

Station and Data Provenance -- KTUP (2021–2025)

Surface station

Station KTUP TUPELO REGIONAL AIRPORT, MS
ICAO / WBAN / USAF KTUP / 93862 / 723320
GHCNh station ID USW00093862
Latitude, longitude 34.2620 N, 88.7710 W
Elevation 103.8 m MSL
Wind reference height 10.0 m Temperature reference height: 2.0 m

Upper air station

Station USM00072235 JACKSON/ALLEN C. THOMPSON FIE
Latitude, longitude 32.3189 N, 90.0800 W Elevation: 90.7 m MSL
Separation 248 km SSW of KTUP

Processing

Software AERMET 26135 | AERMINUTE 26135 | AERSURFACE 26135 (NLCD 2021)
Surface observations NCEI GHCNh hourly (replaces the discontinued ISHD)
Winds NCEI ASOS 1–minute and 5–minute, hourly–averaged by AERMINUTE
Upper air NCEI IGRA v2 radiosonde soundings
GHCNh quality control 66873 observations screened; 140 suspect/erroneous and 0 METAR–mismatch rejected
Report generated 2026–07–26

Files in this dataset

KTUP<yyyy>.sfc / .pfl AERMOD surface and profile files, processed WITHOUT ADJ_U*
KTUP<yyyy>US.sfc / .pfl the same period processed with METHOD STABLEBL ADJ_U*

The .sfc file carries the hourly boundary–layer parameters and the .pfl carries the wind and temperature profile at the measurement heights; AERMOD requires both. Use the regular set or the ADJ_U* set consistently -- do not mix them within a single AERMOD run. ADJ_U* is the EPA–approved treatment for low–wind stable hours and generally lowers modelled concentrations; its use should be stated and justified in the modelling protocol.

Each yearly .sfc ends with the 24 hours of 1 January of the FOLLOWING year. That is how AERMET writes the file for XDATES y/01/01 TO y+1/01/01 and is expected by AERMOD -- it is not duplicated data within the year.

AERMET Meteorological Data Report -- KTUP (2021–2025)

Generated 2026–07–26 | AERMET 26135 + AERMINUTE 26135 + AERSURFACE 26135 (NLCD 2021)

Surface data: NCEI GHCNh (replaces discontinued ISHD) | Upper air: IGRA soundings | Winds: 1–min ASOS (AERMINUTE)

Annual summary (regular, non–ADJ_U* files):

Year	Valid hrs	Calm %	Mean WS	Max WS	Prevail dir	Mean T	Precip (in)
2021	8752	2.2%	3.0 m/s	10.6 m/s	N	64.2 degF	71.2
2022	8722	1.3%	3.2 m/s	11.9 m/s	N	64.1 degF	53.5
2023	8721	3.3%	3.0 m/s	13.1 m/s	N	65.5 degF	47.7
2024	8674	6.1%	3.1 m/s	12.1 m/s	N	65.5 degF	54.9
2025	8492	10.8%	3.0 m/s	17.3 m/s	N	63.3 degF	52.2

Quarterly data completeness vs EPA 90% criterion:

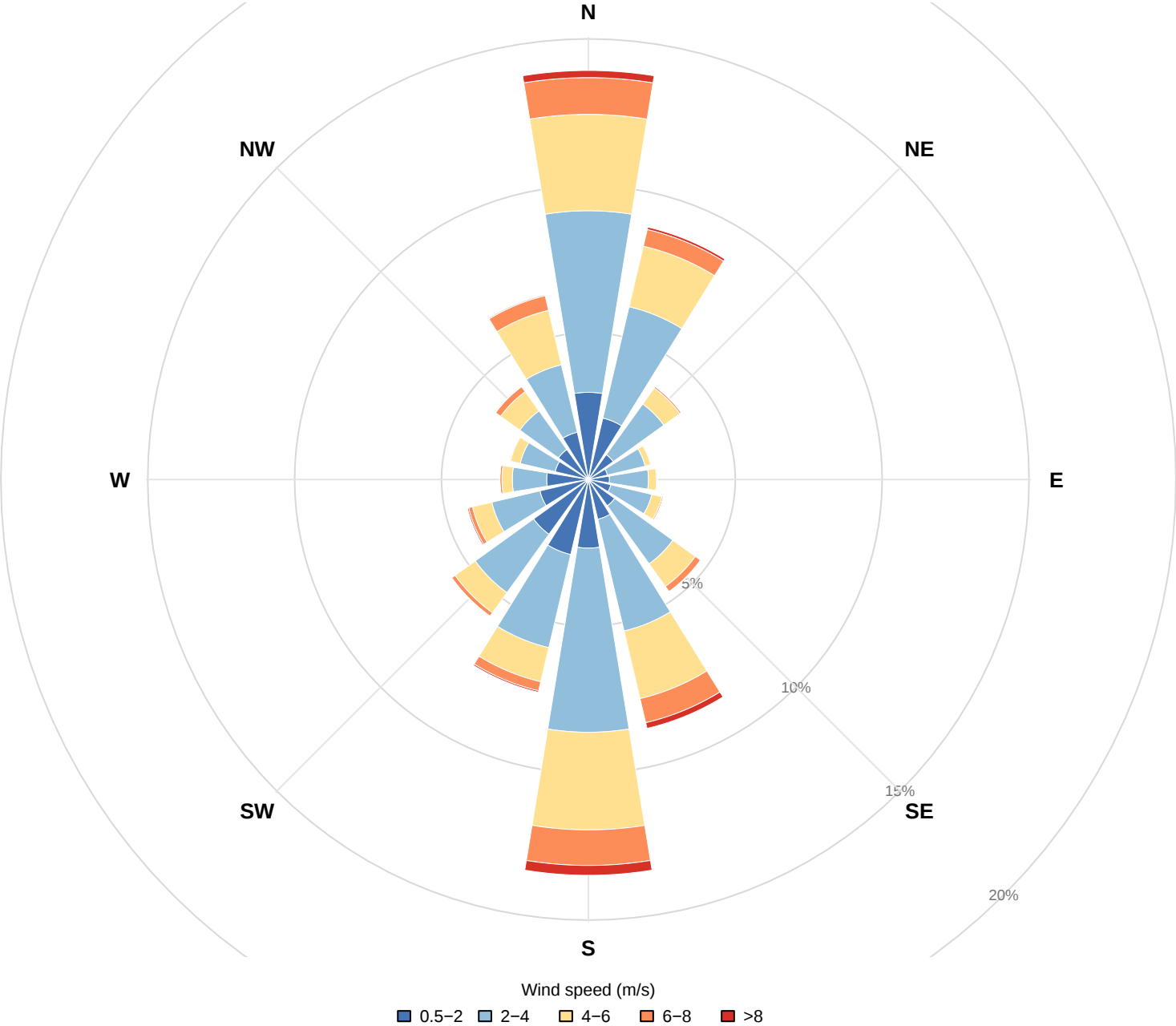
Year	Q1	Q2	Q3	Q4	Annual
2021	99.9%	99.4%	99.0%	99.9%	99.5%
2022	100.0%	98.9%	96.4%	99.9%	98.8%
2023	99.6%	96.8%	97.6%	99.6%	98.4%
2024	98.7%	99.0%	96.3%	97.0%	97.7%
2025	94.5%	95.6%	88.2%*	98.5%	94.2%

* below the 90% quarterly completeness target -- review per App. W / regional guidance (consider substitute years).

Notes for PSD applications:

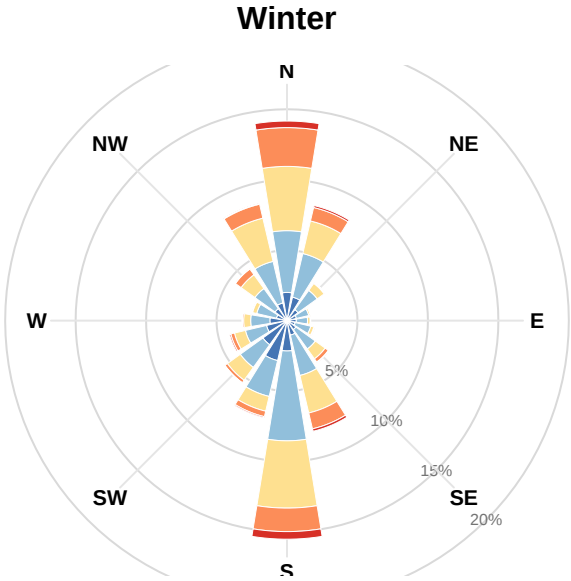
- Prevailing wind N; network–wide calms 4.7% of valid hours; ADJ_U* companion files (US) included in this dataset.
- ADJ_U* raises stable–hour friction velocity by 52% on average (median regular 0.107 → ADJ_U* 0.182 m/s).
- Surface characteristics: AERSURFACE 26135, NLCD 2021, 1000.0 m radius, 2 sector(s); z0 0.026–0.175 m. Full table follows.
- Wind roses use direction FROM which the wind blows; petals are % of all valid hours.
- AERMOD excludes calm and missing hours from the averaging period: 2033 calm and 487 missing hours over 2021–2025 (5.7% of the record). AERMOD reports both counts in its own output; no substitution is made here.

Wind Rose -- KTUP, 2021–2025 (all hours)

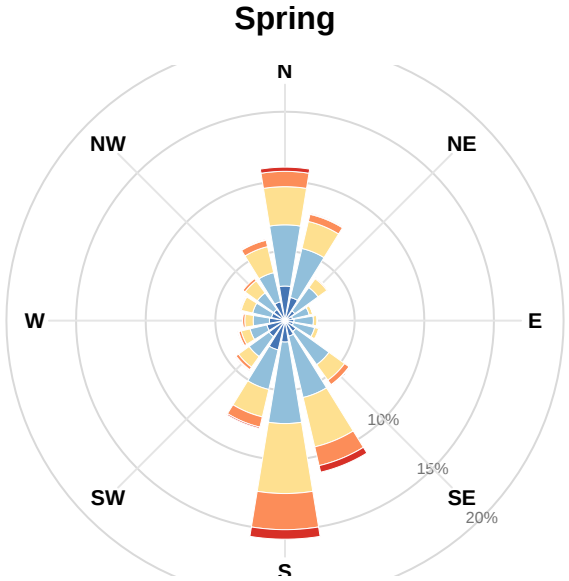


Calm (<0.5 m/s): 4.7%

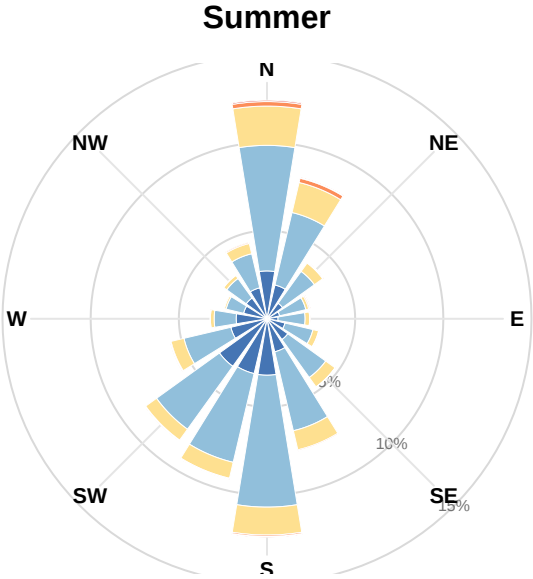
Seasonal Wind Roses -- KTUP, 2021-2025



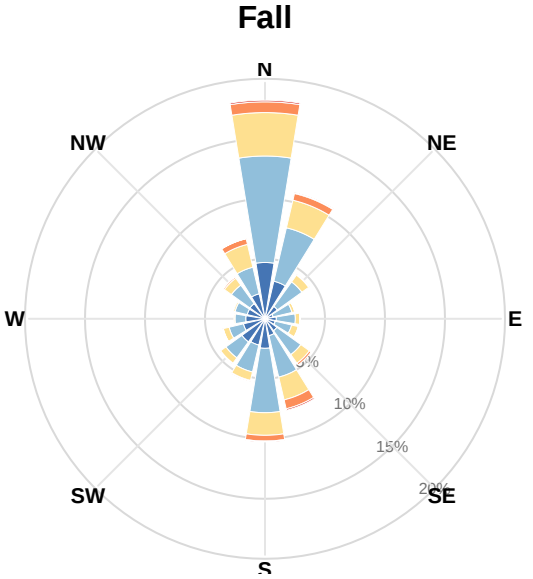
Calm (<0.5 m/s): 5.2%



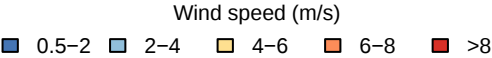
Calm (<0.5 m/s): 4.7%



Calm (<0.5 m/s): 4.5%

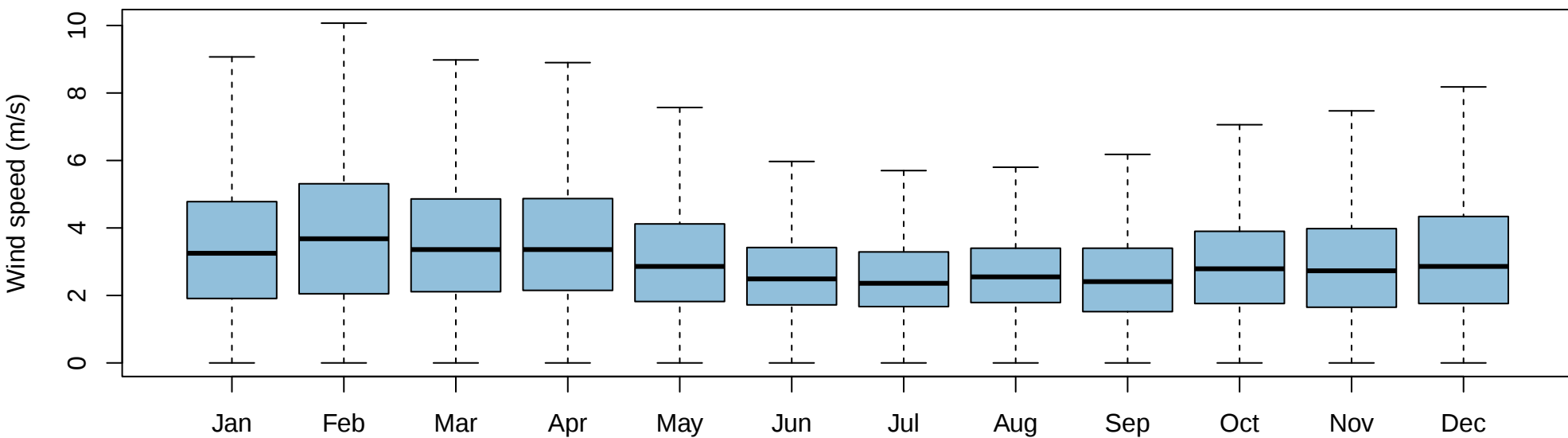


Calm (<0.5 m/s): 4.4%

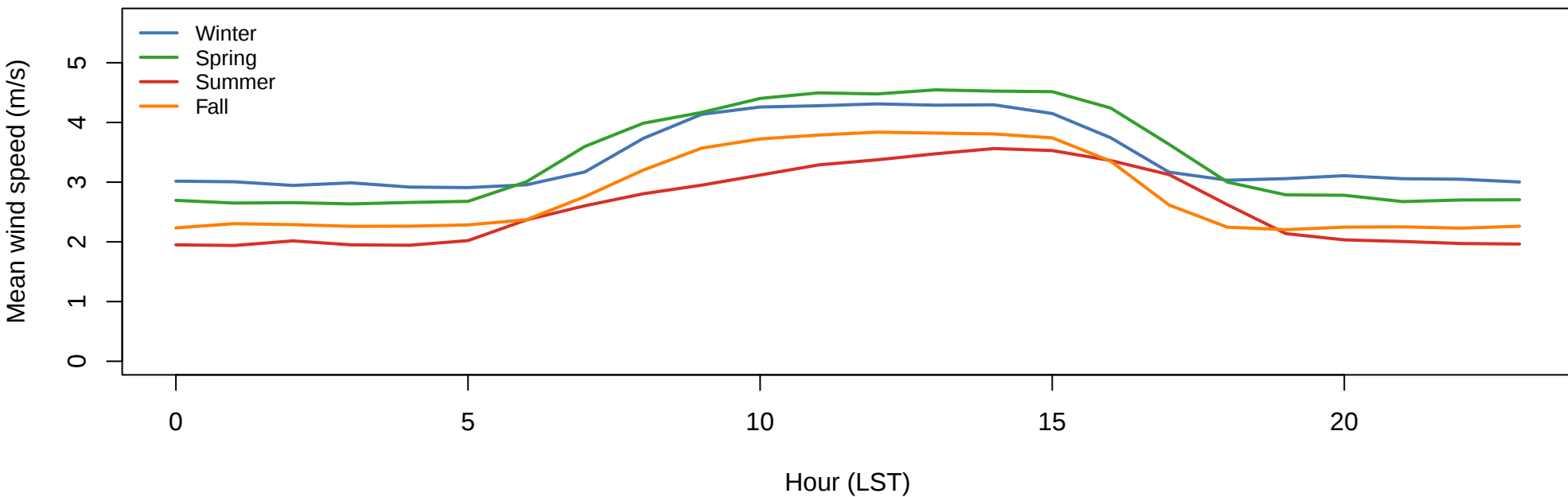


Wind Speed -- KTUP, 2021-2025

Monthly wind speed distribution

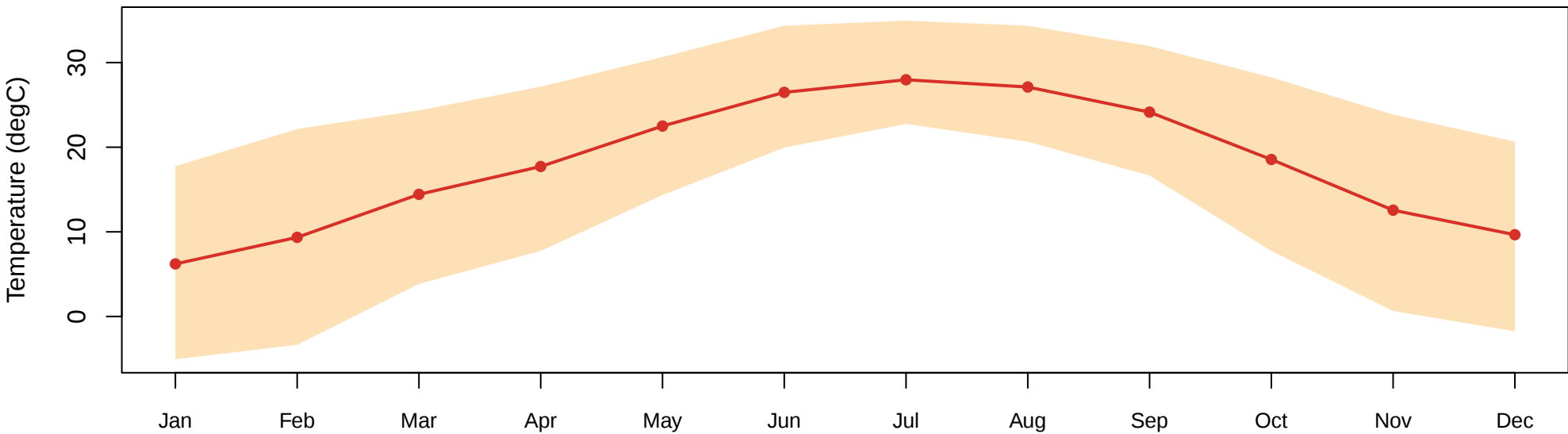


Diurnal wind speed by season

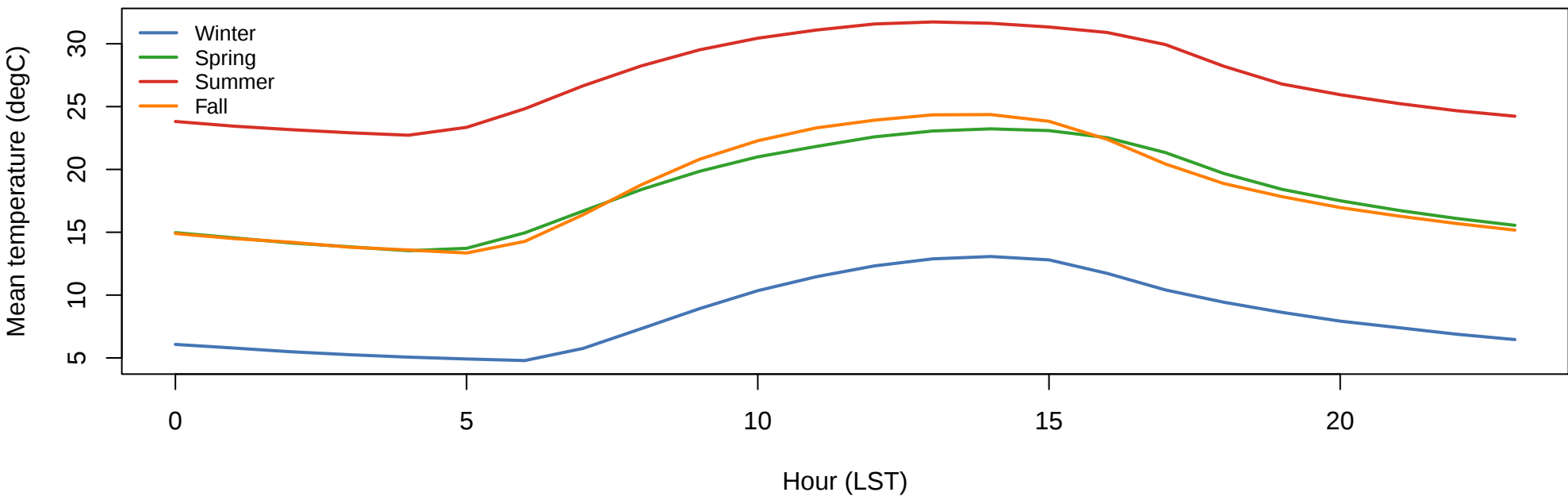


Temperature -- KTUP, 2021–2025

Monthly temperature: mean and 5th–95th percentile

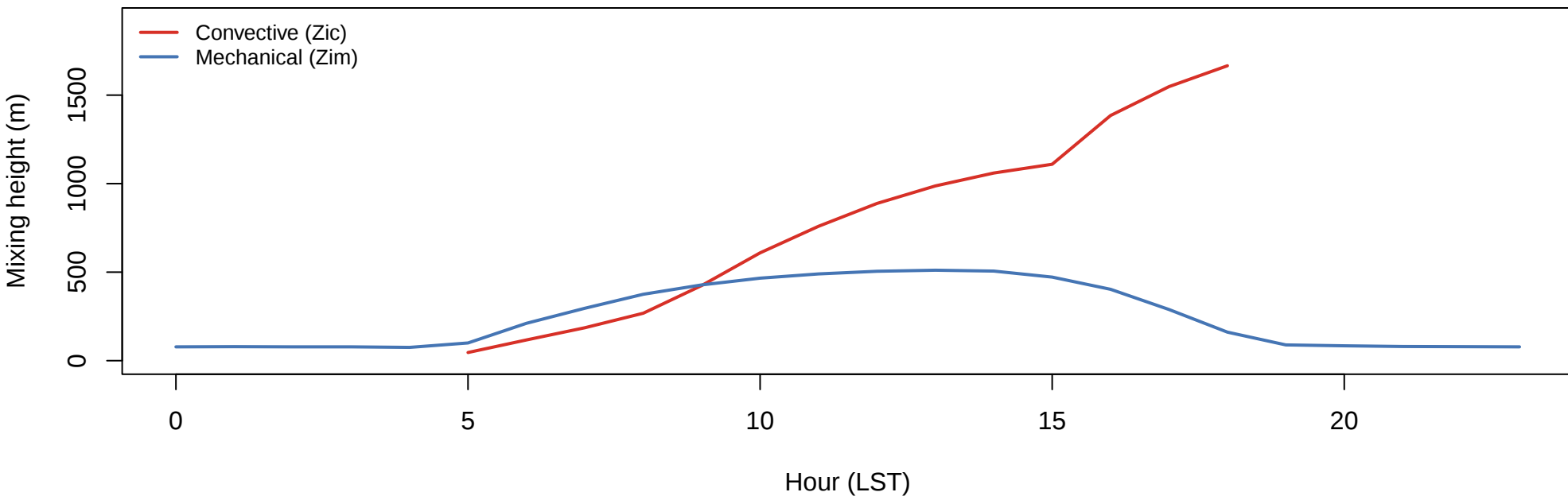


Diurnal temperature by season

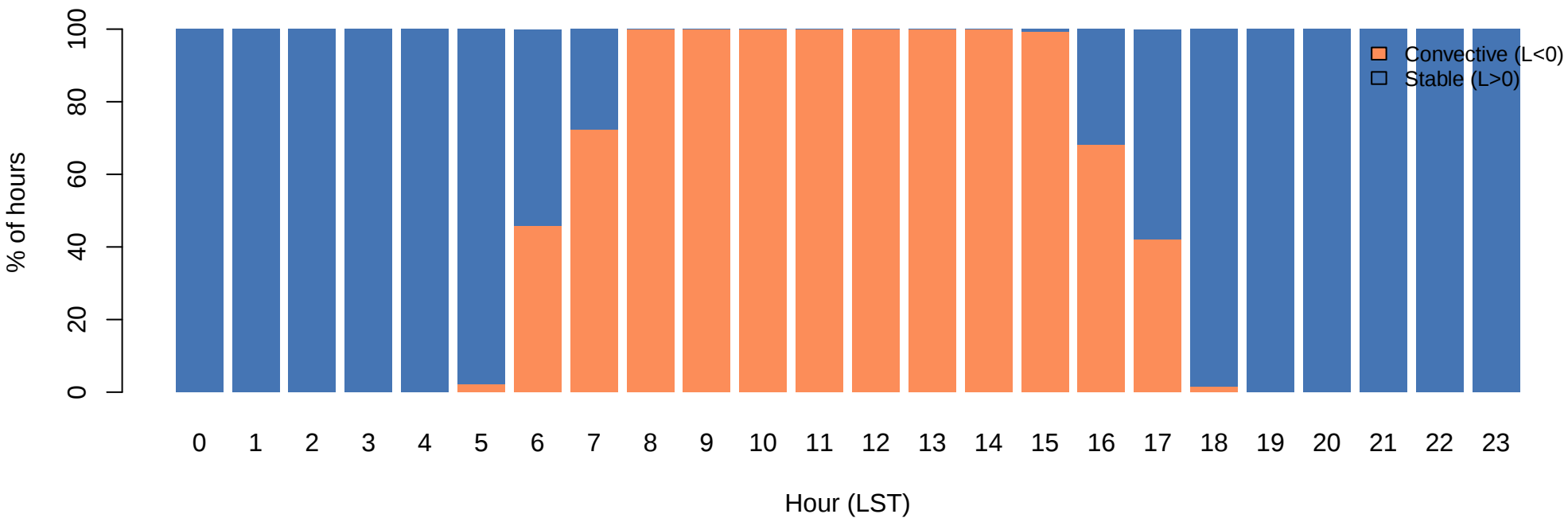


Mixing Heights & Stability -- KTUP, 2021–2025

Diurnal median mixing heights (AERMOD dispersion drivers)

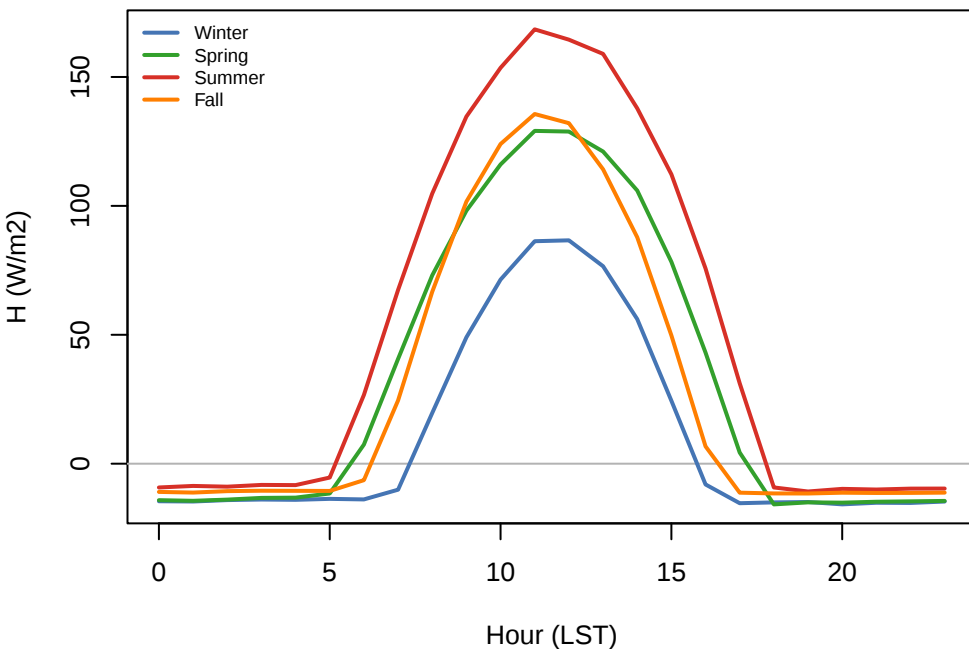


Boundary-layer state by hour (from Monin–Obukhov L)

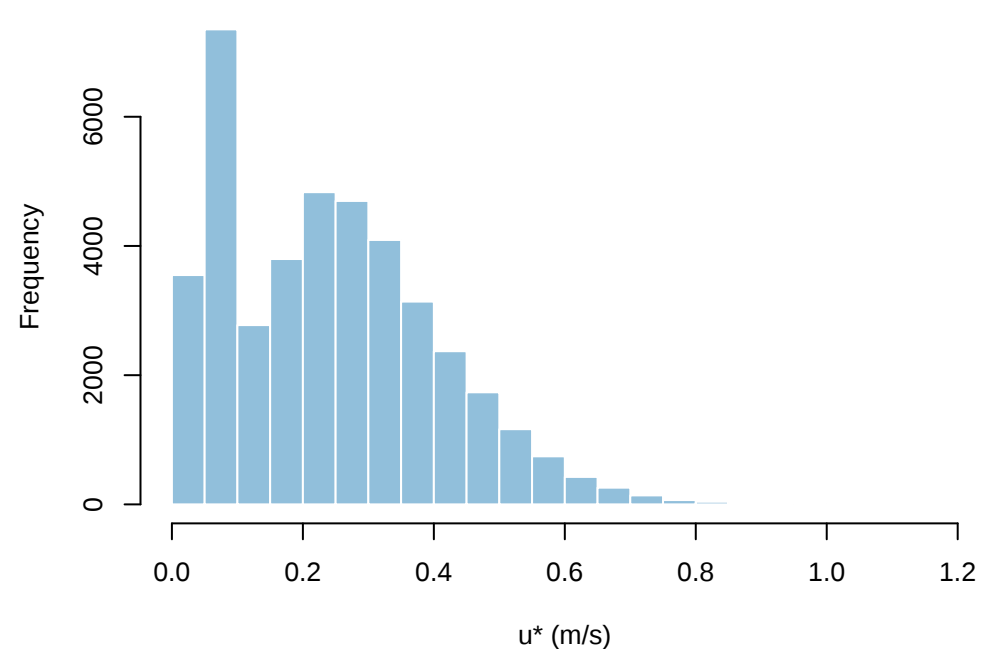


Surface Energetics & ADJ_U* -- KTUP, 2021–2025

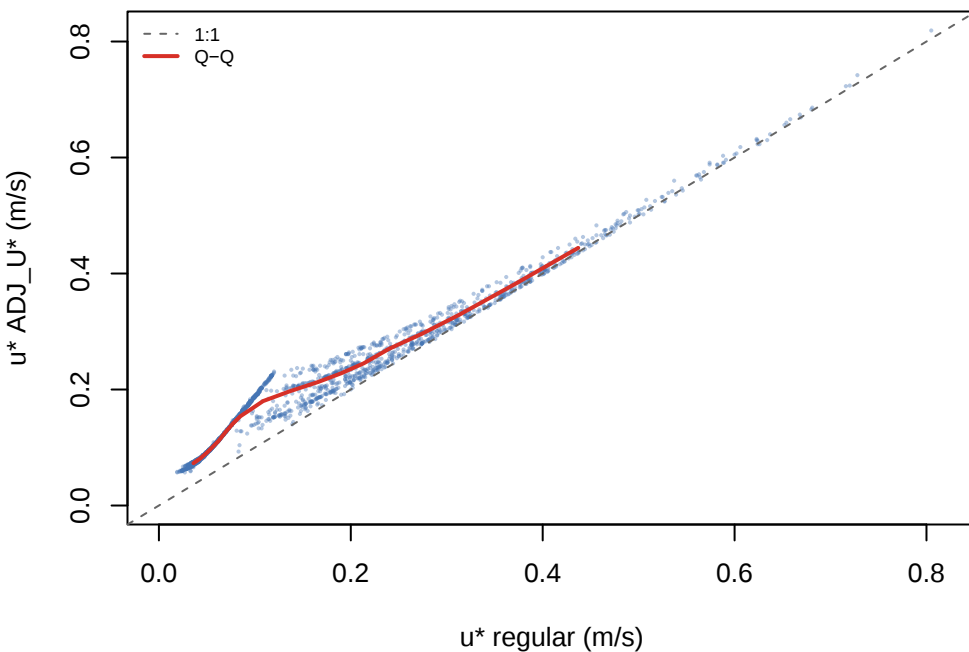
Sensible heat flux by season



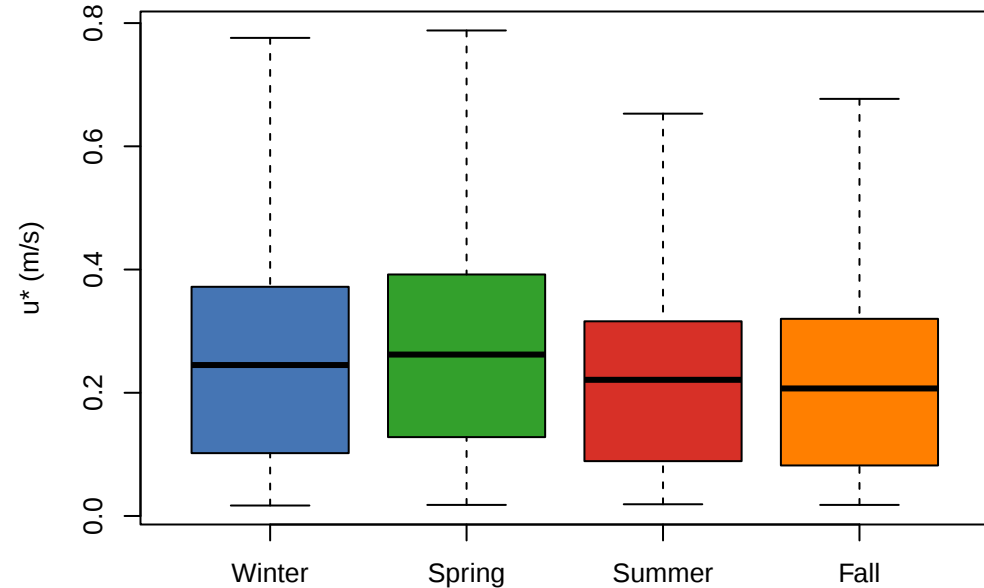
Friction velocity distribution



Stable-hour u^* : regular vs ADJ_U*

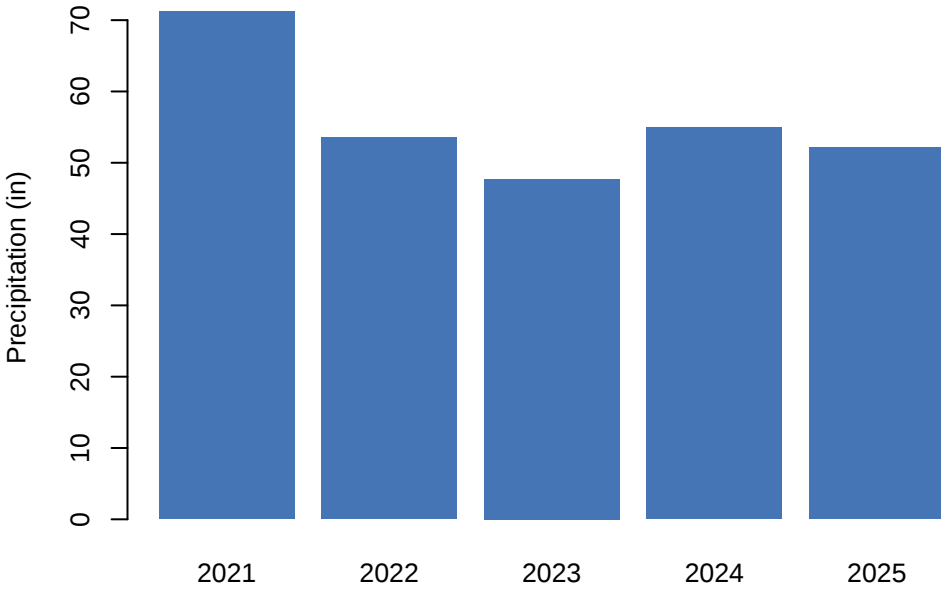


u^* by season

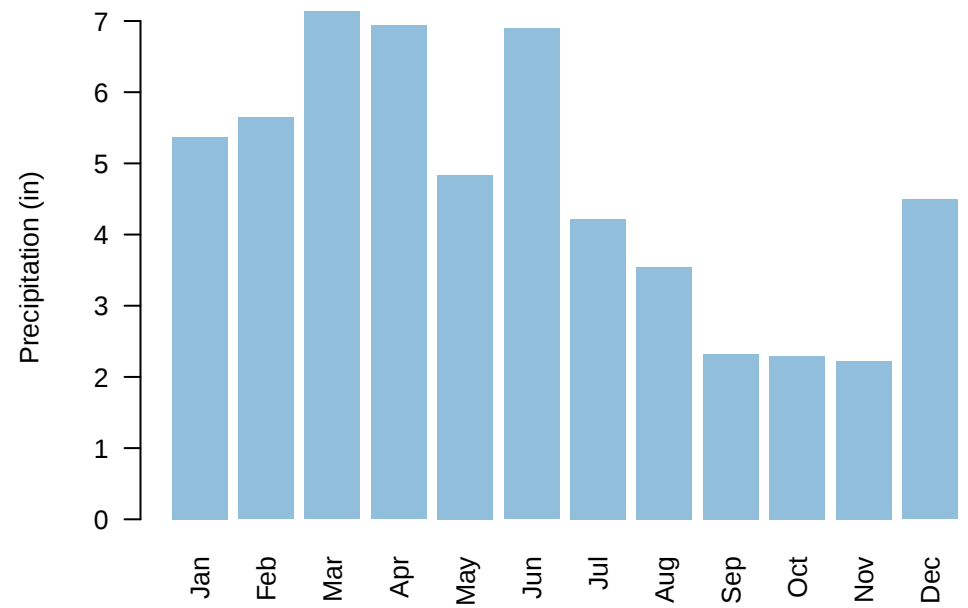


Moisture & Cloud Cover -- KTUP, 2021–2025

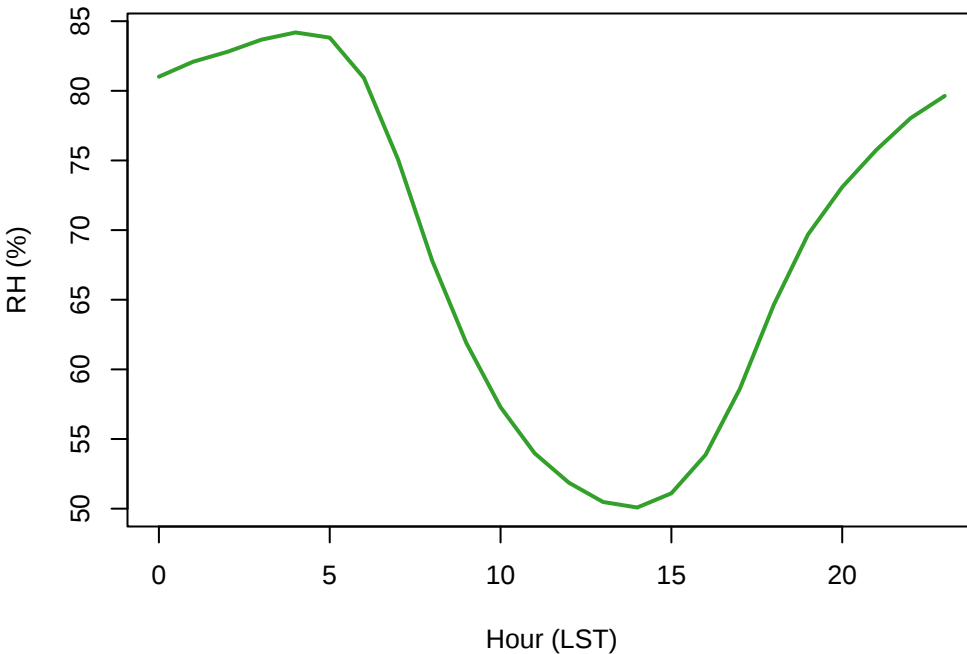
Annual precipitation



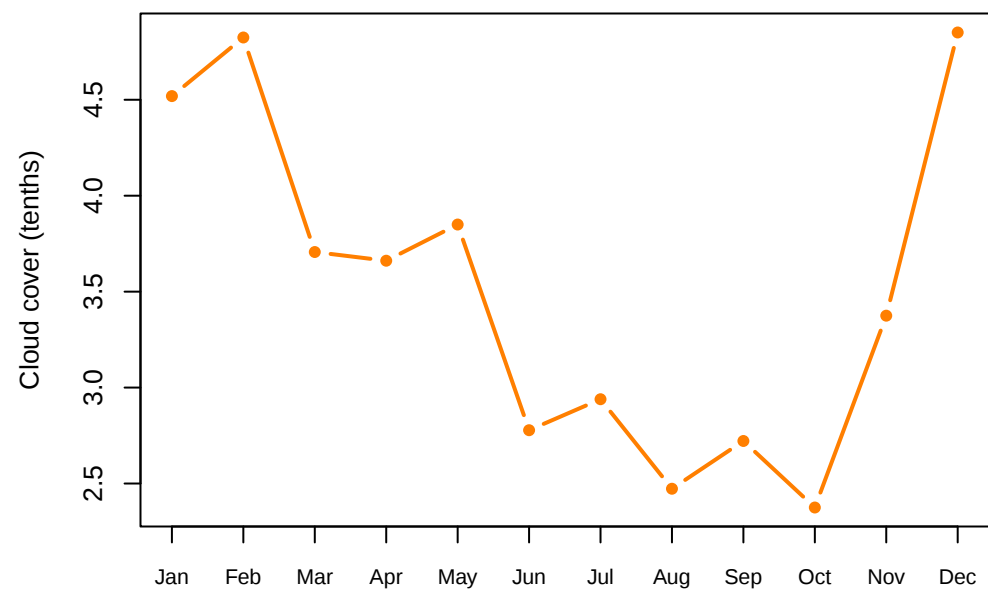
Mean monthly precipitation



Diurnal relative humidity



Monthly mean cloud cover



Surface Characteristics -- KTUP (AERSURFACE 26135)

Run settings

Land cover NLCD 2021 land cover, with impervious and canopy
Roughness method ZORAD, 1000.0 m radius, monthly resolution
Site centre 34.262222, -88.771389 (NAD83)
Surface moisture Average; Arid: N
Continuous snow cover N
Non-airport sectors 2
Sectors 2
sector 1: 0.0 to 180.0 degrees
sector 2: 180.0 to 360.0 degrees

Monthly values applied by AERMET

Month	S1 alb	S1 Bo	S1 z0	S2 alb	S2 Bo	S2 z0
Jan	0.17	0.80	0.026	0.17	0.80	0.097
Feb	0.17	0.80	0.026	0.17	0.80	0.097
Mar	0.15	0.48	0.032	0.15	0.48	0.122
Apr	0.15	0.48	0.032	0.15	0.48	0.122
May	0.17	0.55	0.038	0.17	0.55	0.175
Jun	0.17	0.55	0.038	0.17	0.55	0.175
Jul	0.17	0.55	0.038	0.17	0.55	0.175
Aug	0.17	0.55	0.038	0.17	0.55	0.175
Sep	0.17	0.55	0.038	0.17	0.55	0.175
Oct	0.17	0.80	0.033	0.17	0.80	0.157
Nov	0.17	0.80	0.033	0.17	0.80	0.157
Dec	0.17	0.80	0.026	0.17	0.80	0.097

alb = albedo, Bo = Bowen ratio, z0 = surface roughness length (m). These are the values
AERMET applied; they are reproduced from the AERSURFACE output supplied with this dataset.

Data Quality Screening -- KTUP (2021–2025)

Surface data quality control applied before processing

NCEI flags every observation with a quality code that AERMET does not act on, so the GHCNh file is screened first. Rejected values are blanked and treated as missing; no record is dropped and no value is altered or substituted. A second screen compares the decoded wind speed against the verbatim METAR text NCEI carries alongside it, which catches decoding errors the quality flags miss.

Observations screened 66873

Rejected: NCEI suspect or erroneous 140

Rejected: decoded wind vs METAR text 0

Itemised log KTUP_GHCNh_2021_2025_qc_log.txt

Physical plausibility of the delivered files

Screening of the .sfc files as delivered. A non-zero count is not by itself an error, but each occurrence should be explainable before the data are used.

Year	Max wind	Min temp	Max temp	Hrs ws>25 m/s	Hrs T out of range
2021	10.6 m/s	−10.6 C	36.1 C	0	0
2022	11.9 m/s	−15.6 C	38.9 C	0	0
2023	13.1 m/s	−3.9 C	38.2 C	0	0
2024	12.1 m/s	−12.8 C	37.8 C	0	0
2025	17.3 m/s	−12.8 C	36.7 C	0	0

Bounds used: wind speed above 25 m/s, temperature outside −25 to +45 C.

Monthly data completeness (% of hours with valid wind and temperature)

