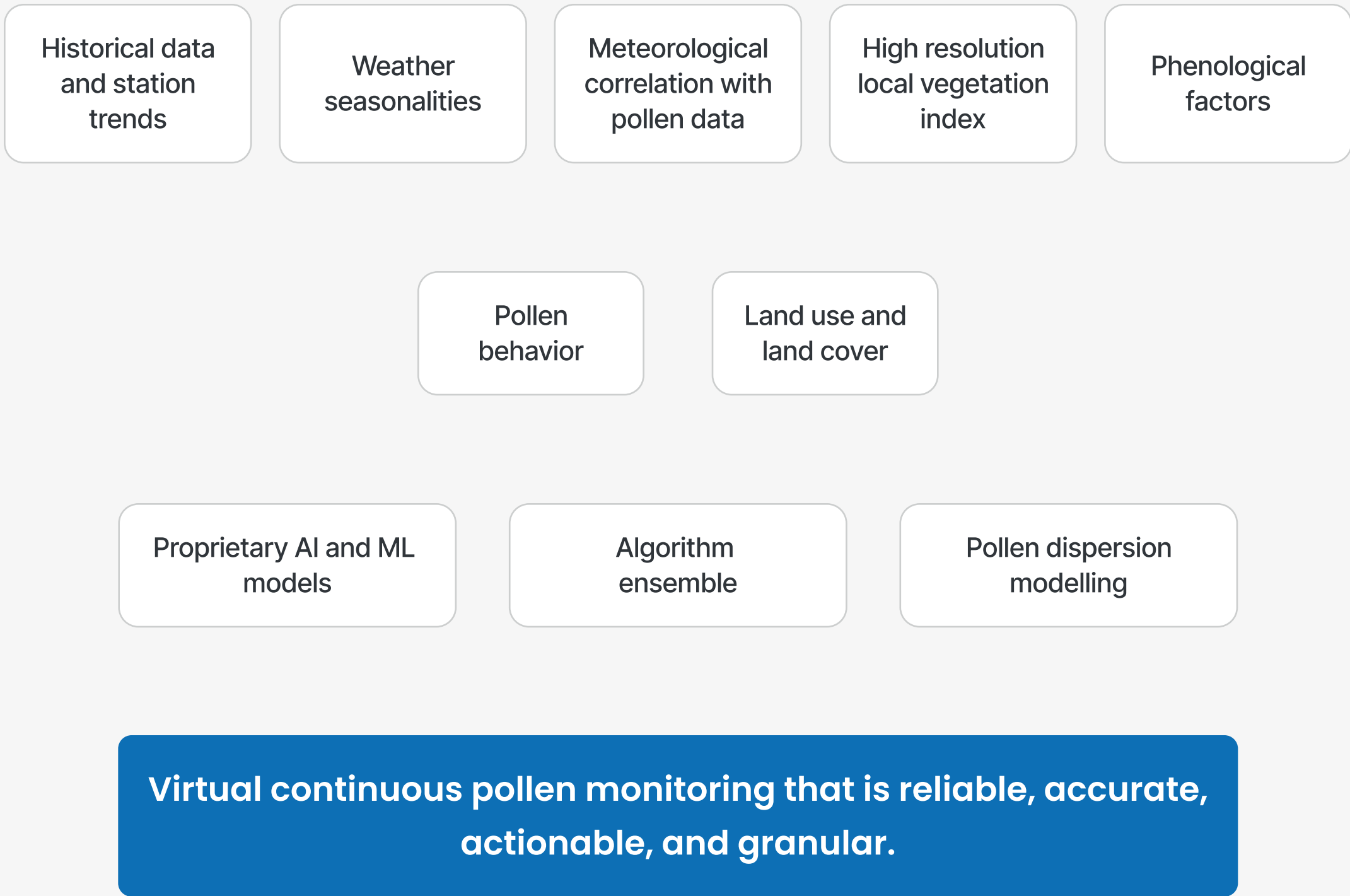


EXHIBIT 3 | Schematic representation of Ambee's pollen data architecture

What makes Ambee's pollen data accurate?

- Ambee periodically re-trains and calibrates its proprietary AI and ML models to enhance accuracy.
- The data is available with hyperlocal granularity, covering multiple regions, including frequently underserved ones.
- Ambee's pollen data is modeled using factors such as multi-species vegetation, weather conditions, and phenology.
- Data is provided on an hourly basis and is regularly updated, ensuring year-round availability.
- Both real-time pollen data and hourly forecasts, including accurate pollen count numbers, are offered.
- Ambee's risk levels are derived using National Allergy Bureau (NAB) guidelines.

Ambee pollen v. ground station



PARAMETER	GROUND STATIONS	AMBEE
Operating principle	Manual counting stations	Based on real-time stations + meteorological, phenological, and vegetation data
Technology	Machine-based sampling and manual counting	10+ years of historical training data, analysis, engineering, machine learning, and modeling output data format
Data parameters	Pollen risk categories only*	Near real-time pollen category and species-level counts, along with risk levels
Geographical spread	One station per city and depends on the location of the pollen station*	Commercially relevant regions across Europe, North America, South America, Africa, Asia, Australia, and New Zealand
Granularity	Granularity is limited to city level	Ability to map to any location of interest (lat/lon, zip/postal codes, DMA, MSA, or any user-defined boundary)
Data modeling	Subjected to manual placement and sampling errors	Modeled after factors like vegetation, weather, and phenology
Seasonal coverage	No data outside the pollen season*	Data provided throughout the year

TABLE 4 | Detailed qualitative comparison between ground stations and Ambee

*Applicable for most stations

**Available on demand



PARAMETER	GROUND STATIONS	AMBEE
Frequency	Frequency is limited to daily at best, and is generally irregular	Hourly frequency; regularly updated
Location	Data published only for a few cities	Data available for all latitudes-longitudes within supported geographies
Availability	Inconsistent data availability with no forecasting*	Hourly temporal resolution and hourly forecasts available

TABLE 5 | Detailed qualitative comparison between ground stations and Ambee

*Applicable for most stations

Pollen forecast

QUICK ACCESS:

[Validation methodology](#) 

[Accuracy benchmarks](#) 

Validation methodology

Our approach: Post-forecast observation

We generated a 2 day (30 to 31 Aug 2025), 5 day (27 to 31 Aug 2025) and 30 day (1 Aug 2025 to 29 Aug 2025) forecast using our predictive models. After the forecast period, we gathered real-time observational data from Ambee’s API, enabling a direct comparison between the predicted values and the real-time observations. This comparison assessed the accuracy of our predictions and validated the performance of our forecasting model during the specified timeframe.

Accuracy overview



Performance metrics

Next to each legend in the graph, you will find these performance metrics:

- **MAE (mean absolute error):** Measures the average magnitude of errors between the predicted and actual values.
- **RMSE (root mean squared error):** Measures the average magnitude of error in a set of predictions by calculating the square root of the average of squared differences between predicted and actual values.

LEGEND	DESCRIPTION
X-axis: (timestamp)	Represents the time period for 2 day, 5 day and 30 day forecasts with respective dates.
Y-axis (total pollen count)	Represents the total pollen count at any given time
Solid black line (Ambee present) —	This solid black line represents the real-time measurements from Ambee’s present (real-time) pollen API
Dashed yellow line (Ambee forecast) - - -	The dashed yellow line represents the predicted pollen count recorded by Ambee’s forecast pollen API

EXHIBIT 4 | Legend of accuracy benchmark for 2-day, 5-day, 30-day pollen forecasts

2.2.3



Accuracy benchmark: 2-day pollen forecast

Accuracy benchmark: 2-day pollen forecast - Greenfield, United States of America (NAR)

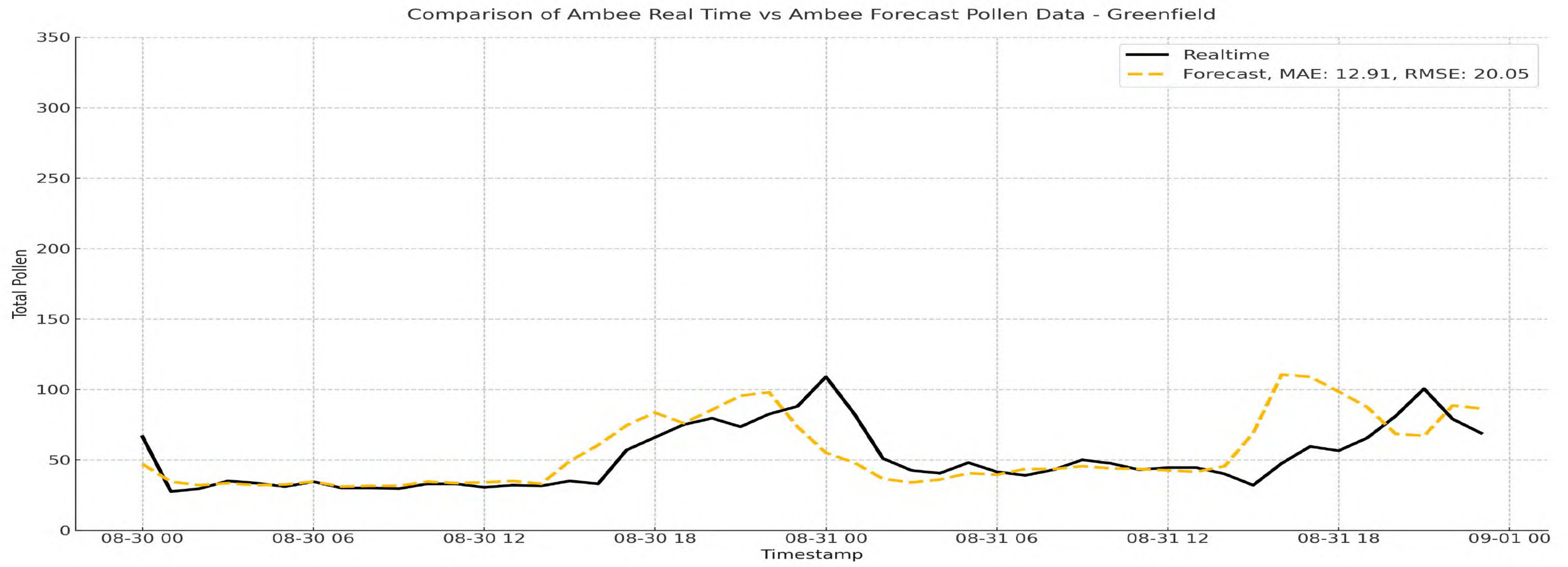


EXHIBIT 5 | Comparison of Ambee present pollen data with 2-day forecast for Greenfield, USA (Aug 30–31, 2025).

Accuracy benchmark: 2-day pollen forecast - Paris, France (EUR)

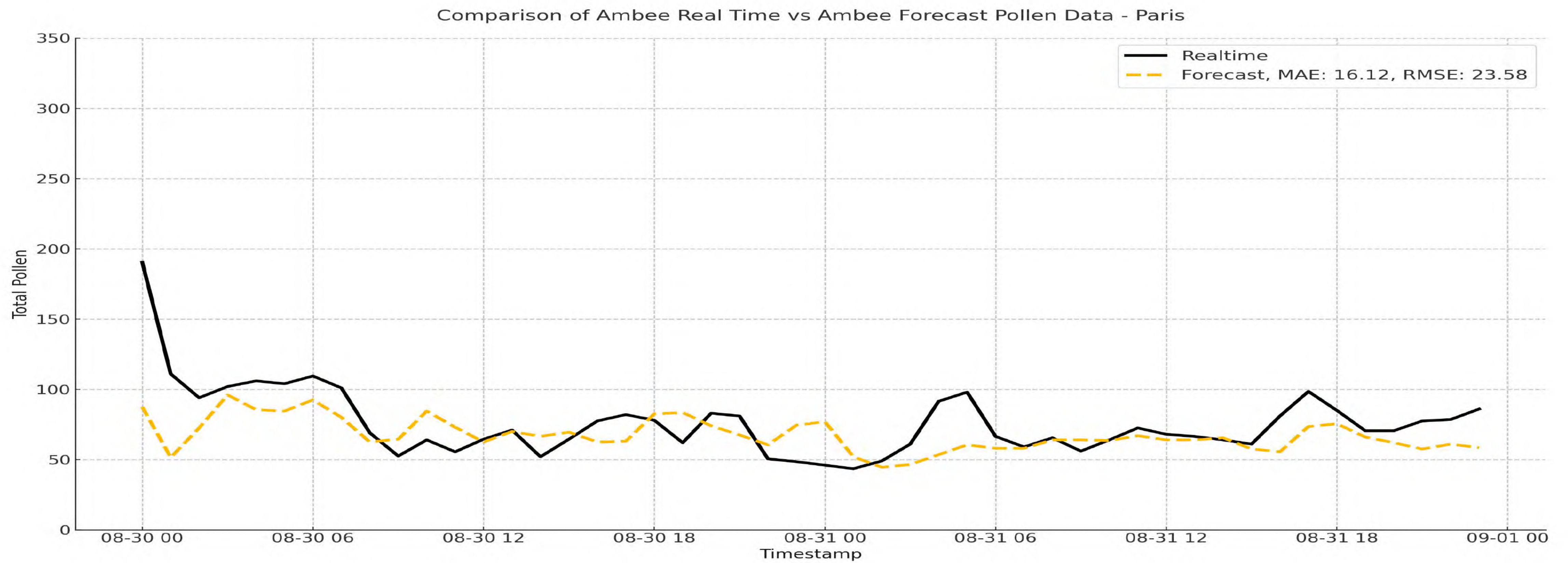


EXHIBIT 6 | Comparison of Ambee present pollen data with 2-day forecast for Paris, France (Aug 30–31, 2025).

Accuracy benchmark: 2-day pollen forecast - Adelaide, South Australia (AUS)

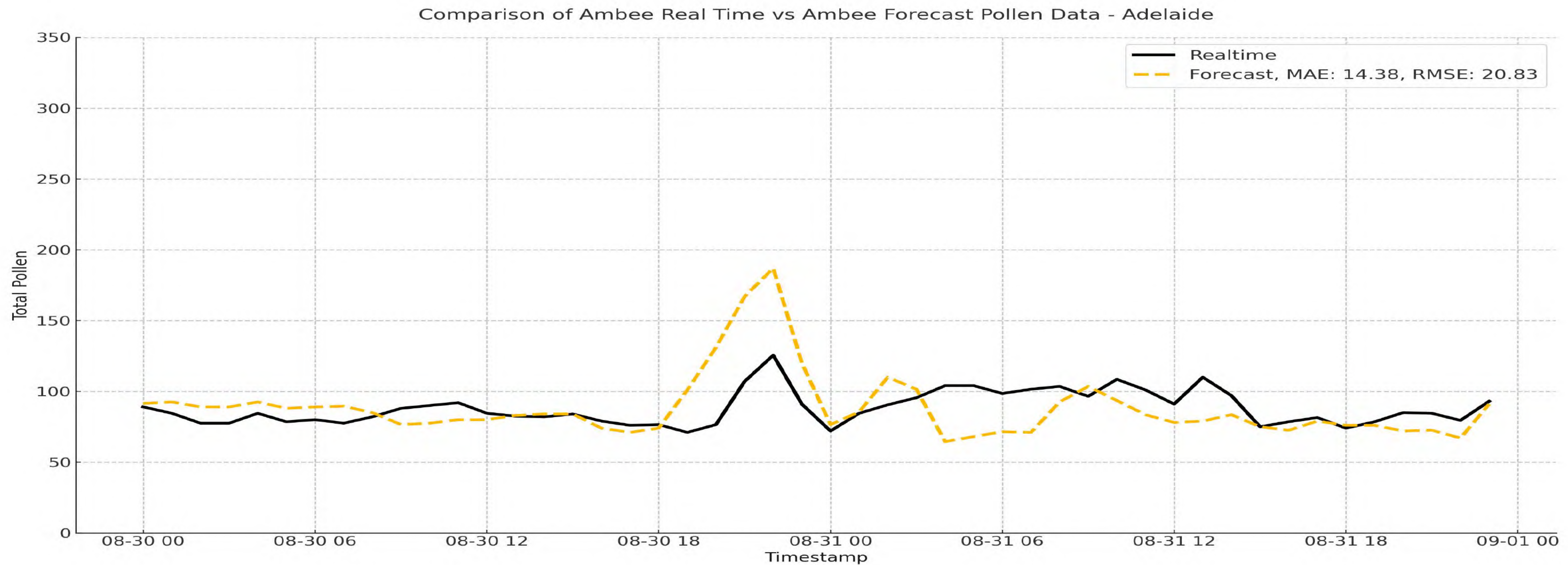


EXHIBIT 7 | Comparison of Ambee present pollen data with 2-day forecast for Adelaide, South Australia (Aug 30–31, 2025).

Accuracy benchmark: 2-day pollen forecast - Kolkata, India (ASIA)

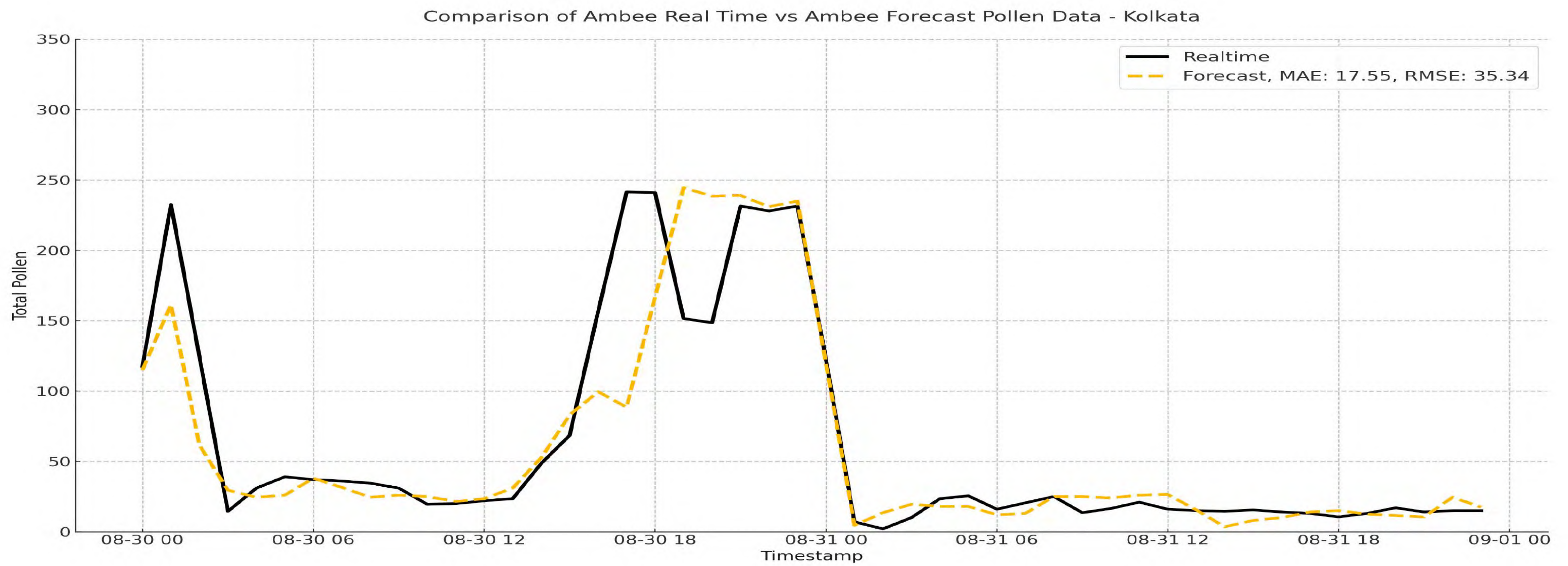


EXHIBIT 8 | Comparison of Ambee present pollen data with 2-day forecast for Kolkata, India (Aug 30–31, 2025).

Accuracy benchmark: 2-day pollen forecast - Khartoum, Sudan (AFR)

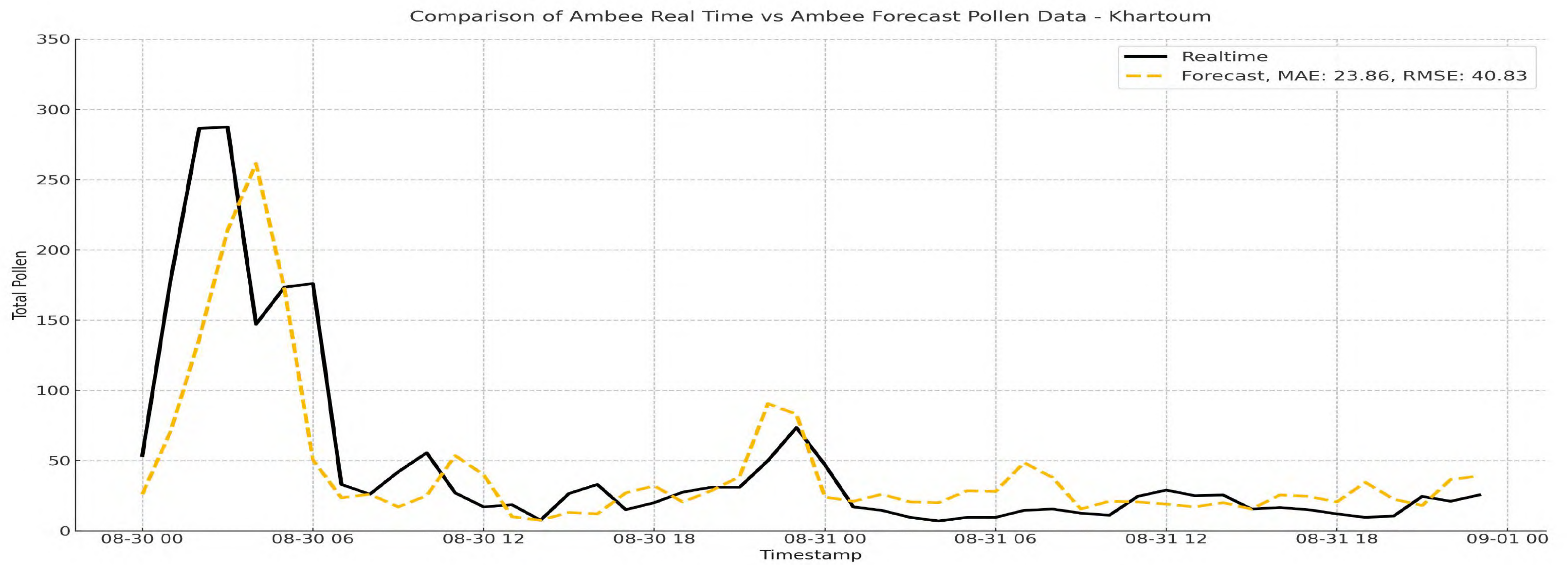


EXHIBIT 9 | Comparison of Ambee present pollen data with 2-day forecast for Khartoum, Sudan (Aug 30–31, 2025).

2.2.4



Accuracy benchmark: 5-day pollen forecast

Accuracy benchmark: 5-day pollen forecast - Mexico City, Mexico (NAR)

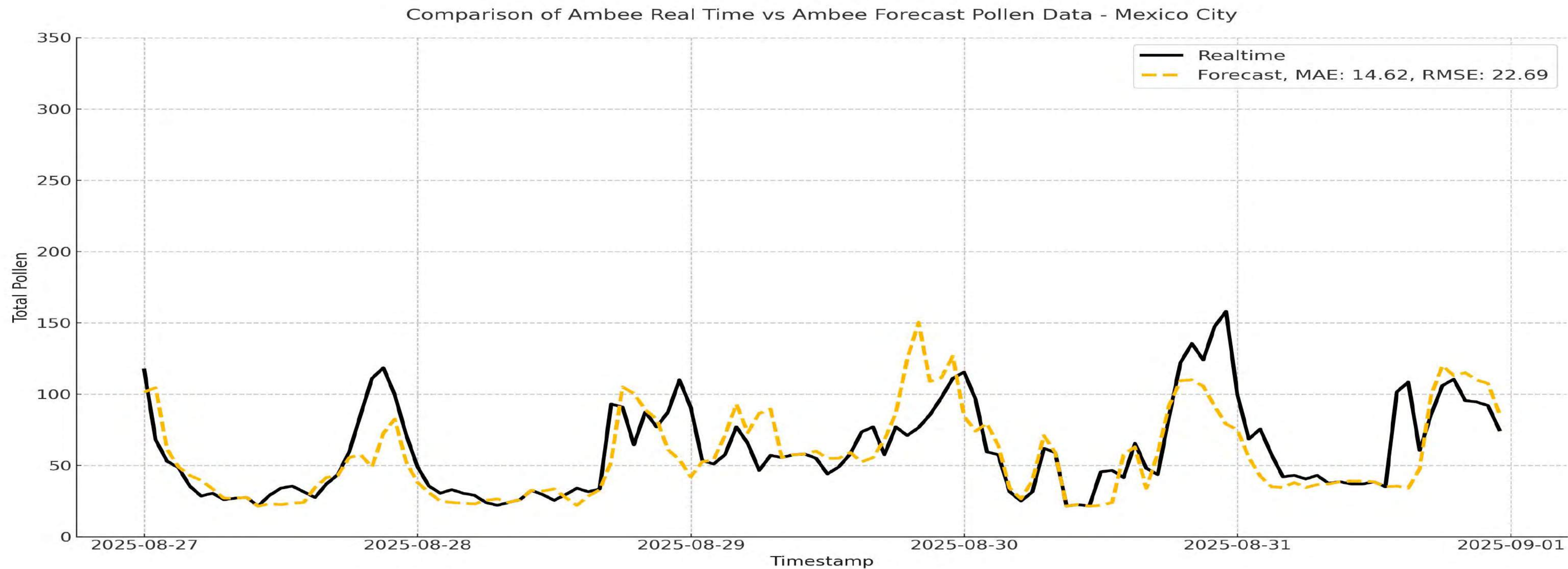


EXHIBIT 10 | Comparison of Ambee present pollen data with 5-day forecast for Mexico City, Mexico (Aug 27, 2025 - Aug 31, 2025).

Accuracy benchmark: 5-day pollen forecast - London, England (EUR)

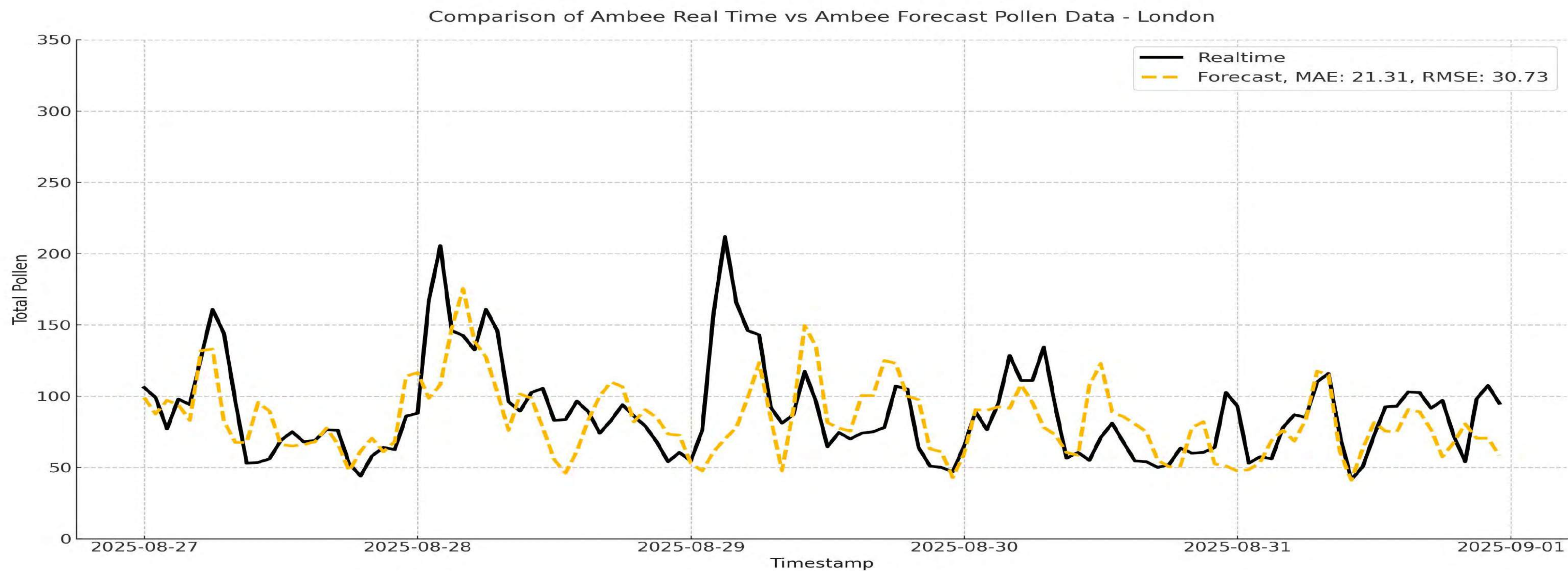


EXHIBIT 11 | Comparison of Ambee present pollen data with 5-day forecast for London, England (Aug 30–31, 2025).

Accuracy benchmark: 5-day pollen forecast - Adelaide, South Australia (AUS)

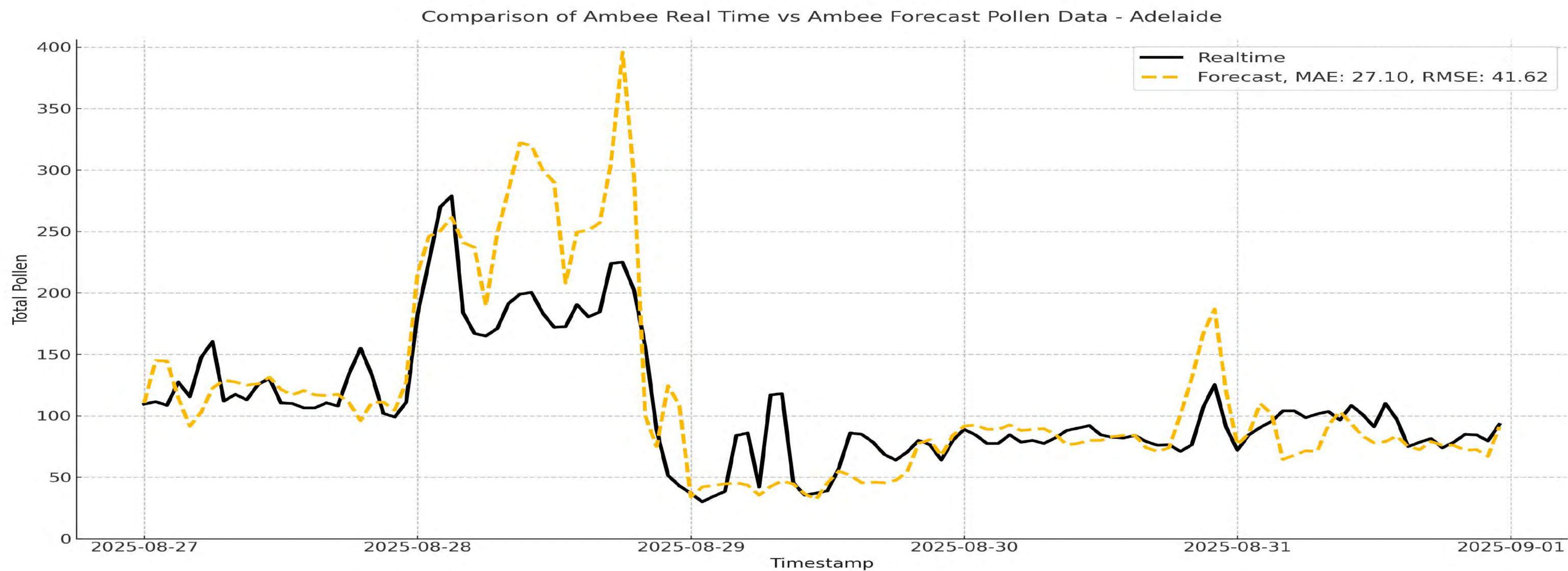


EXHIBIT 12 | Comparison of Ambee present pollen data with 5-day forecast for Adelaide, South Australia (Aug 27, 2025 - Aug 31, 2025).

Accuracy benchmark: 5-day pollen forecast - Kolkata, India (ASIA)

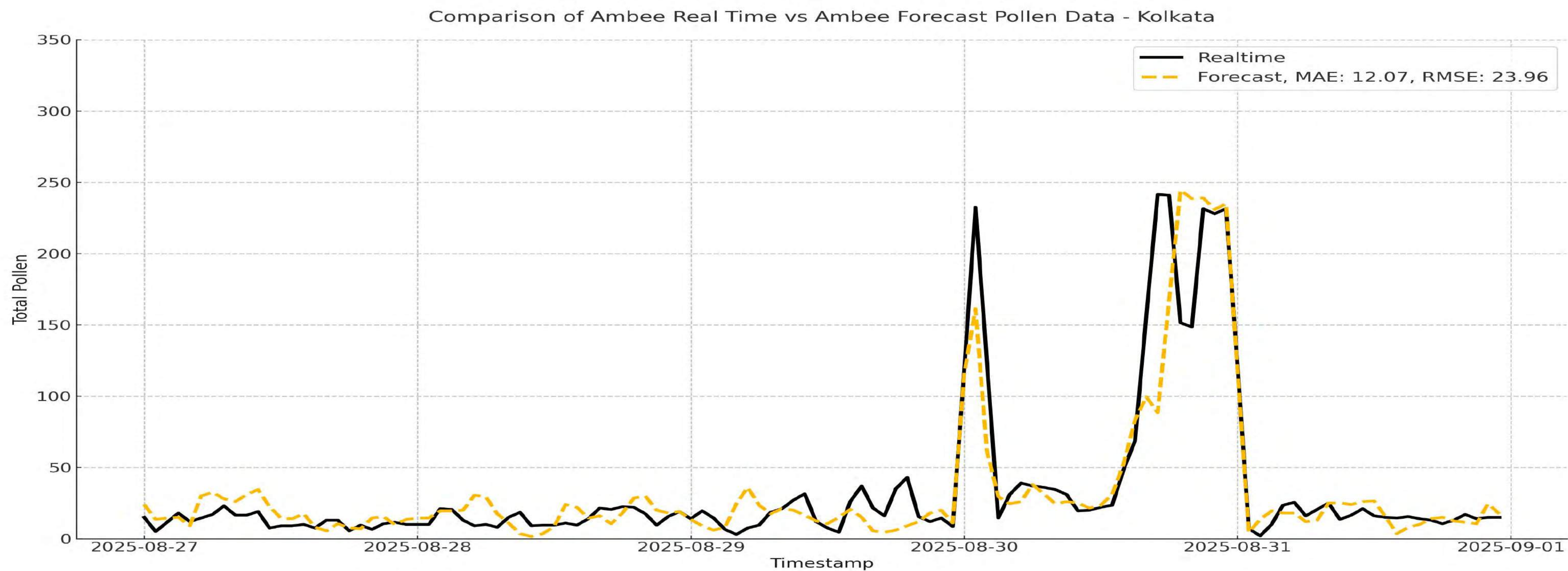


EXHIBIT 13 | Comparison of Ambee present pollen data with 5-day forecast for for Kolkata, India (Aug 27, 2025 - Aug 31, 2025).

Accuracy benchmark: 5-day pollen forecast - Khartoum, Sudan (AFR)

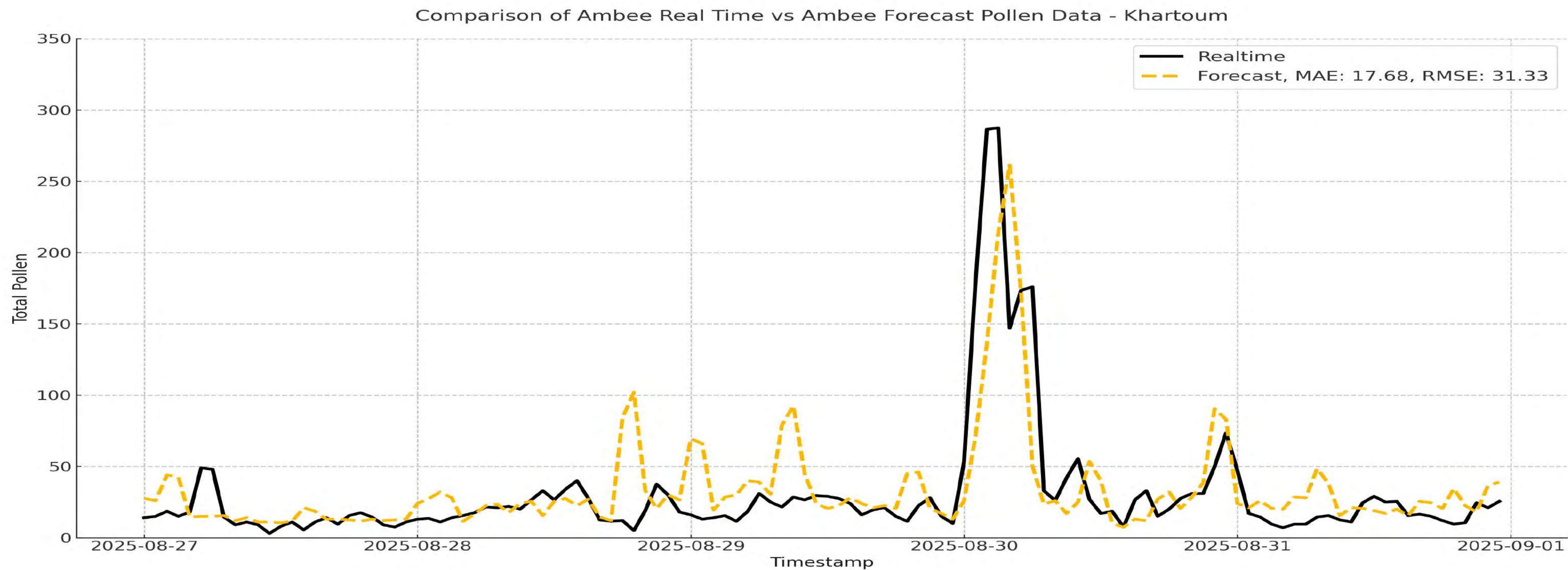


EXHIBIT 14 | Comparison of Ambee present pollen data with 5-day forecast for Khartoum, Sudan (Aug 27, 2025 - Aug 31, 2025).

2.2.5



Accuracy benchmark: 30-day pollen forecast

Accuracy benchmark: 30-day pollen forecast - Richmond VA, United States of America (NAR)

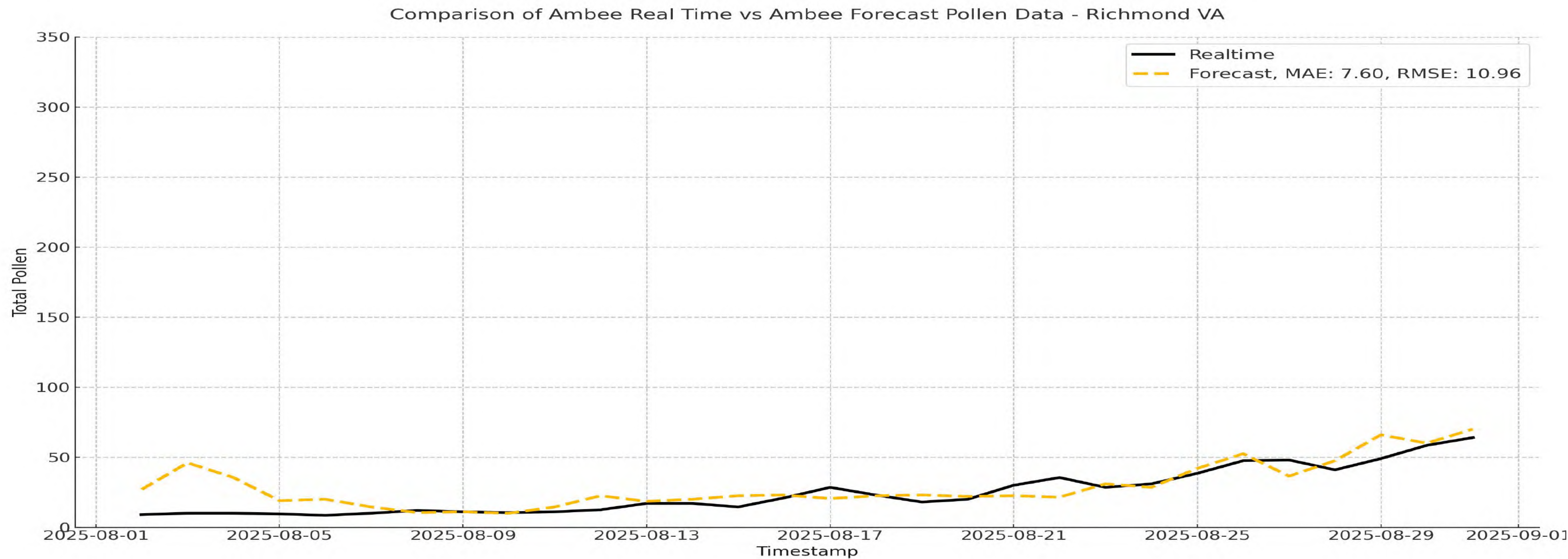


EXHIBIT 15 | Comparison of Ambee present pollen data with 30-day forecast for Richmond VA, USA (Aug 1, 2025 - Aug 29, 2025).

Accuracy benchmark: 30-day pollen forecast - Istanbul, Turkey (ASIA/EUR)

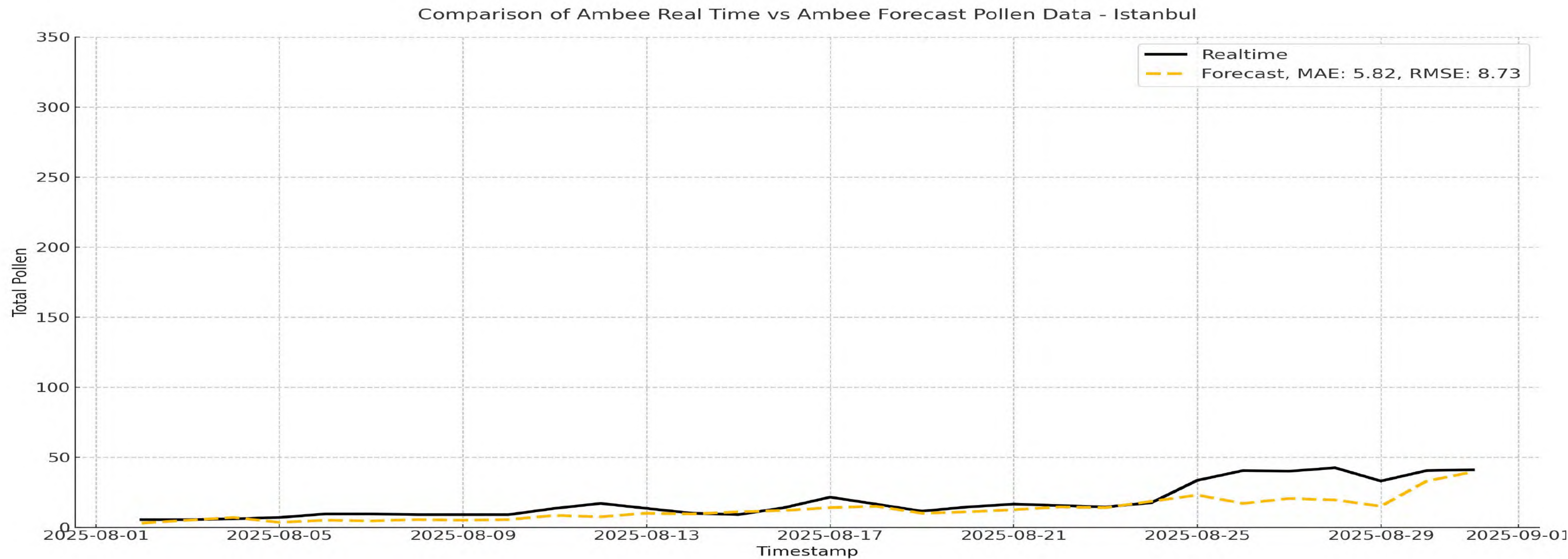


EXHIBIT 16 | Comparison of Ambee present pollen data with 30-day forecast for Istanbul, Turkey (Aug 1, 2025 - Aug 29, 2025).

Accuracy benchmark: 30-day pollen forecast - Adelaide, South Australia (AUS)

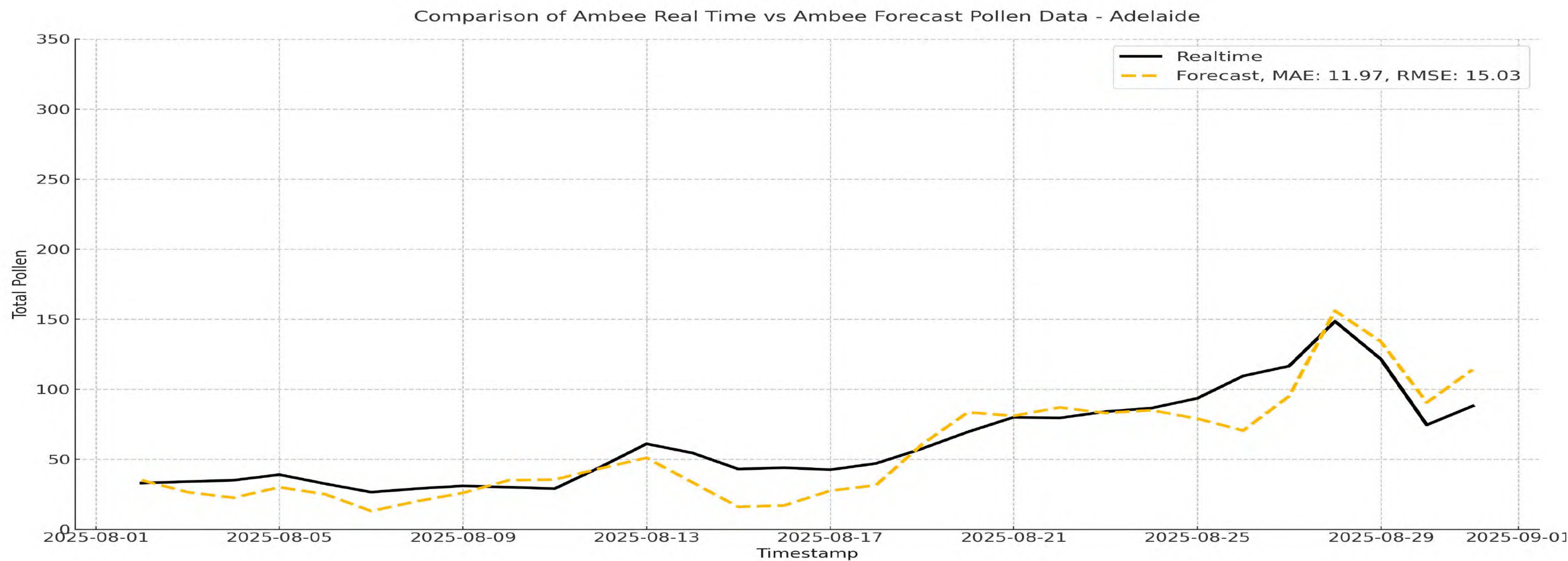


EXHIBIT 17 | Comparison of Ambee present pollen data with 30-day forecast for Adelaide, South Australia (Aug 1, 2025 - Aug 29, 2025).

Accuracy benchmark: 30-day pollen forecast - Delhi, India (ASIA)

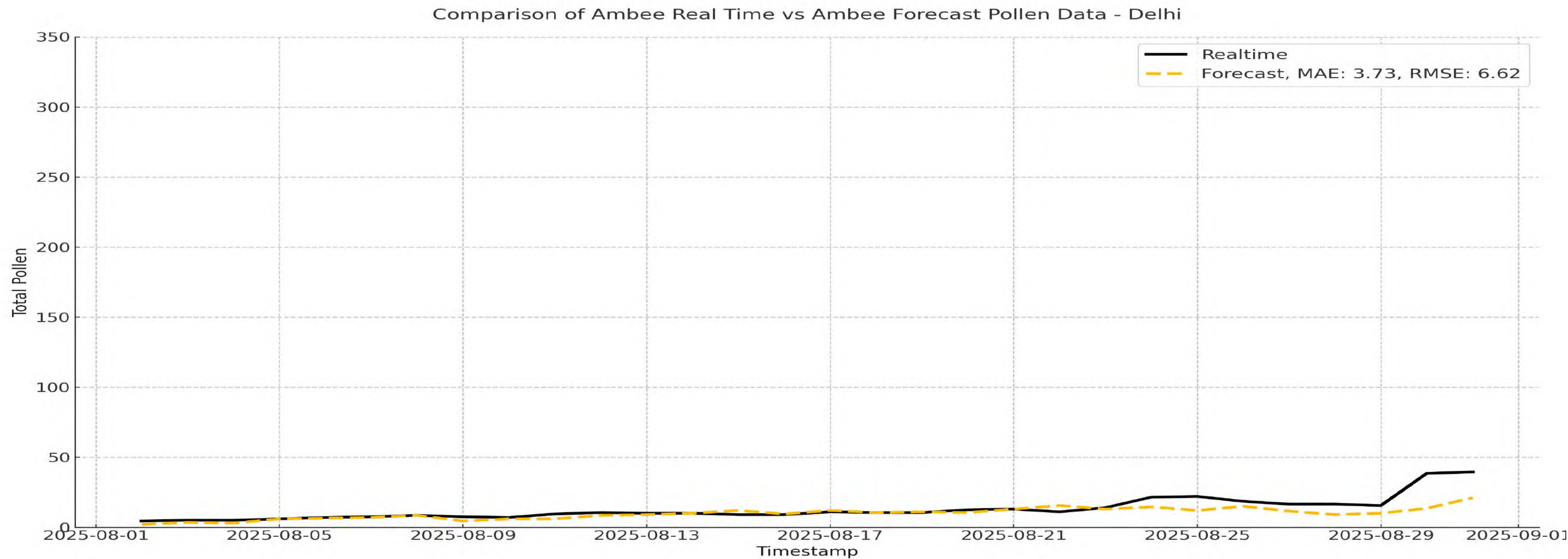


EXHIBIT 18 | Comparison of Ambee present pollen data with 30-day forecast for for Delhi, India (Aug 1, 2025 - Aug 29, 2025).

Accuracy benchmark: 30-day pollen forecast - Khartoum, Sudan (AFR)

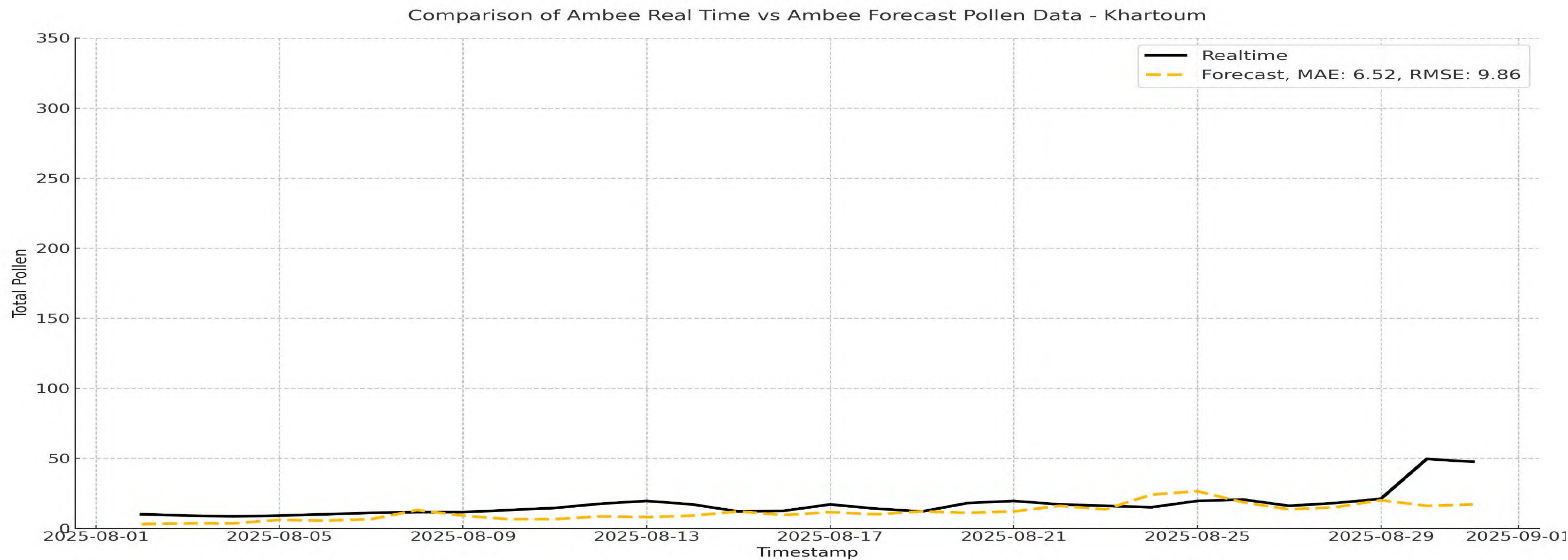


EXHIBIT 19 | Comparison of Ambee present pollen data with 30-day forecast for Khartoum, Sudan (Aug 1, 2025 - Aug 29, 2025).

Pollen forecast accuracy: 2-day, 5-day, and 30-day summary



RANK	CITY	CONTINENT	2-DAY MAE	5-DAY MAE	30-DAY MAE	2-DAY RMSE	5-DAY RMSE	30-DAY RMSE
1	Kolkata	Asia	17.55	12.07	6.05	35.34	23.96	14.12
2	Montreal	North America	19.73	15.95	10.50	27.27	22.30	13.69
3	Adelaide	Australia (Oceania)	14.38	27.10	11.97	20.30	41.62	15.03
4	Shanghai	Asia	25.75	16.91	7.50	36.12	25.79	11.08
5	Greenfield	North America	12.91	15.77	10.82	20.50	23.55	13.13

TABLE 6 | Pollen forecast accuracy: 2-day, 5-day, and 30-day summary



Validation methodology – pollen categories

Our approach: Post-forecast observation

We generated 30 day (1 Aug 2025 to 29 Aug 2025) tree, grass, weed pollen categories forecast using our predictive models. After the forecast period, we gathered real-time observational data from Ambee’s API, enabling a direct comparison between the predicted values and the real-time observations. This comparison assessed the accuracy of our predictions and validated the performance of our forecasting model during the specified timeframe.

LEGEND	DESCRIPTION
X-axis: (timestamp)	Represents the time period of 30 day (1 Aug 2025 to 29 Aug 2025) forecasts.
Y-axis (total pollen count)	Represents the total pollen count at any given time
Blue bar 	Represents the actual pollen actual risk levels
Orange bar 	Represents the forecasted pollen risk level recorded by Ambee's pollen API.

EXHIBIT 20 | Legend of accuracy benchmark for tree, grass, weed pollen 30-day forecasts

Accuracy benchmark: Pollen categories

QUICK ACCESS:

[Tree pollen](#) 

[Grass pollen](#) 

[Weed pollen](#) 

Accuracy benchmark: Tree pollen – Chicago, United States of America (NAR) TREE

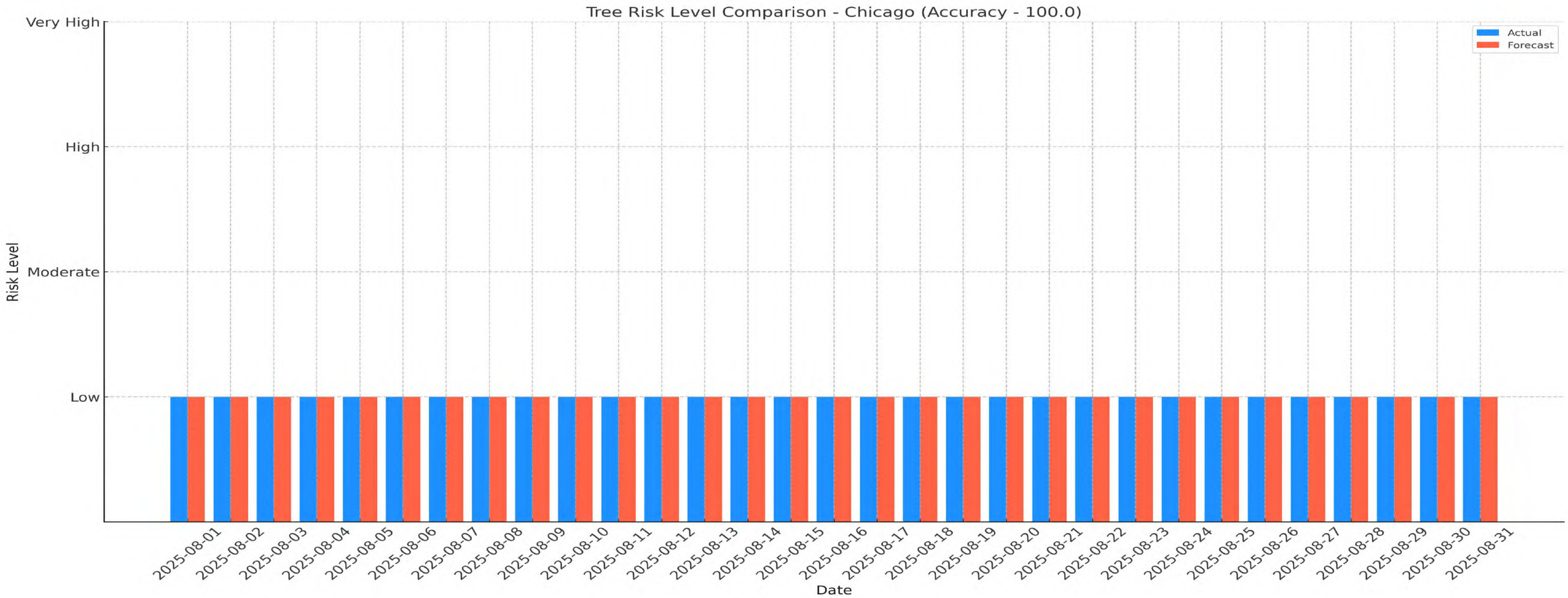


EXHIBIT 21 | Comparison of actual vs. forecasted tree pollen risk levels in Chicago, USA (August 2025).

Accuracy benchmark: Tree pollen – Paris, France (EUR) TREE

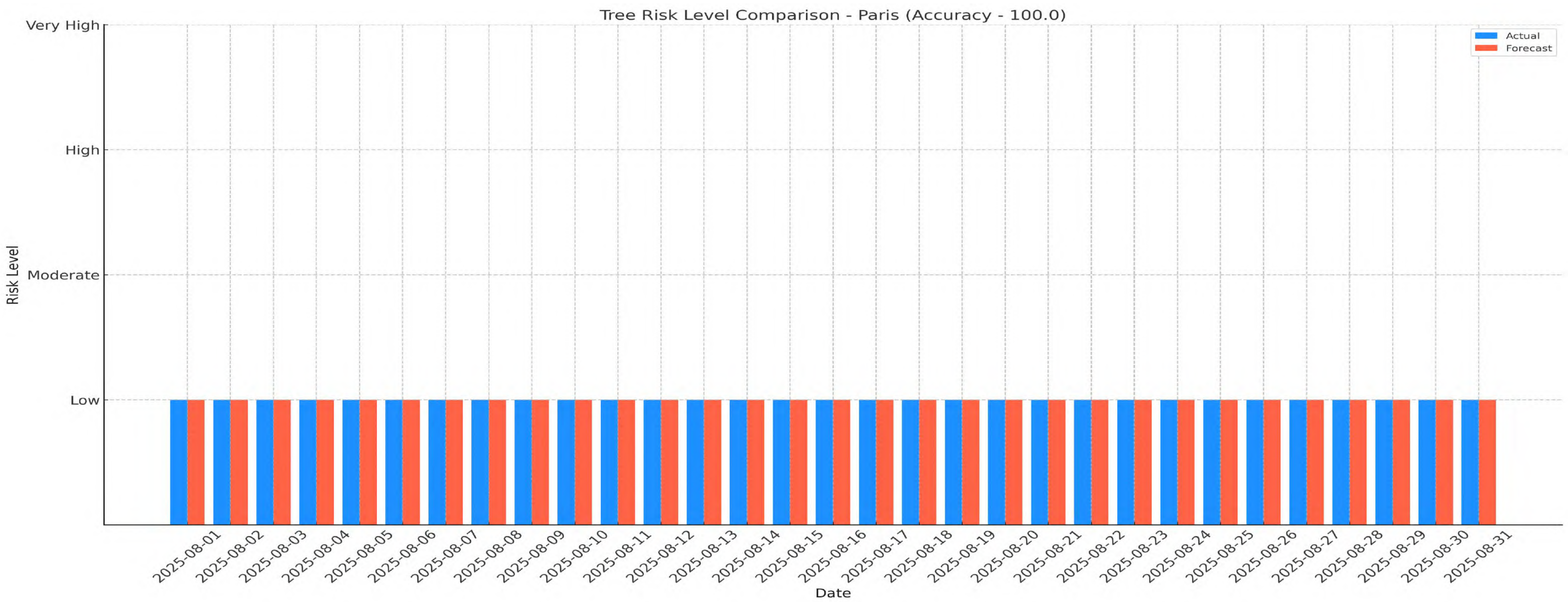


EXHIBIT 22 | Comparison of actual vs. forecasted tree pollen risk levels in Paris, France (August 2025).

Accuracy benchmark: Tree pollen - Perth, West Australia (AUS) TREE

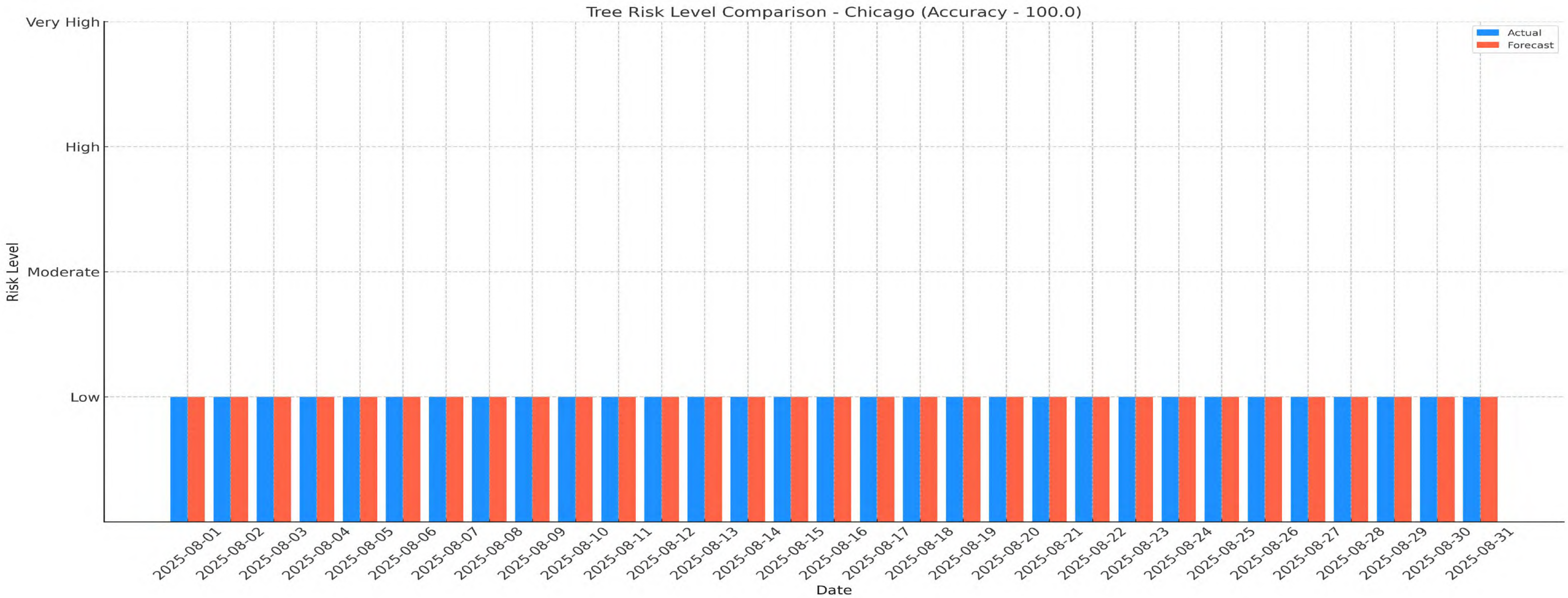


EXHIBIT 23 | Comparison of actual vs. forecasted tree pollen risk levels in Perth, West Australia (August 2025).

Accuracy benchmark: Tree pollen - Beijing, China (ASIA) TREE

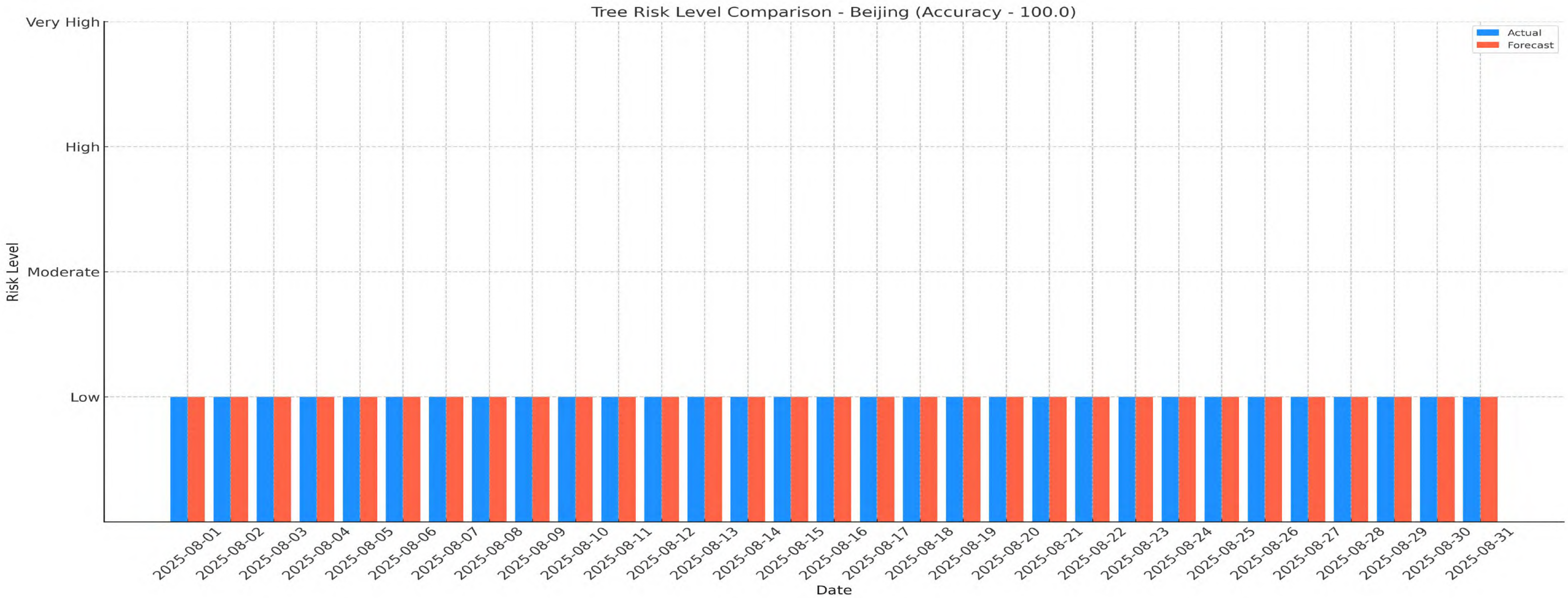


EXHIBIT 24 | Comparison of actual vs. forecasted tree pollen risk levels in Beijing, China (August 2025).

Accuracy benchmark: Tree pollen - Cairo, Egypt (AFR) TREE

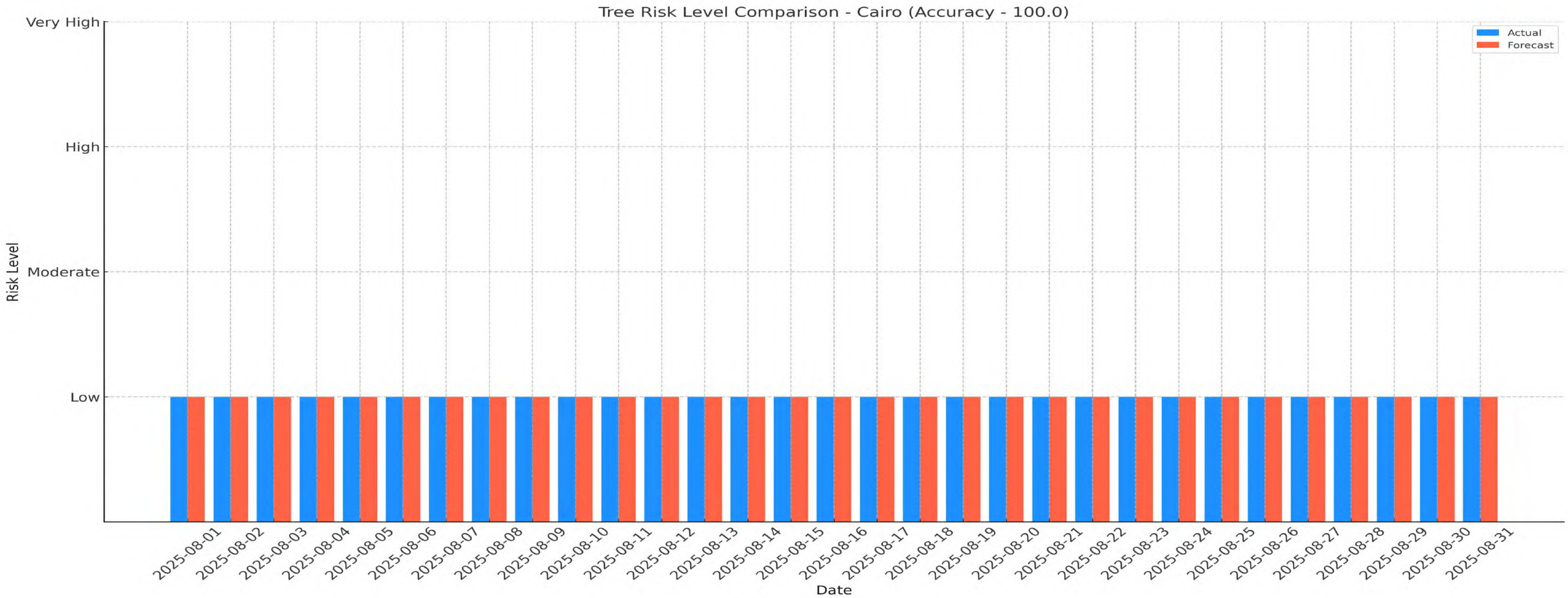


EXHIBIT 25 | Comparison of actual vs. forecasted tree pollen risk levels in Cairo, Egypt (August 2025).

Accuracy benchmark: Grass pollen – Chicago, United States of America (NAR)

GRASS

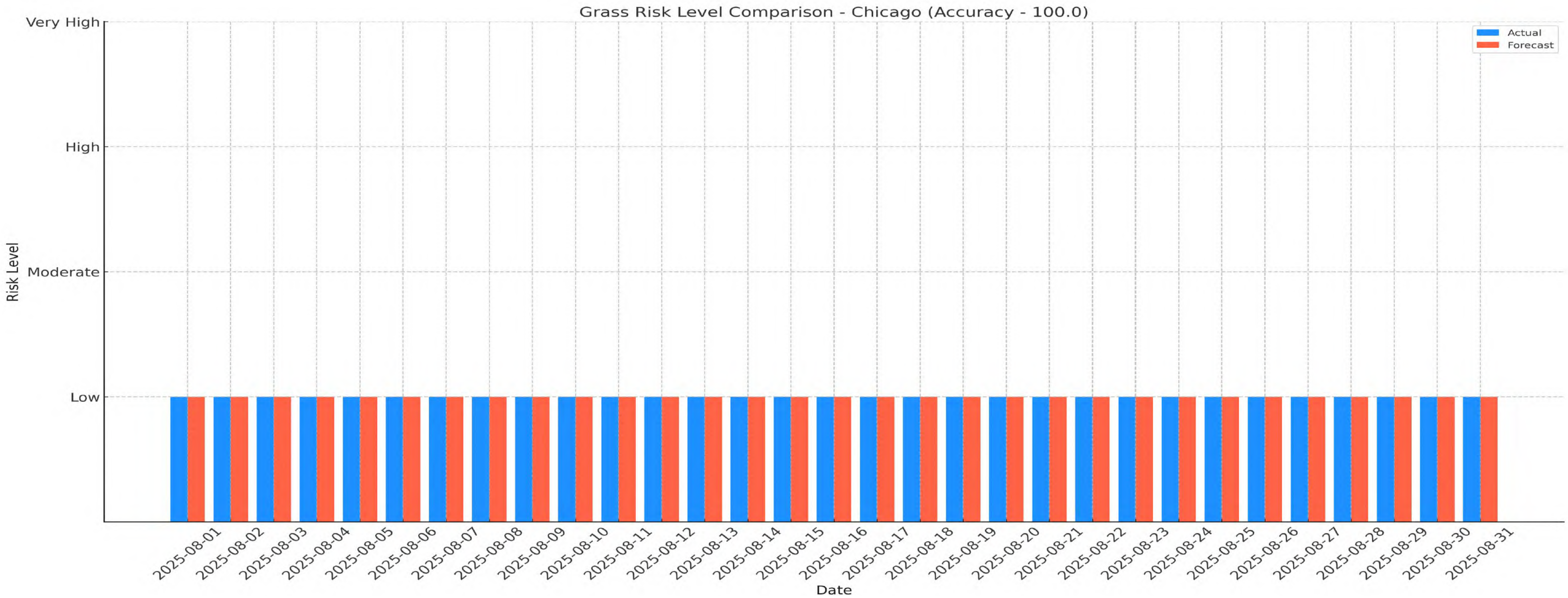


EXHIBIT 26 | Comparison of actual vs. forecasted grass pollen risk levels in Chicago, USA (August 2025).

Accuracy benchmark: Grass pollen – Paris, France (EUR) GRASS

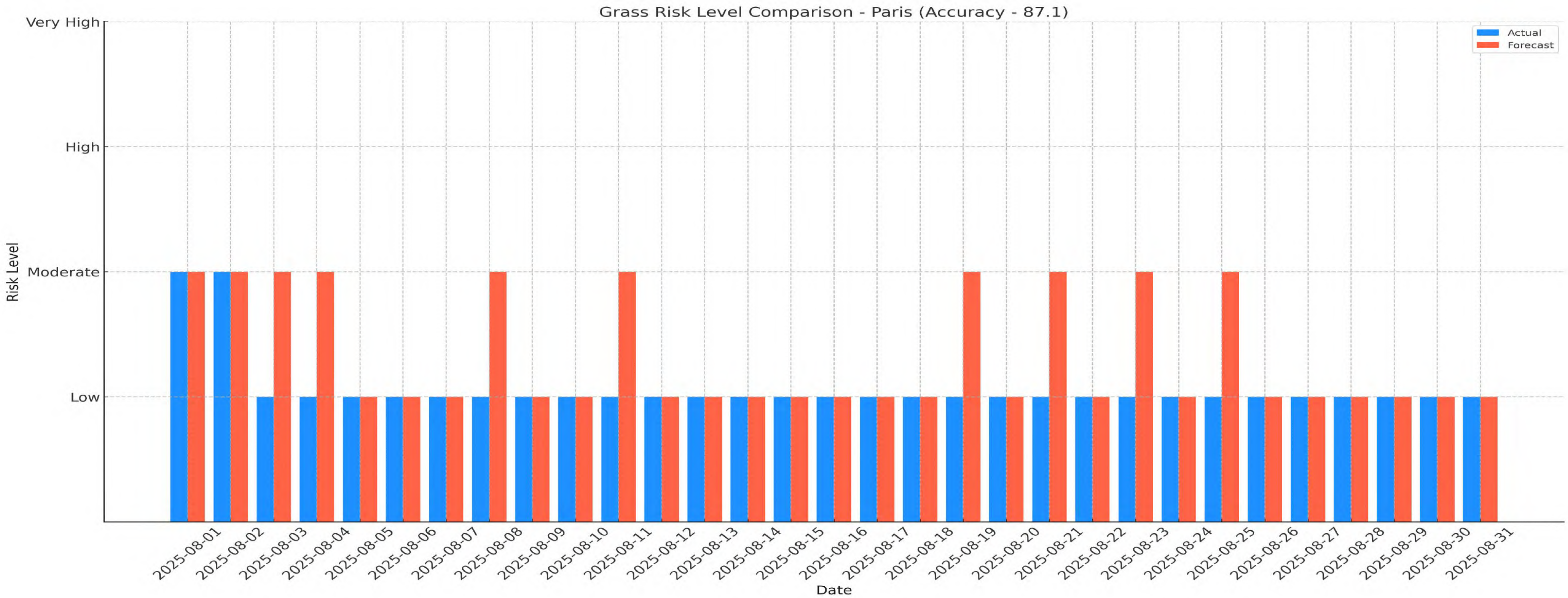


EXHIBIT 27 | Comparison of actual vs. forecasted grass pollen risk levels in Paris, France (August 2025).

Accuracy benchmark: Grass pollen – Perth, West Australia (AUS) GRASS

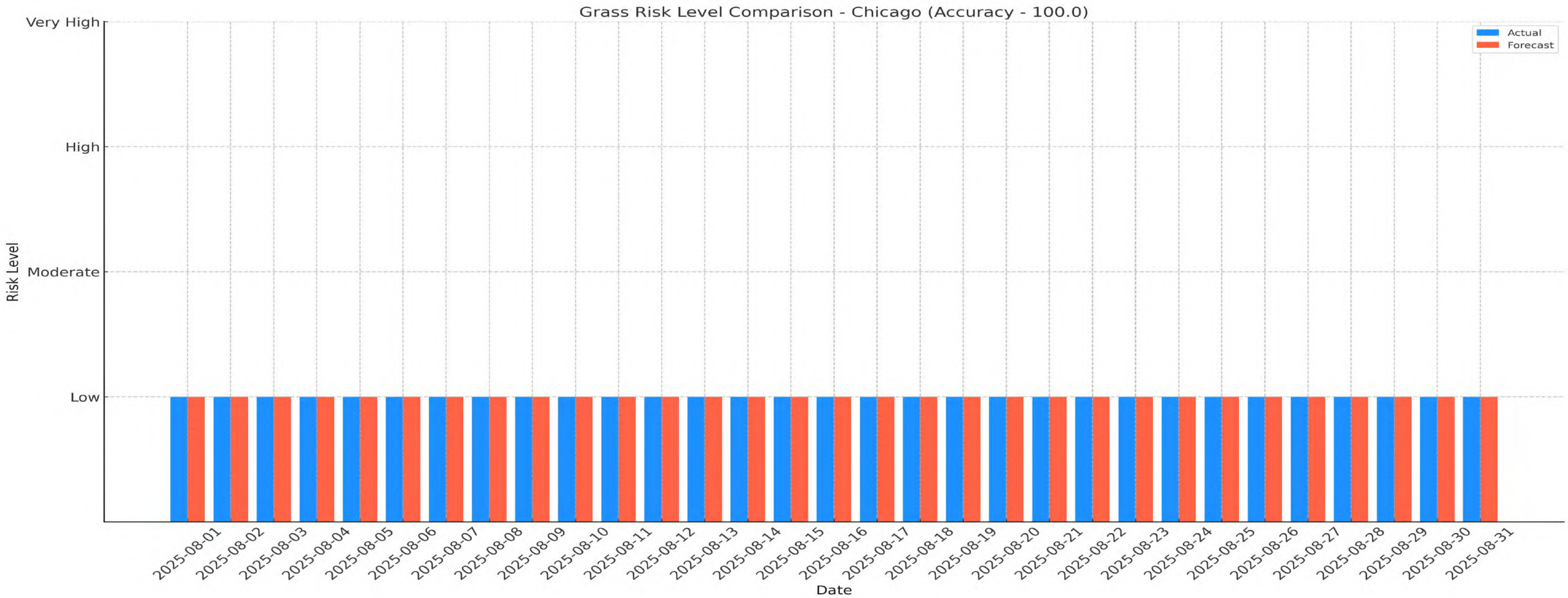


EXHIBIT 28 | Comparison of actual vs. forecasted grass pollen risk levels in Perth, Australia (August 2025).

Accuracy benchmark: Grass pollen – Beijing, China (ASIA) GRASS

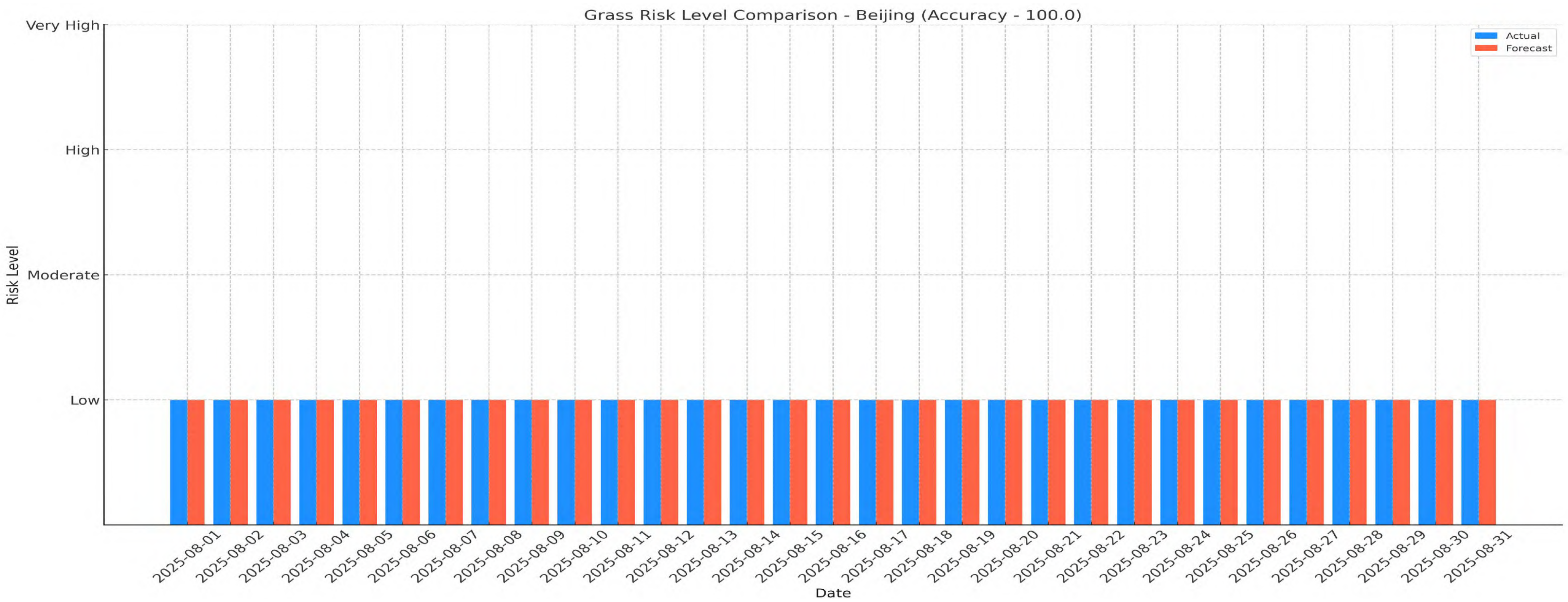


EXHIBIT 29 | Comparison of actual vs. forecasted grass pollen risk levels in Beijing, China (August 2025).

Accuracy benchmark: Grass pollen – Cairo, Egypt (AFR) GRASS

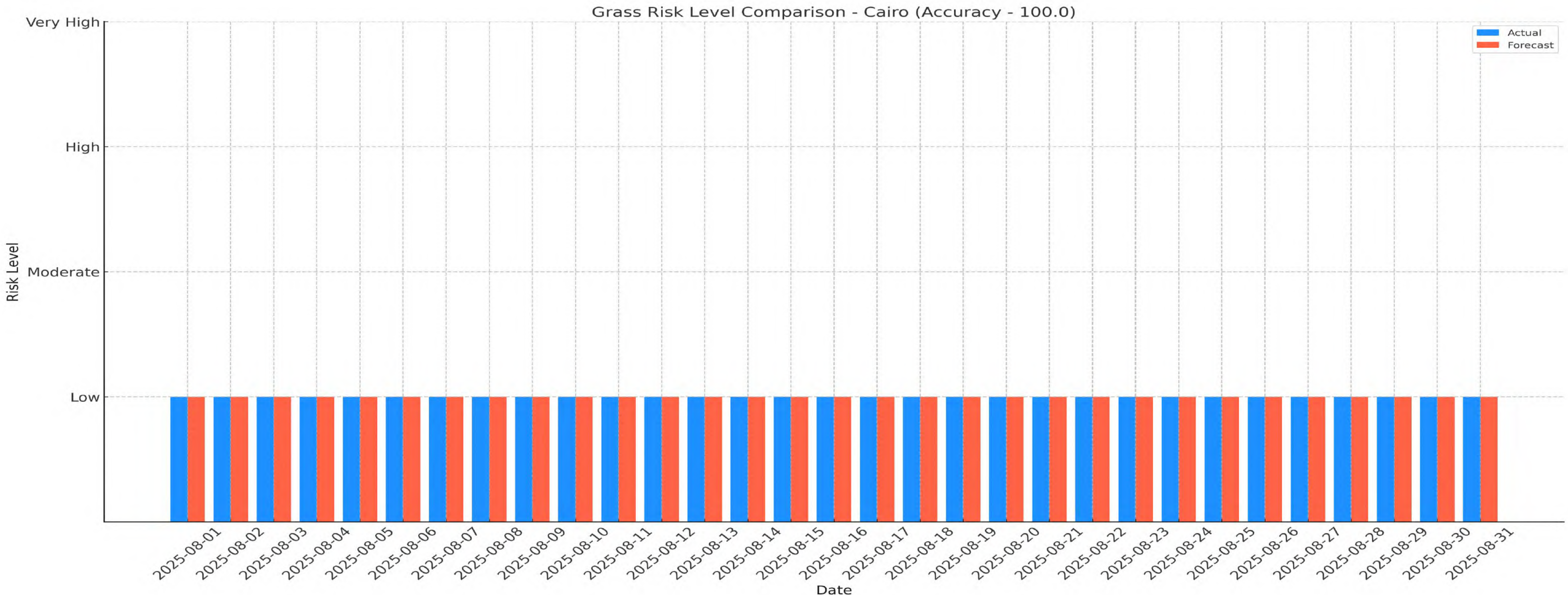


EXHIBIT 30 | Comparison of actual vs. forecasted grass pollen risk levels in Cairo, Egypt (August 2025).

Accuracy benchmark: Weed pollen - Chicago, United States of America (NAR) WEED

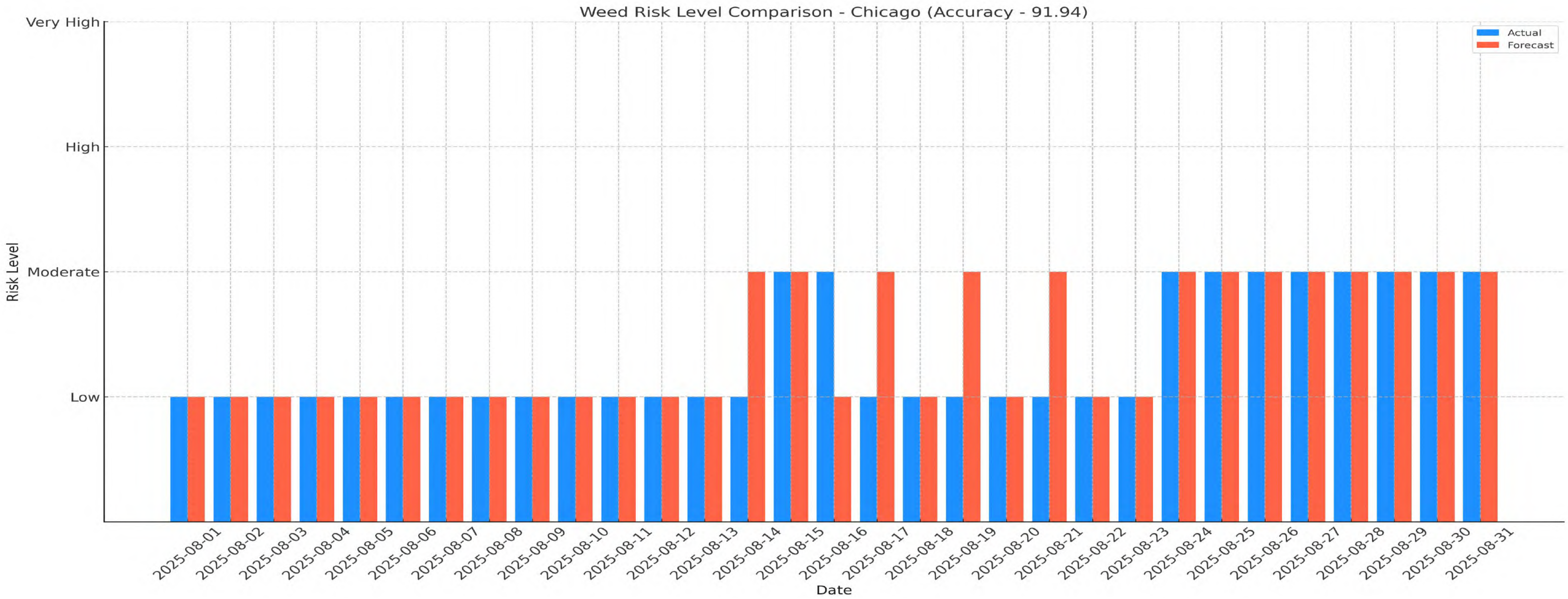


EXHIBIT 31 | Comparison of actual vs. forecasted weed pollen risk levels in Chicago, USA (August 2025).

Accuracy benchmark: Weed pollen - Paris, France (EUR) WEED

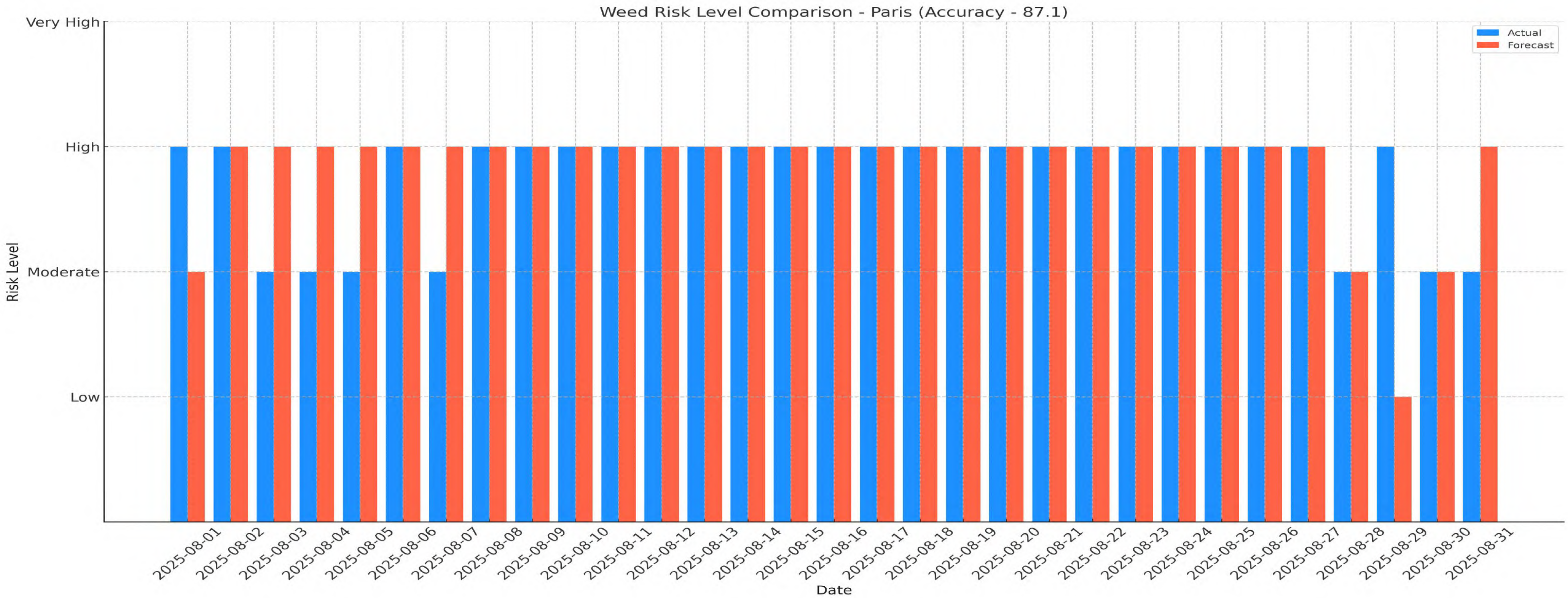


EXHIBIT 32 | Comparison of actual vs. forecasted weed pollen risk levels in Paris, France (August 2025).

Accuracy benchmark: Weed pollen – Perth, West Australia (AUS) WEED

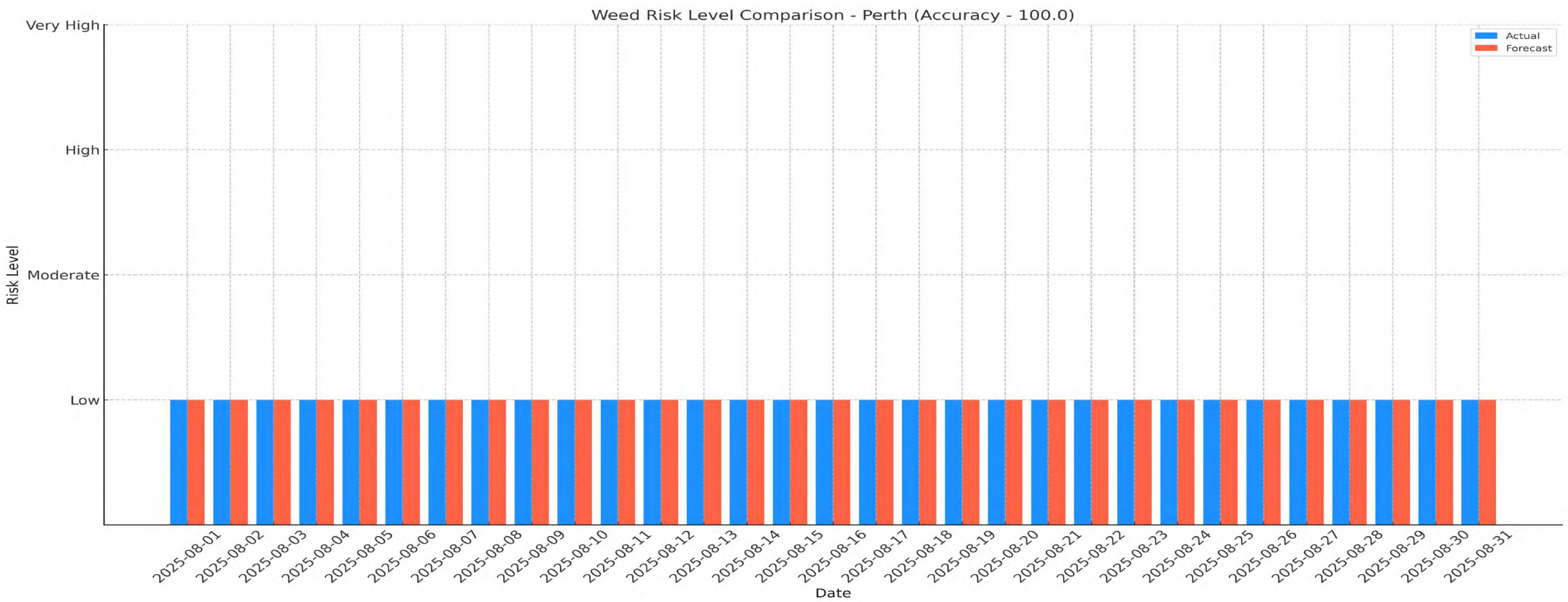


EXHIBIT 33 | Comparison of actual vs. forecasted weed pollen risk levels in Perth, West Australia (August 2025).

Accuracy benchmark: Weed pollen - Beijing, China (ASIA) WEED

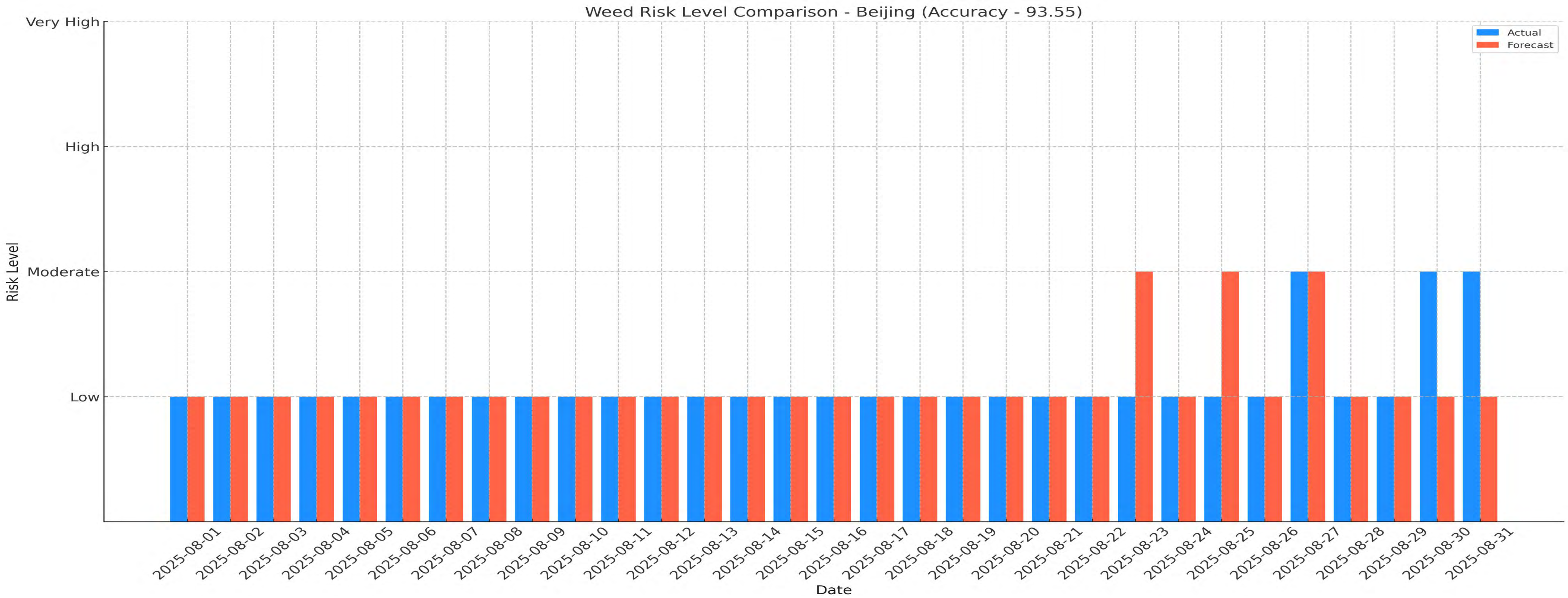


EXHIBIT 34 | Comparison of actual vs. forecasted weed pollen risk levels in Beijing, China (August 2025).

Accuracy benchmark: Weed pollen - Cairo, Egypt (AFR) WEED

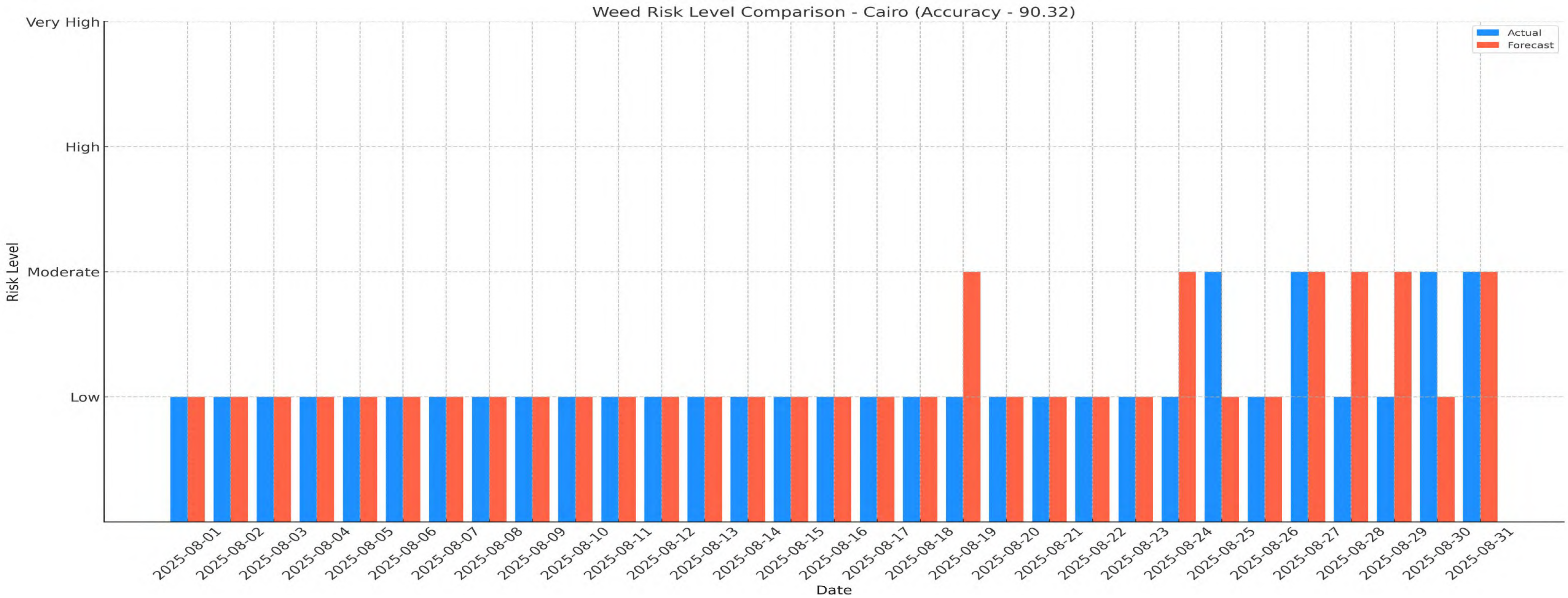


EXHIBIT 35 | Comparison of actual vs. forecasted weed pollen risk levels in Cairo, Egypt (August 2025).

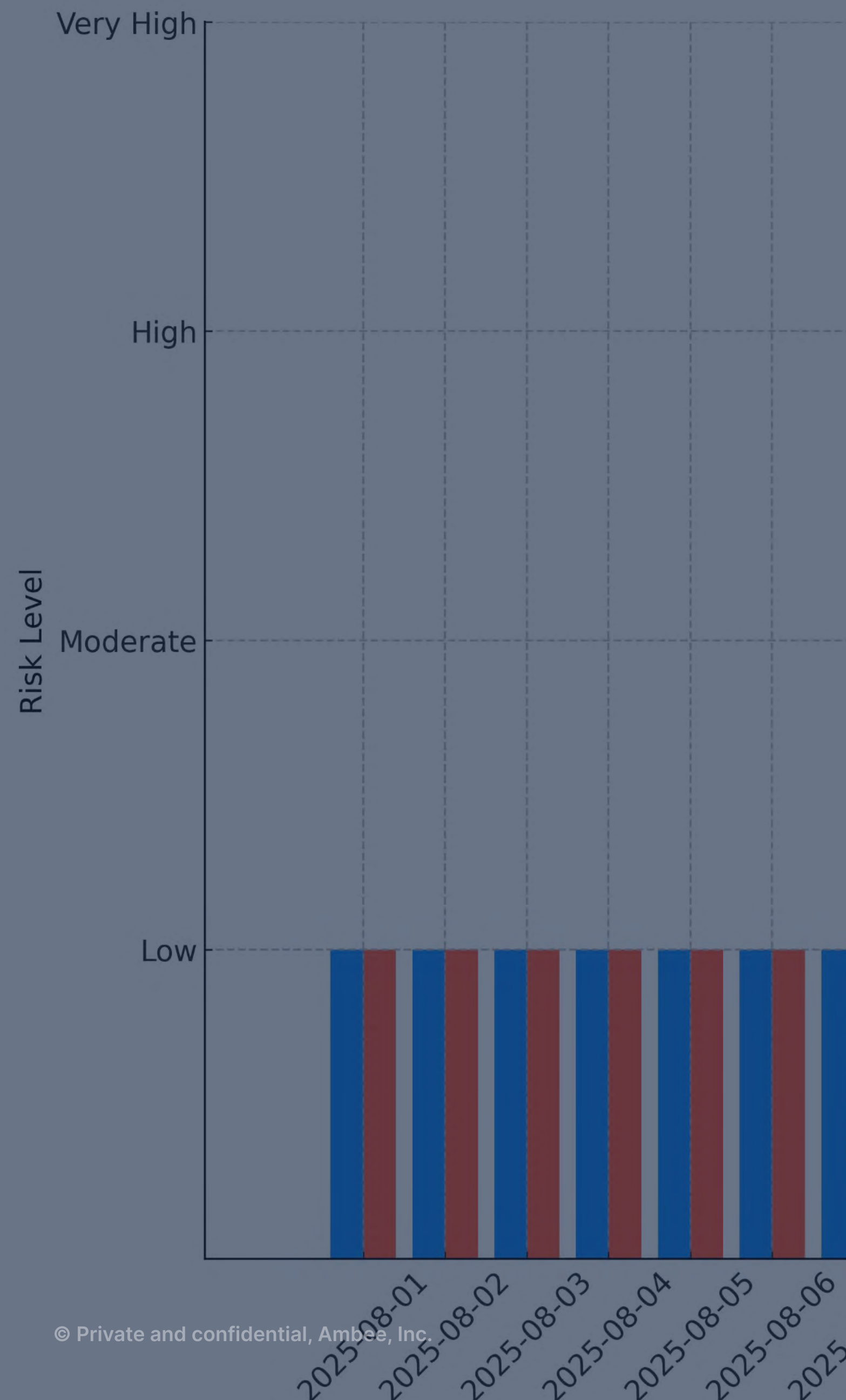


3. Appendix

QUICK ACCESS:

[Pollen forecast accuracy – additional comparisons](#) 

[Pollen category accuracy – additional comparisons](#) 



Pollen forecast accuracy – additional comparisons

2 DAY FORECAST

Mexico city, Mexico

Perth, Western Australia

5 DAY FORECAST

Greenfield, United States of America

Shanghai, China

30 DAY FORECAST

Chicago, United States of America

Alexandria, Egypt

Accuracy benchmark: 2-day pollen forecast – - Mexico City, Mexico (NAR)

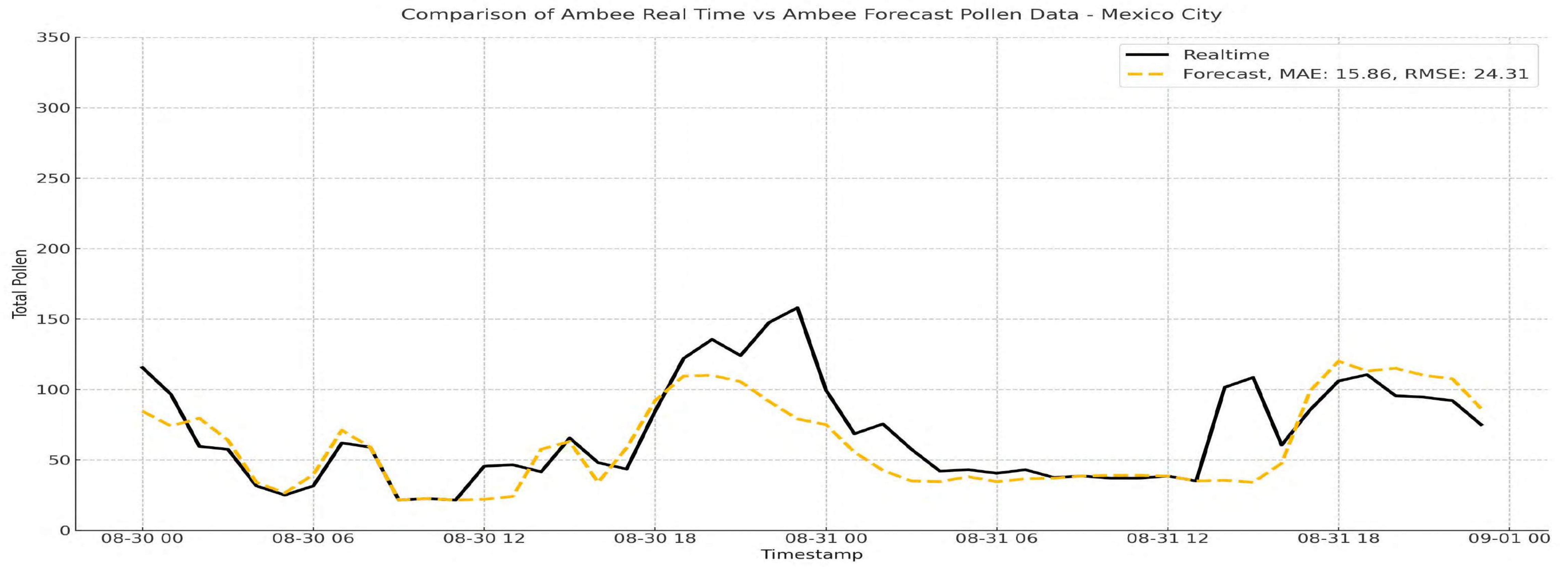


EXHIBIT 36 | Comparison of Ambee present pollen data with 2-day forecast for Mexico City, Mexico (Aug 30–31, 2025).

Accuracy benchmark: 2-day pollen forecast – - Perth, Western Australia (AUS)

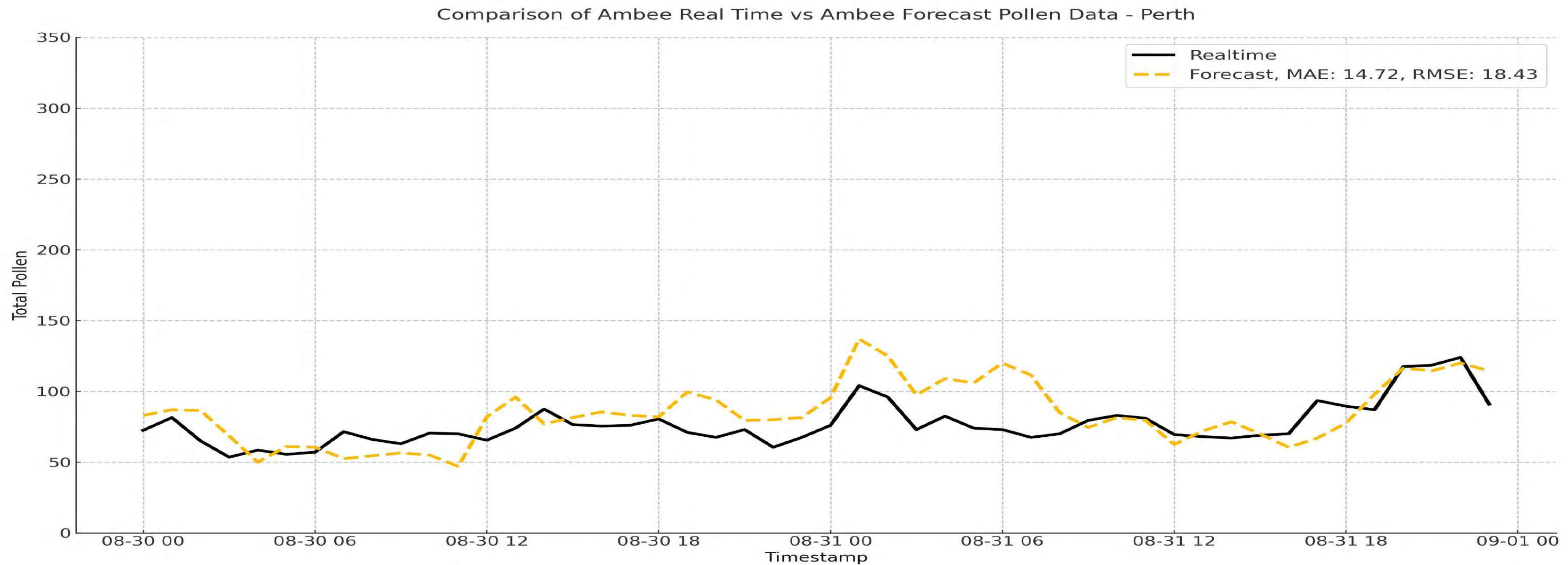


EXHIBIT 37 | Comparison of Ambee present pollen data with 2-day forecast for Perth, Western Australia (Aug 30-31, 2025).

Accuracy benchmark: 5-day pollen forecast - Greenfield, United States of America (NAR)

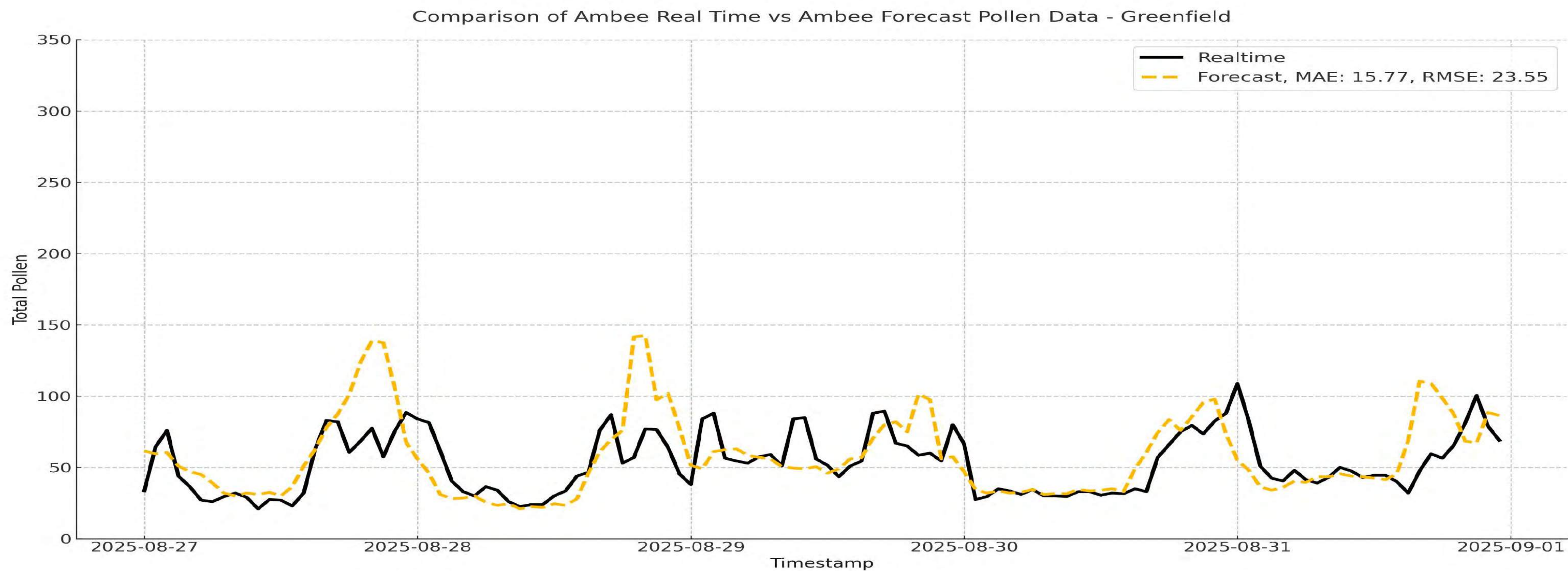


EXHIBIT 38 | Comparison of Ambee present pollen data with 2-day forecast for Greenfield, USA (Aug 30-31, 2025).

Accuracy benchmark: 5-day pollen forecast - Shanghai, China (ASIA)

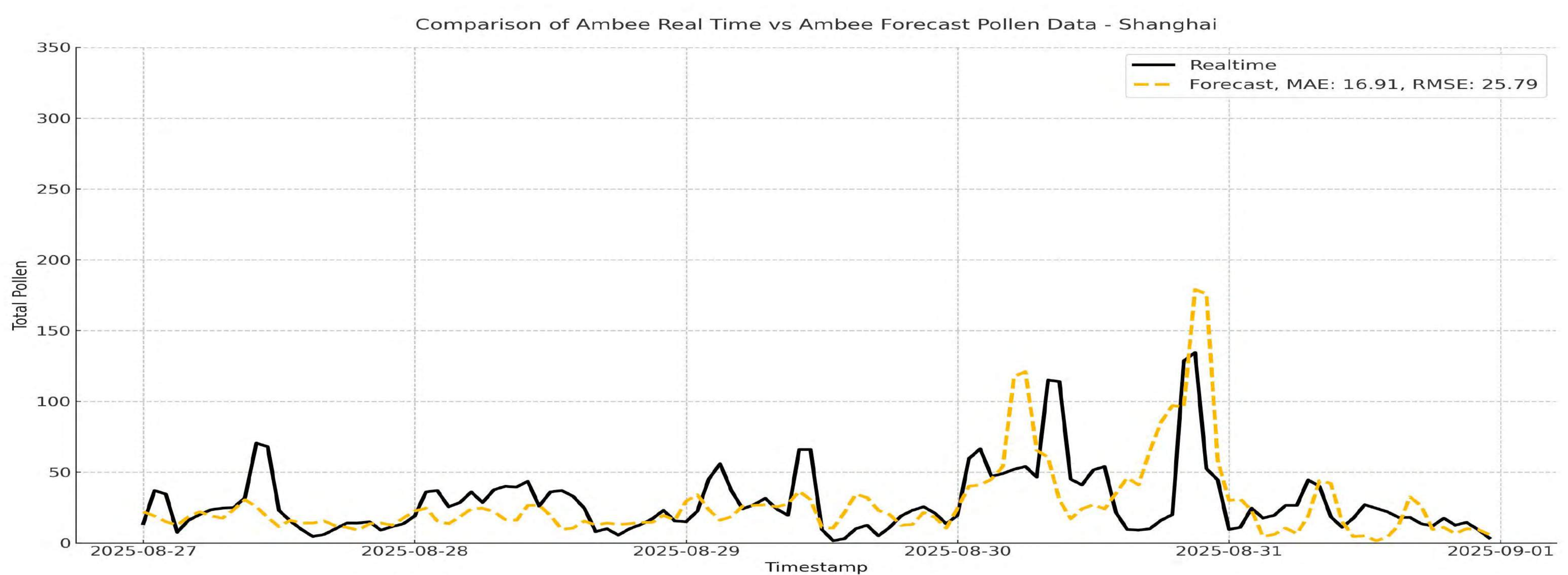


EXHIBIT 39 | Comparison of Ambee present pollen data with 5-day forecast for Shanghai, China (Aug 27, 2025 - Aug 31, 2025).

Accuracy benchmark: 30-day pollen forecast - Chicago, United States of America (NAR)

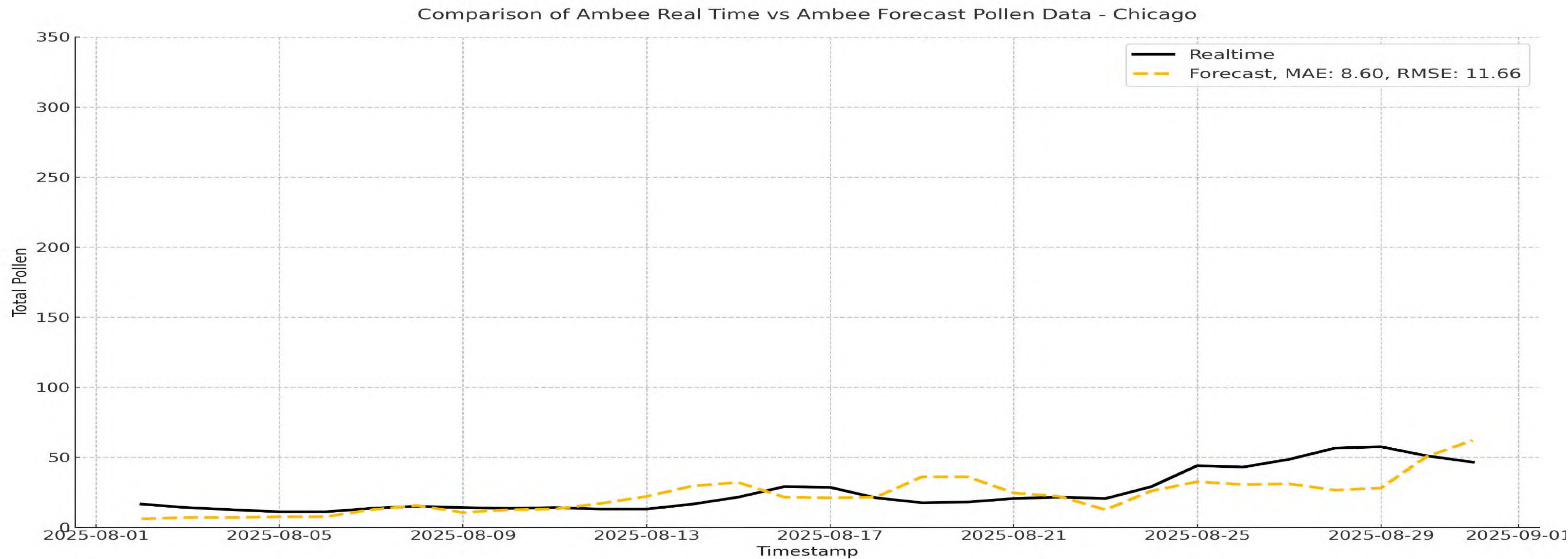


EXHIBIT 40 | Comparison of Ambee present pollen data with 30-day forecast for Chicago, USA (Aug 1, 2025 - Aug 29, 2025).

Accuracy benchmark: 30-day pollen forecast - Alexandria, Egypt (AFR)

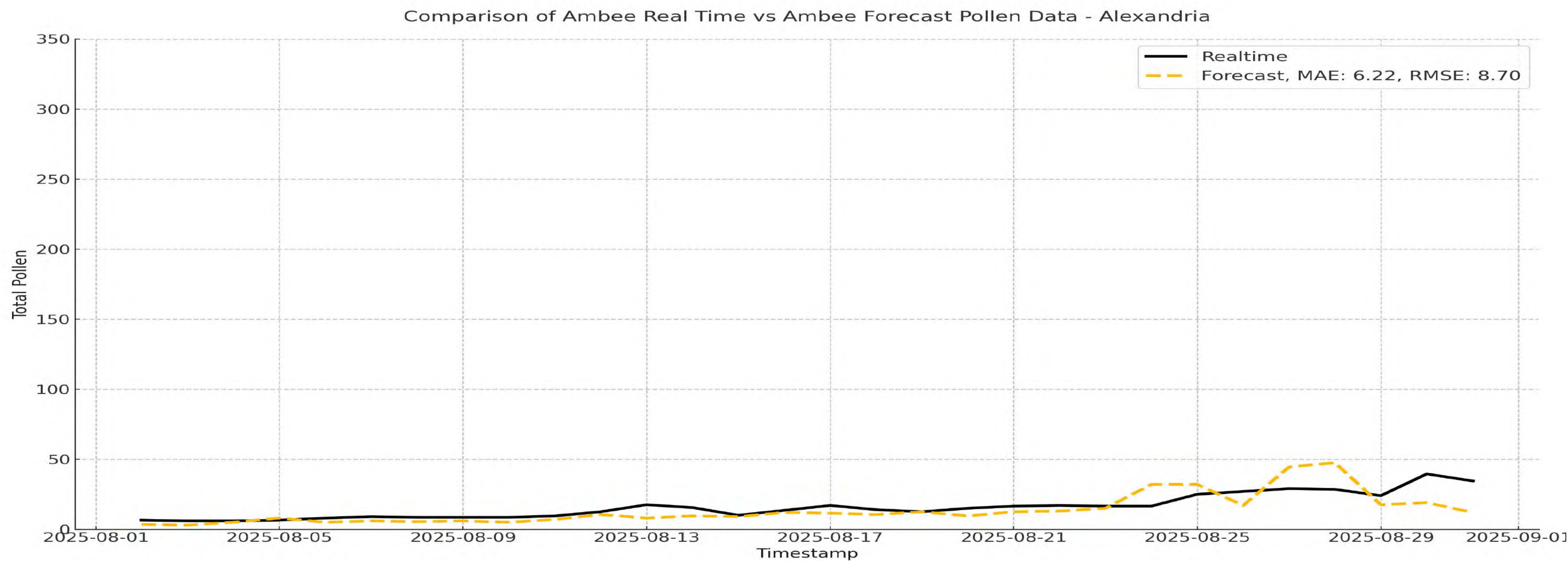


EXHIBIT 41 | Comparison of Ambee present pollen data with 30-day forecast for Alexandria, Egypt (Aug 1, 2025 - Aug 29, 2025).



Pollen category accuracy – additional comparisons

TREE	GRASS	WEED
Greenfield, United States of America	Greenfield, United States of America	Montreal, Canada
London, England	Istanbul, Turkey	Istanbul, Turkey

Accuracy benchmark: Tree pollen - Greenfield, United States of America (NAR) TREE

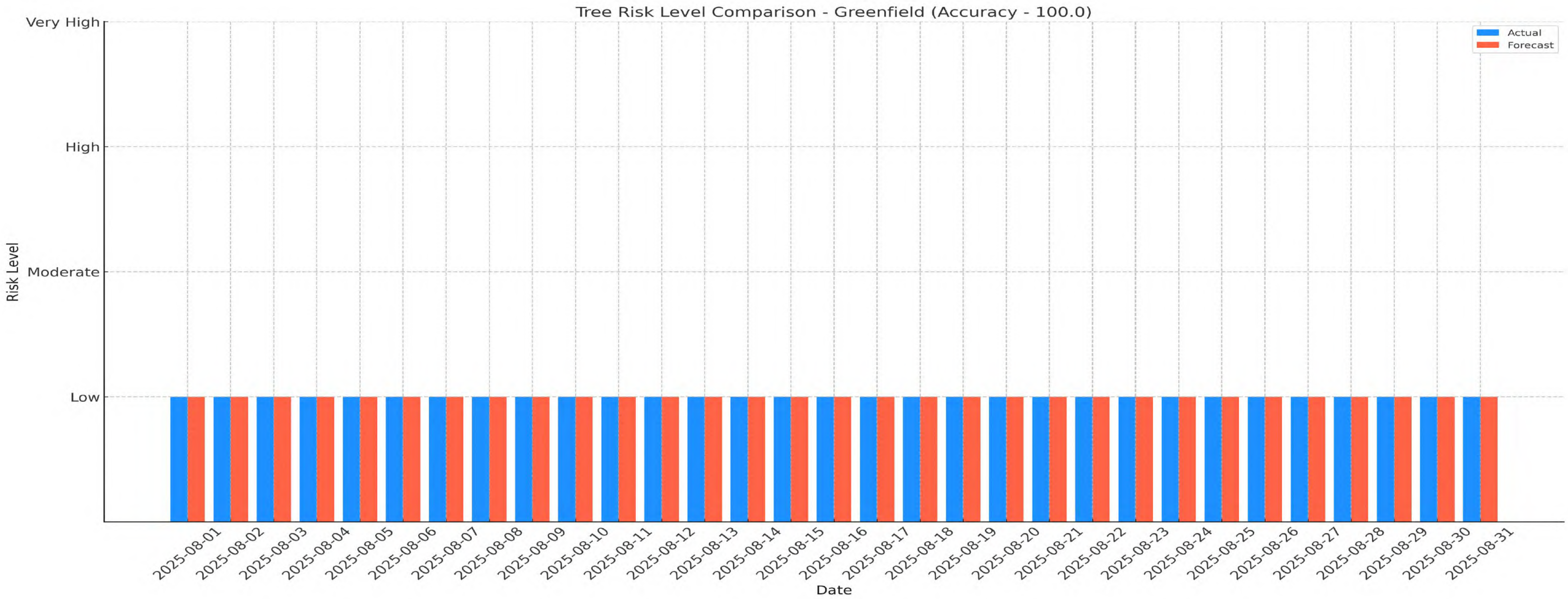


EXHIBIT 42 | Comparison of actual vs. forecasted tree pollen risk levels in Greenfield, USA (August 2025).

Accuracy benchmark: Tree pollen - London, England (EUR) TREE

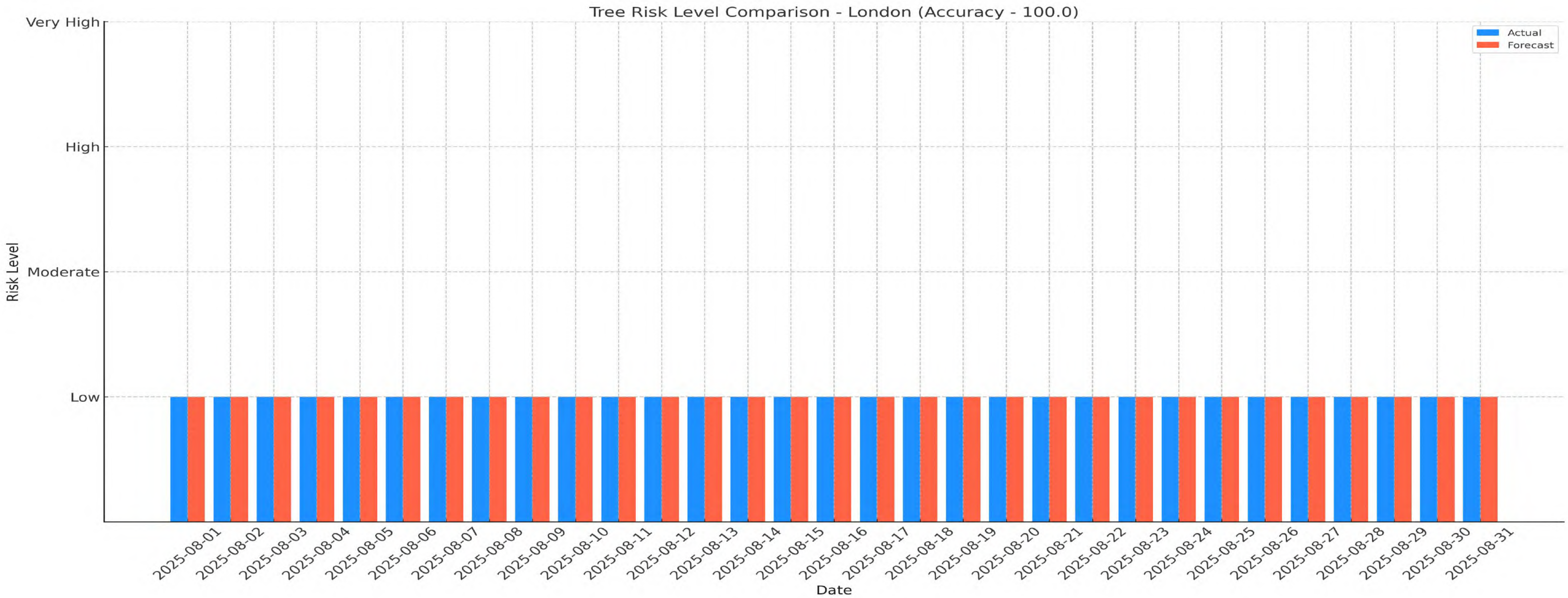


EXHIBIT 43 | Comparison of actual vs. forecasted tree pollen risk levels in London, England (August 2025).

Accuracy benchmark: Grass pollen - Greenfield, United States of America (NAR) GRASS

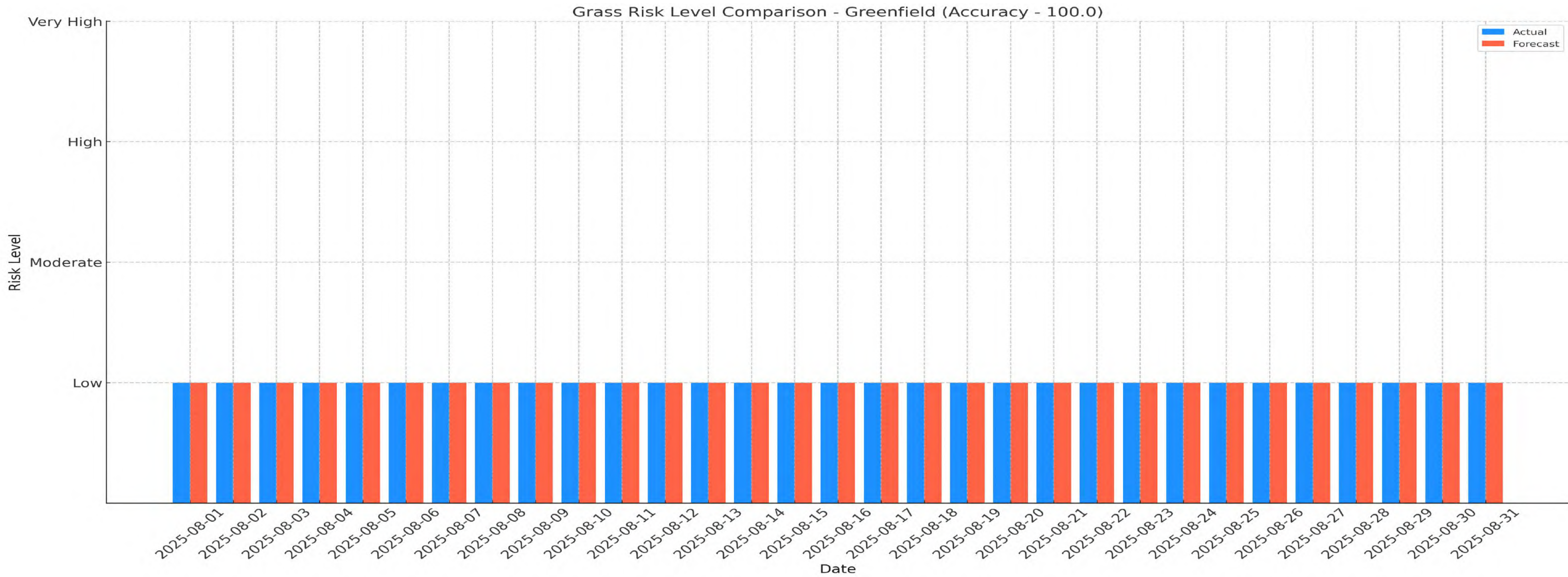


EXHIBIT 44 | Comparison of actual vs. forecasted grass pollen risk levels in Greenfield, USA (August 2025).

Accuracy benchmark: Grass pollen - Istanbul, Turkey (ASIA/EUR) GRASS

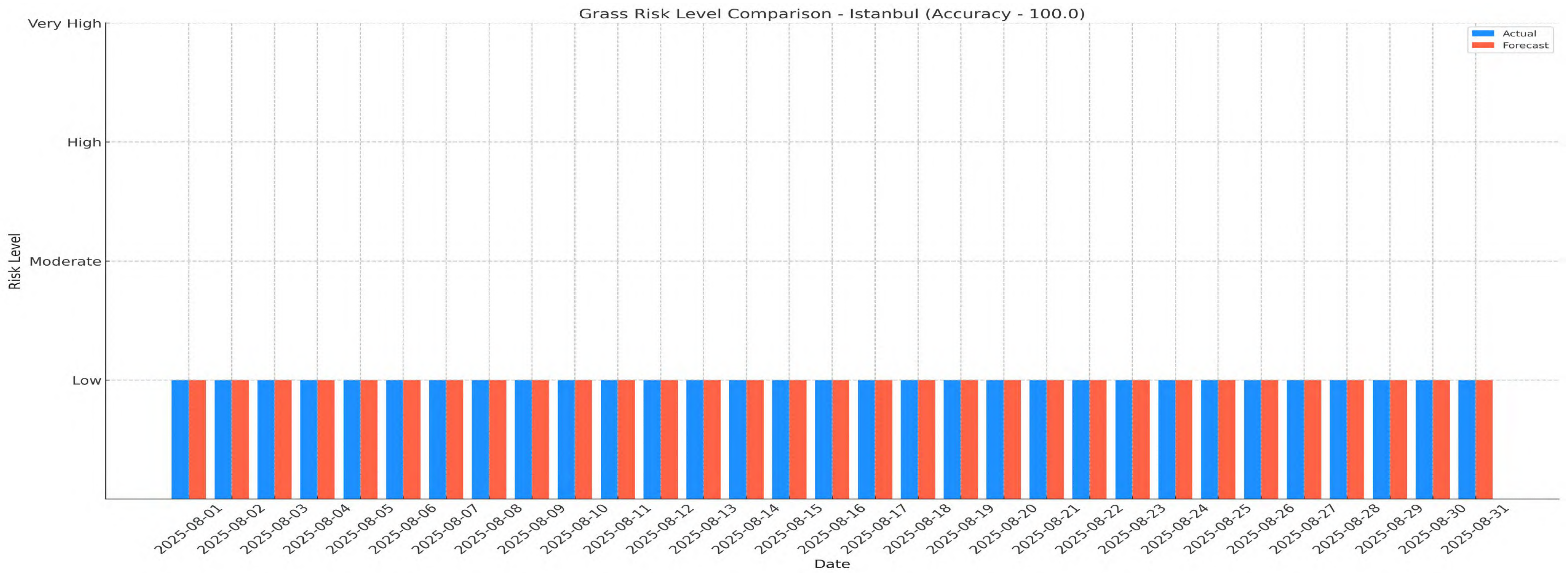


EXHIBIT 45 | Comparison of actual vs. forecasted Grass pollen risk levels in Istanbul, Turkey (August 2025).

Accuracy benchmark: Weed pollen - Montreal, Canada (NAR) WEED

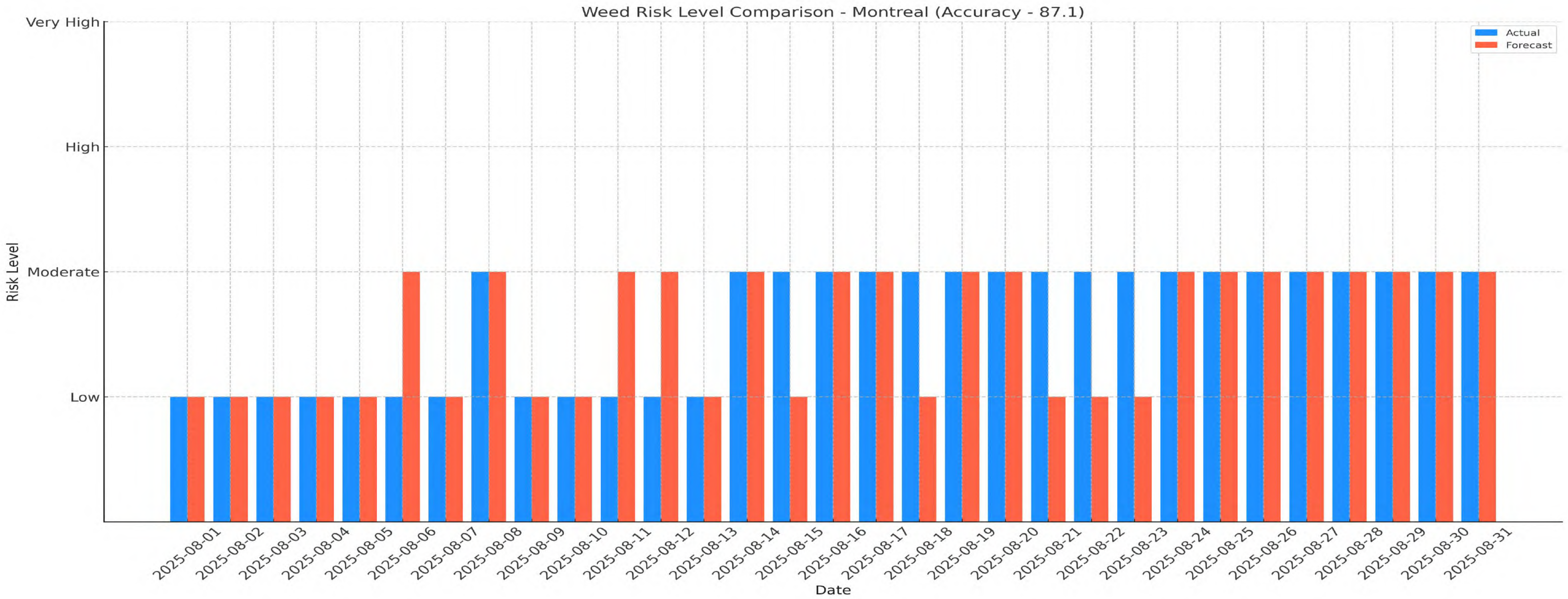


EXHIBIT 46 | Comparison of actual vs. forecasted weed pollen risk levels in Montreal, Canada (August 2025).

Accuracy benchmark: Weed pollen - Istanbul, Turkey (ASIA/EUR) WEED

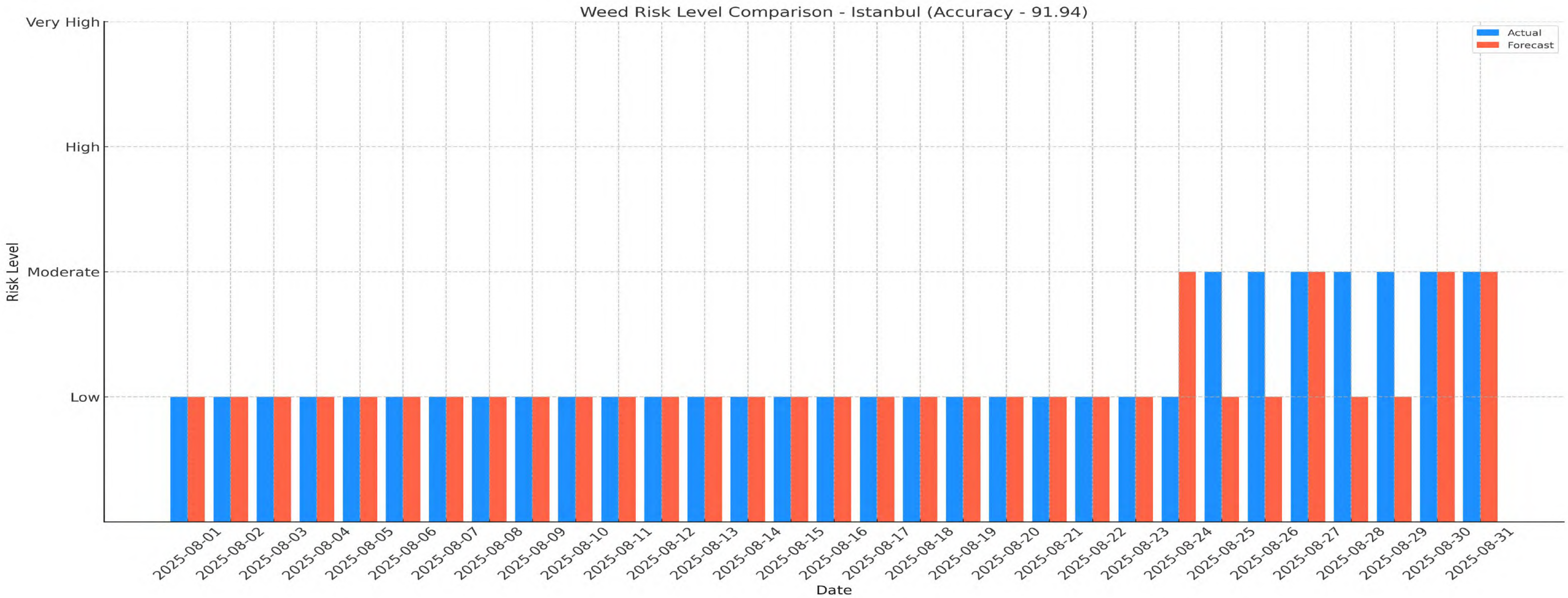


EXHIBIT 47 | Comparison of actual vs. forecasted weed pollen risk levels in Istanbul, Turkey (August 2025).

Questions? Ask away

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