US Urban Climate Analysis: 50 Metropolitan Areas (2021-2026)

Generated Report

January 30, 2026

Content

Executive Summary

This analysis examines **2,191,200** hourly weather observations across 50 major US metropolitan areas, providing climate intelligence for urban planning, energy forecasting, and risk assessment.

Data Window

Parameter	Value
Period	2021-01-31 to 2026-01-30
Cadence	Hourly
Cities	50 US metros
Source	Open-Meteo Historical Weather API (ERA5 reanalysis)
Observations	2,191,200

Note: ERA5 reanalysis provides modeled estimates suitable for comparative climate patterns; not a substitute for certified station records.

Key Findings

- **Average Temperature:** 61.14°F (all cities)
- **Record High:** 117.9°F (Fresno, 2024-07-07)
- **Record Low:** -33.6°F (Denver, 2024-01-16)
- **Temperature Trend:** -0.112°F/year (2021-2025)
- Computed on 5 full calendar years; partial years excluded

Annual Temperature Analysis

Year	Avg Temperature (°F)	Notes
2021	62.6°F	Full year
2022	60.43°F	Full year
2023	61.32°F	Full year
2024	61.83°F	Full year
2025	61.34°F	Full year
2026 (YTD)	40.69°F	Partial year (excluded from trend)

City Rankings

Hottest Cities (5-Year Average)

City	Avg Temp (°F)
Miami	76.87°F
Mesa	75.26°F
Honolulu	75.23°F
Phoenix	74.92°F
Tampa	73.3°F

Coldest Cities (5-Year Average)

City	Avg Temp (°F)
Detroit	51.35°F
Denver	50.54°F
Milwaukee	49.67°F
Minneapolis	47.01°F
Anchorage	36.94°F

Extreme Weather Analysis

Threshold Definitions

Event Type	Threshold
Heat	>=95°F daily max
Frost	<=32°F daily min
Cold Snap	<=23°F daily min
Heavy Rain	>=1.0 in/day
High Wind	>=40 mph

Configurable operational thresholds for risk screening

Event Counts (City-Days)

Event Type	City-Days
Heat Days	6,207
Frost Days	12,157
Cold Snap Days	4,880
Heavy Rain Days	1,949
High Wind Days	13

Unique Extreme Days

Metric	Value	Definition
Unique Extreme Days	20,240	City-days with at least one threshold breached
Total City-Days	91,300	Cities × days in analysis period
Extreme Day Rate	22.17%	Unique extreme days / total city-days

Note: A city-day with multiple extreme events (e.g., frost + high wind) is counted once in "Unique Extreme Days" but multiple times in individual event counts.

Energy Demand Indicators

Heating Degree Days (Base 65°F)

City	HDD (5-Year Total)
Anchorage	51,307
Minneapolis	36,925
Milwaukee	31,780
Denver	30,752
Detroit	29,200

Cooling Degree Days (Base 65°F)

City	CDD (5-Year Total)
Mesa	23,831
Phoenix	23,690
Miami	22,029
Las Vegas	20,005
Honolulu	18,688

Degree days computed daily: HDD = max(0, 65 - daily_avg_temp); CDD = max(0, daily_avg_temp - 65)

Precipitation

Wettest Cities (5-Year Total)

City	Total Precipitation (in)
Houston	364.74"
Nashville	343.03"
Orlando	338.8"
New Orleans	333.35"
Miami	310.67"

Heavy precipitation hours: 823 (>0.5 inches hourly accumulation)

Regional Analysis

Region	Cities	Avg Temp (°F)	Avg Humidity (%)
Southwest	6 (Phoenix, Las Vegas, Tucson...)	69.82°F	33.42%
Texas	5 (Houston, Dallas, San Antonio...)	69.78°F	66.08%
Southeast	9 (Atlanta, Miami, Jacksonville...)	67.66°F	73.36%
West Coast	8 (Los Angeles, San Francisco, San Diego...)	59.67°F	68.59%
Pacific	2 (Honolulu, Anchorage)	56.09°F	74.51%
Northeast	5 (New York, Boston, Philadelphia...)	54.64°F	69.58%
Mountain	2 (Denver, Louisville)	54.1°F	61.61%
Midwest	11 (Chicago, Detroit, Minneapolis...)	53.08°F	69.79%

Methodology

Data Source

- **Provider:** Open-Meteo Historical Weather API
- **Dataset:** ERA5 reanalysis (ECMWF)
- **Resolution:** Hourly, interpolated to city coordinates
- **Variables:** Temperature, humidity, precipitation, wind speed, pressure

Limitations

- ERA5 is a reanalysis product (modeled estimates), not direct station observations
- Suitable for comparative climate patterns and trend analysis
- Not a substitute for certified weather station records
- Partial years (2026) excluded from trend calculations

Verification

- **API Documentation:** https://open-meteo.com/en/docs/historical-weather-api
- **ERA5 Documentation:** https://www.ecmwf.int/en/forecasts/dataset/ecmwf-reanalysis-v5

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