

# Station and Data Provenance -- KUTA (2021–2025)

## Surface station

Station KUTA TUNICA MUNICIPAL AIRPORT, MS  
ICAO / WBAN / USAF KUTA / 23903 / 722364  
GHCNh station ID USW00023903  
Latitude, longitude 34.6810 N, 90.3470 W  
Elevation 59.1 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 264 km S of KUTA

## 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 123042 observations screened; 509 suspect/erroneous and 0 METAR–mismatch rejected  
Report generated 2026–07–26

## Files in this dataset

KUTA<yyyy>.sfc / .pfl AERMOD surface and profile files, processed WITHOUT ADJ\_U\*  
KUTA<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 -- KUTA (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 | 7635      | 18.1%  | 3.2 m/s | 14.9 m/s | N           | 58.5 degF | 37.8        |
| 2022 | 7662      | 15.2%  | 3.4 m/s | 13.9 m/s | N           | 60.0 degF | 25.6        |
| 2023 | 8625      | 15.9%  | 3.2 m/s | 18.0 m/s | N           | 64.1 degF | 19.5        |
| 2024 | 8621      | 16.2%  | 3.3 m/s | 13.9 m/s | N           | 63.6 degF | 13.7        |
| 2025 | 8535      | 14.8%  | 3.4 m/s | 14.4 m/s | N           | 63.3 degF | 40.0        |

## Quarterly data completeness vs EPA 90% criterion:

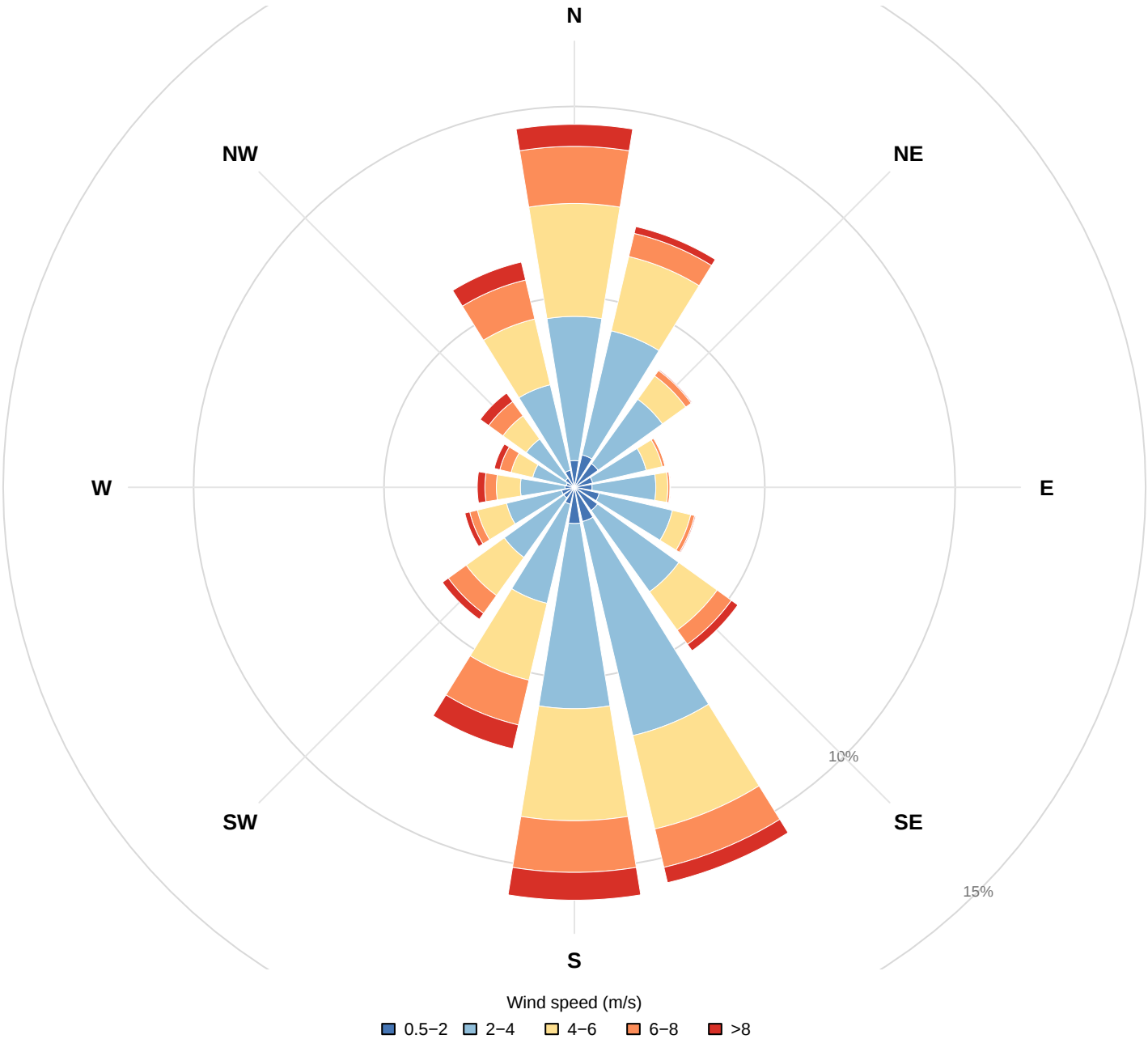
| Year | Q1    | Q2     | Q3     | Q4    | Annual |
|------|-------|--------|--------|-------|--------|
| 2021 | 99.6% | 99.3%  | 52.9%* | 97.2% | 87.1%  |
| 2022 | 93.1% | 57.1%* | 99.0%  | 99.2% | 87.1%  |
| 2023 | 94.8% | 98.4%  | 99.1%  | 99.1% | 97.9%  |
| 2024 | 99.1% | 93.8%  | 98.4%  | 99.3% | 97.7%  |
| 2025 | 98.9% | 98.0%  | 92.3%  | 97.7% | 96.7%  |

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

## Notes for PSD applications:

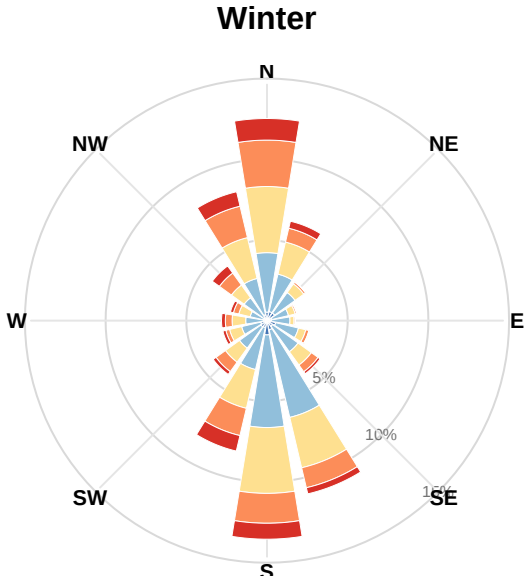
- Prevailing wind N; network–wide calms 16.0% of valid hours; ADJ\_U\* companion files (US) included in this dataset.
- ADJ\_U\* raises stable–hour friction velocity by 39% on average (median regular 0.175 → ADJ\_U\* 0.210 m/s).
- Surface characteristics: AERSURFACE 26135, NLCD 2021, 1000.0 m radius, 4 sector(s); z0 0.027–0.192 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: 6578 calm and 2770 missing hours over 2021–2025 (21.3% of the record). AERMOD reports both counts in its own output; no substitution is made here.

Wind Rose -- KUTA, 2021-2025 (all hours)

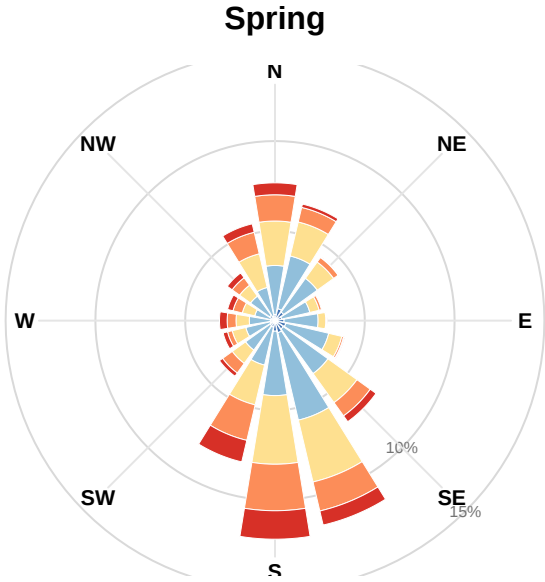


Calm (<0.5 m/s): 16.0%

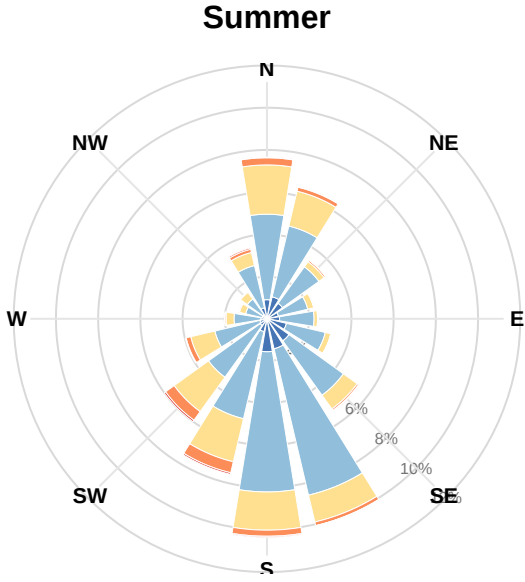
Seasonal Wind Roses -- KUTA, 2021-2025



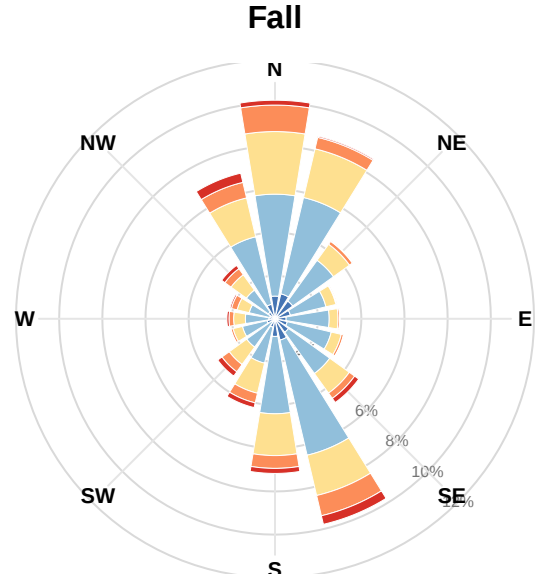
Calm (<0.5 m/s): 10.3%



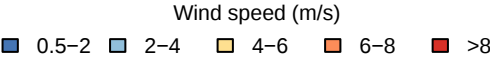
Calm (<0.5 m/s): 11.2%



Calm (<0.5 m/s): 22.0%

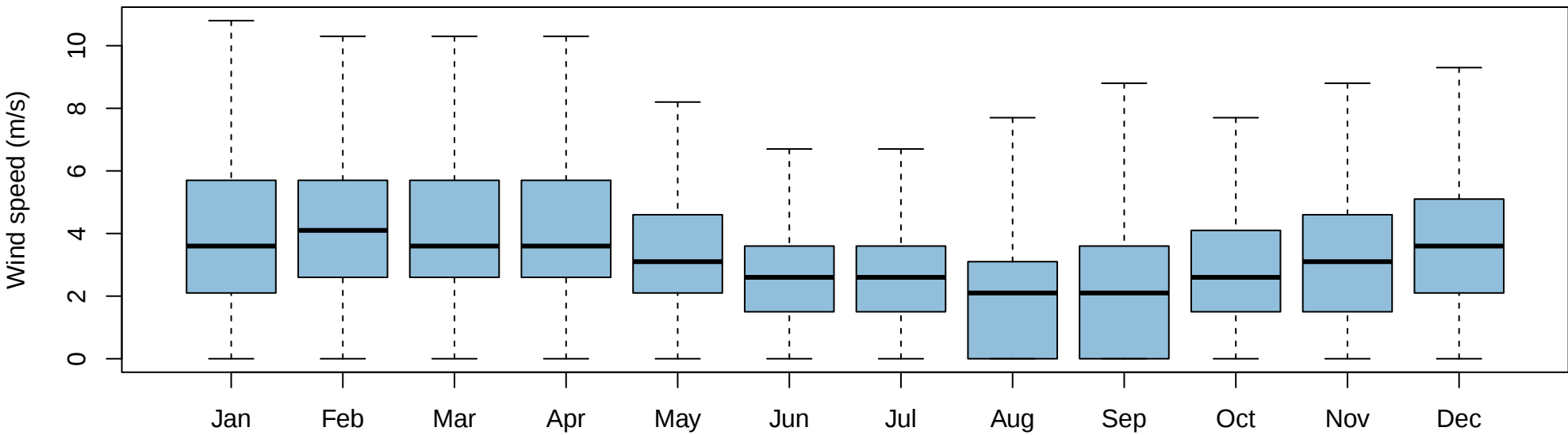


Calm (<0.5 m/s): 21.1%

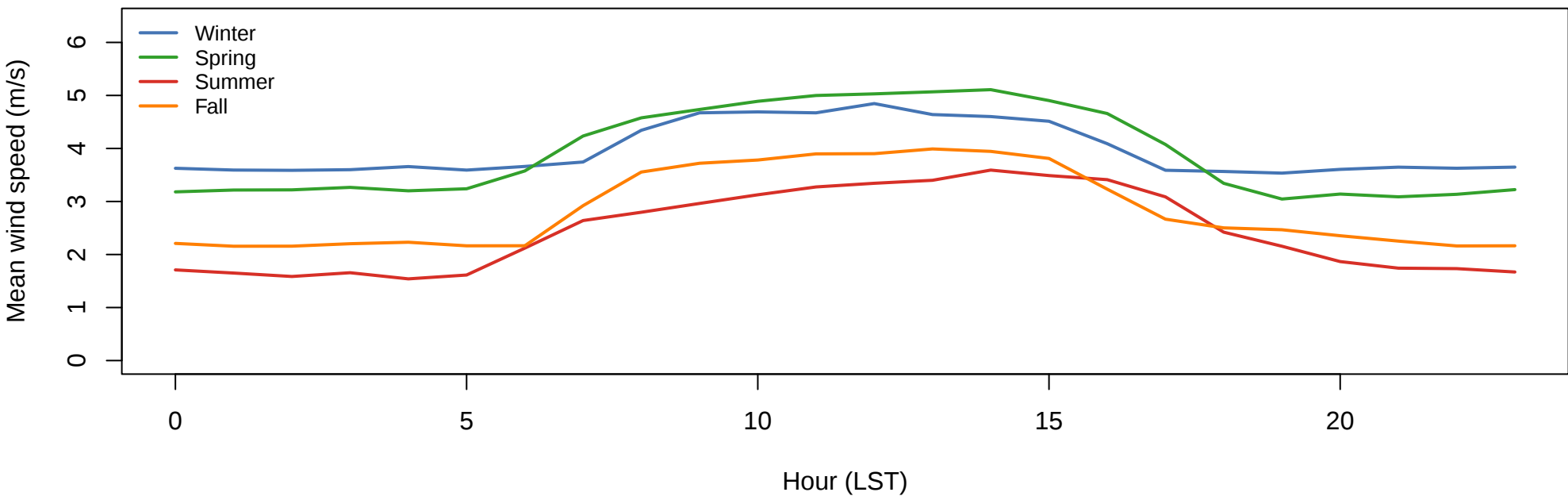


## Wind Speed -- KUTA, 2021-2025

### Monthly wind speed distribution

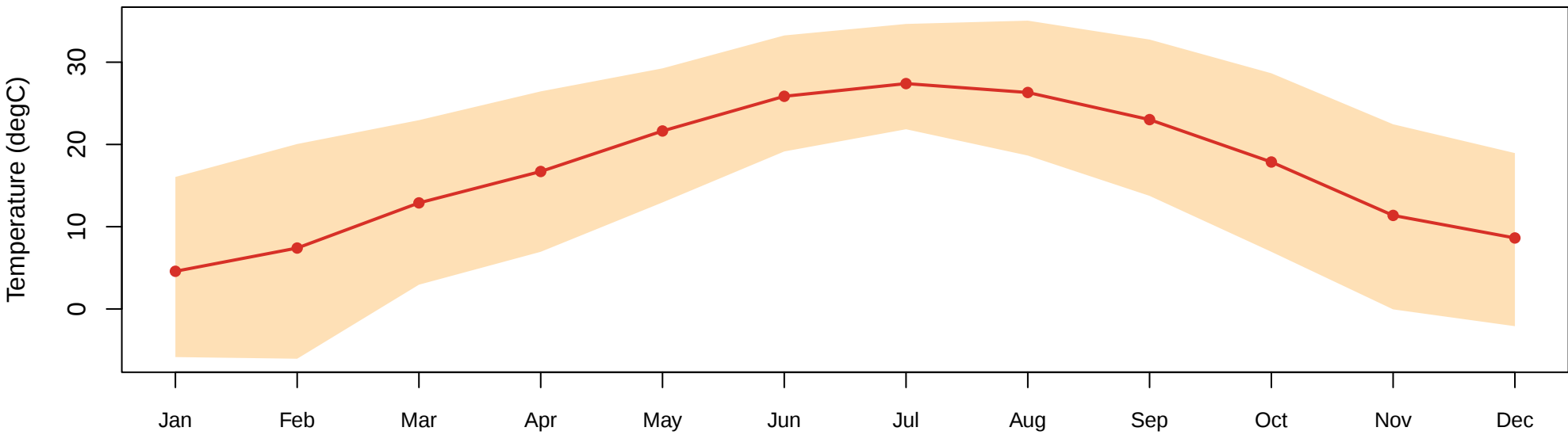


### Diurnal wind speed by season

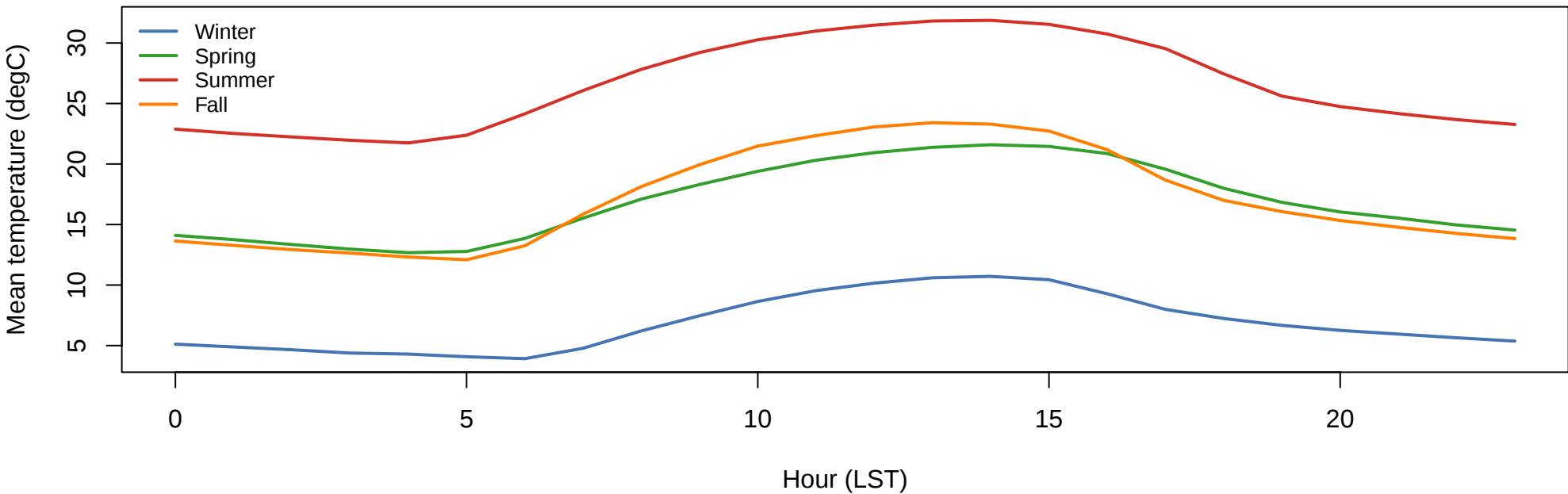


## Temperature -- KUTA, 2021–2025

### Monthly temperature: mean and 5th–95th percentile

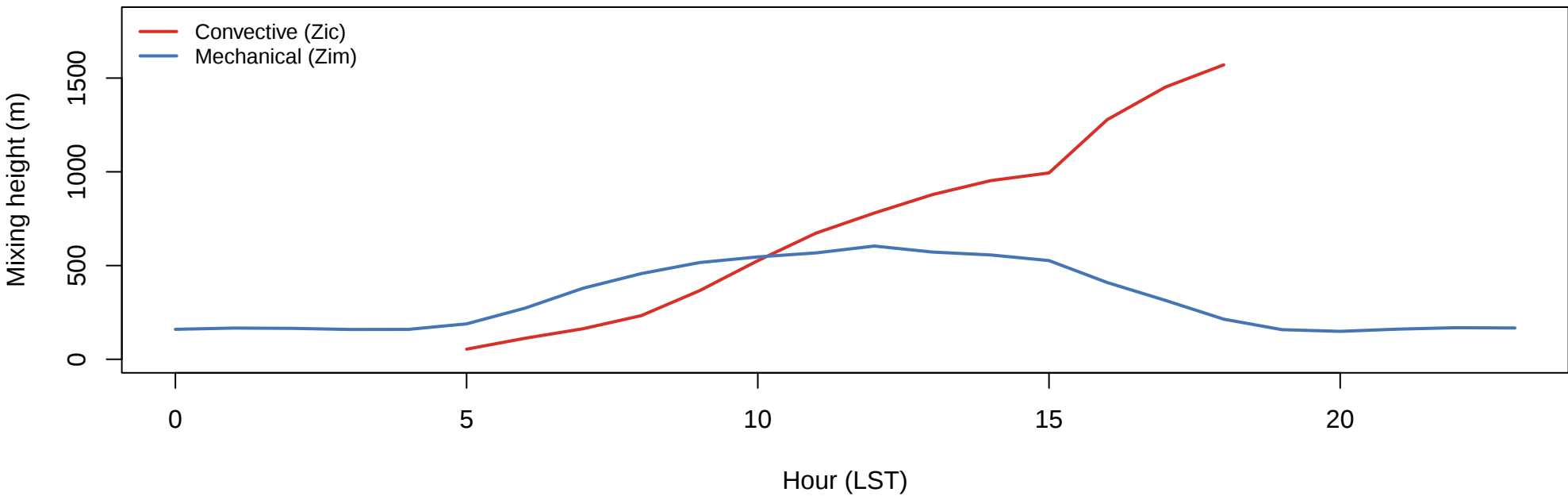


### Diurnal temperature by season

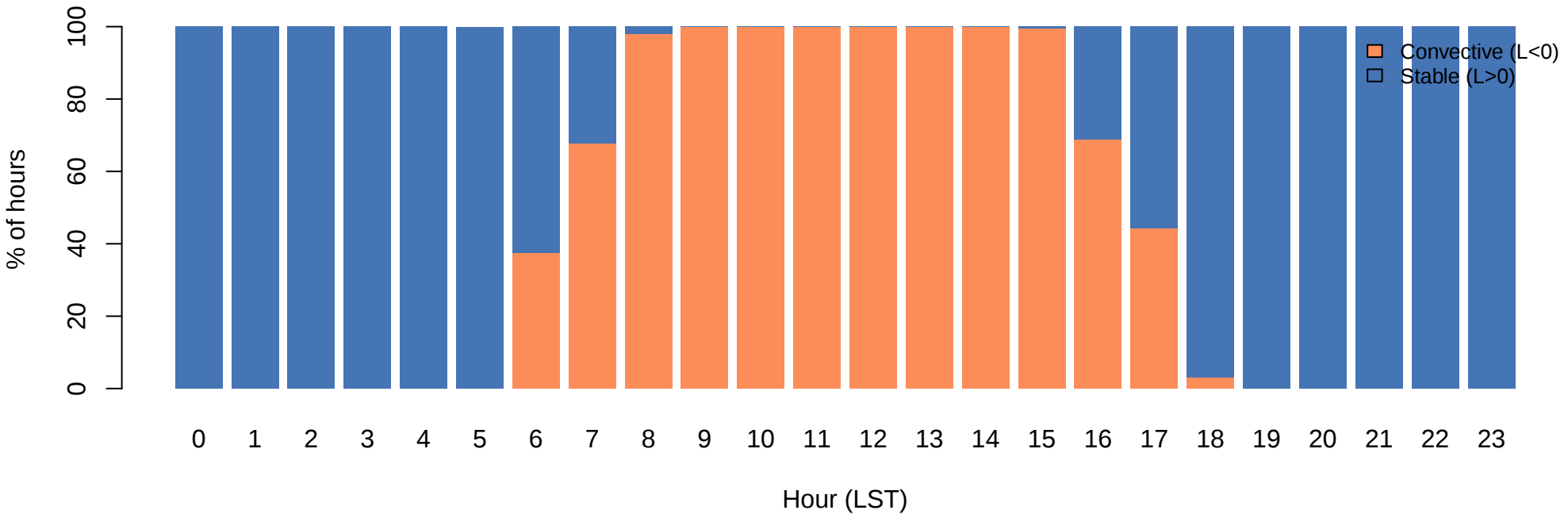


## Mixing Heights & Stability -- KUTA, 2021–2025

### Diurnal median mixing heights (AERMOD dispersion drivers)

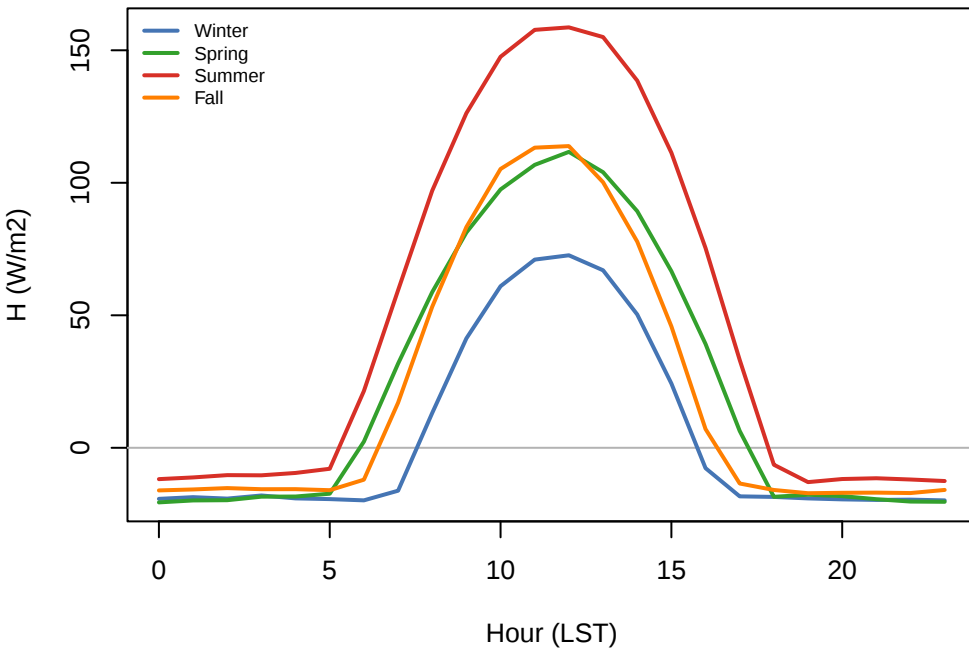


### Boundary-layer state by hour (from Monin–Obukhov L)

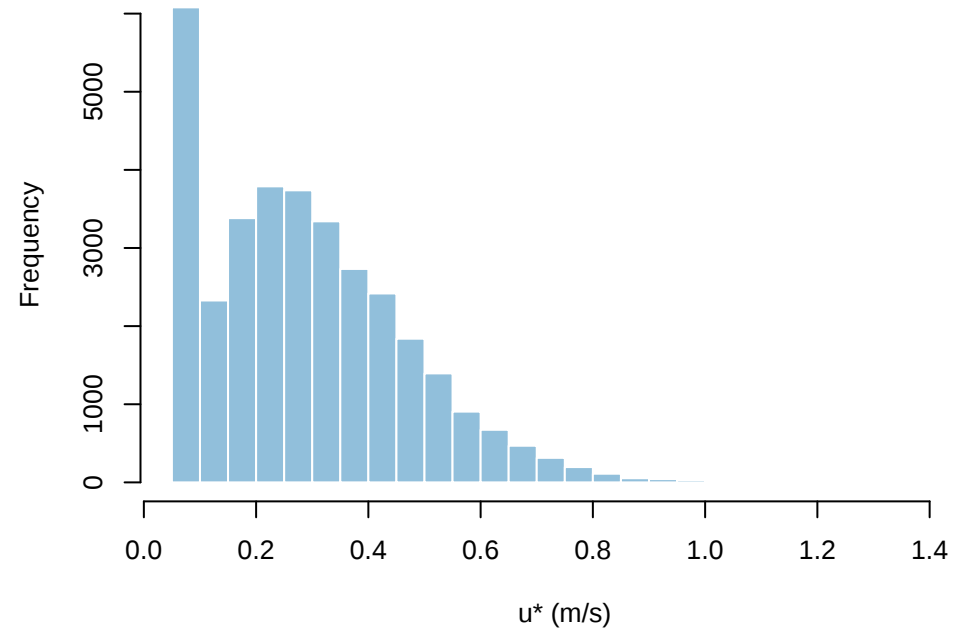


# Surface Energetics & ADJ\_U\* -- KUTA, 2021–2025

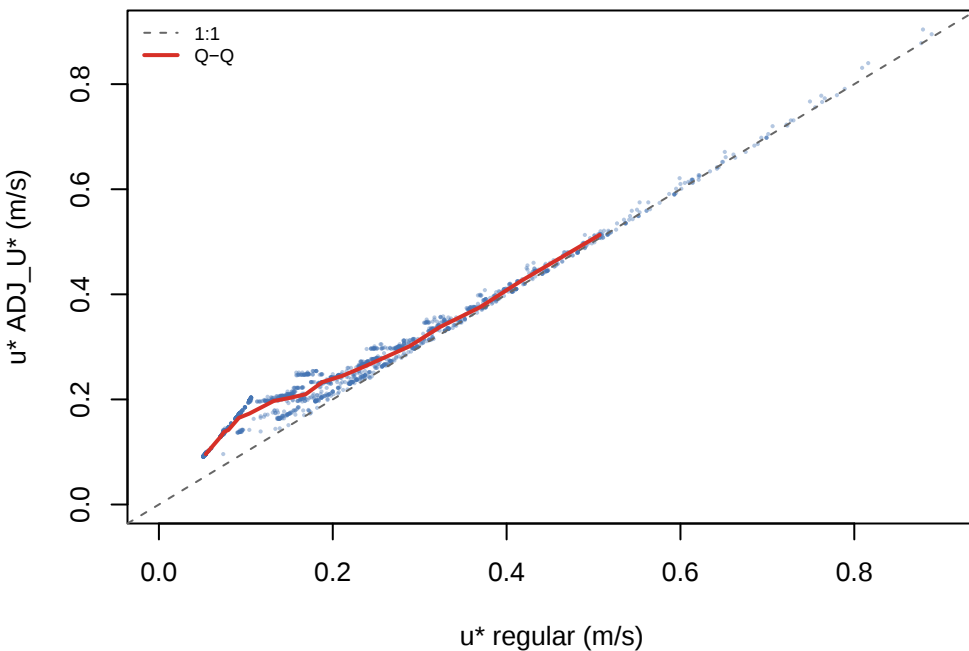
## Sensible heat flux by season



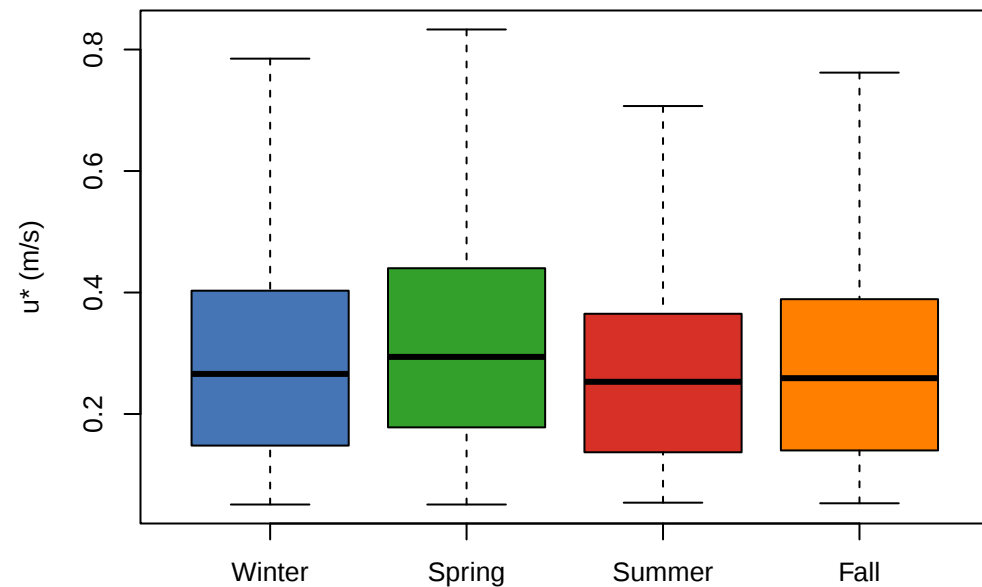
## Friction velocity distribution



## Stable-hour $u^*$ : regular vs ADJ\_ $u^*$

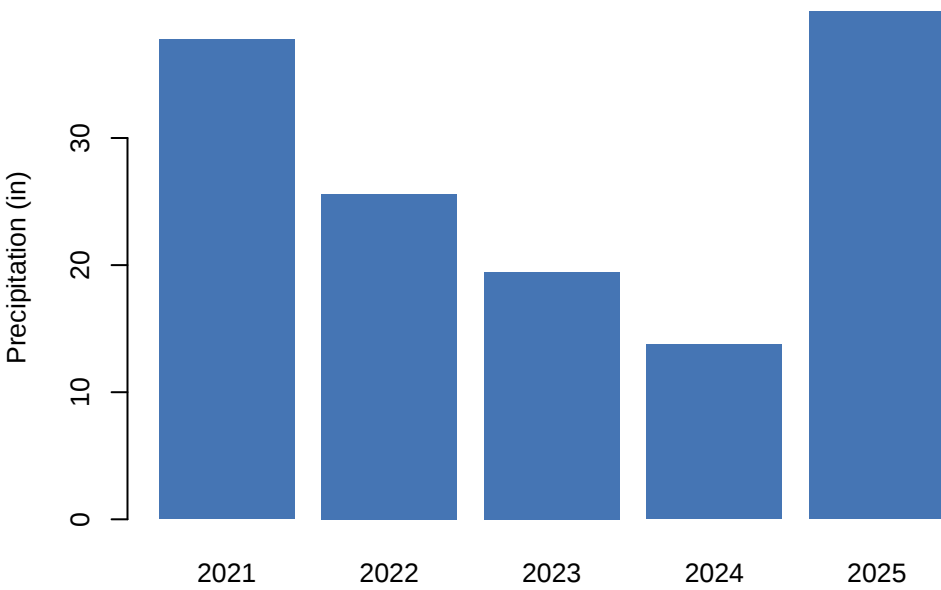


## $u^*$ by season

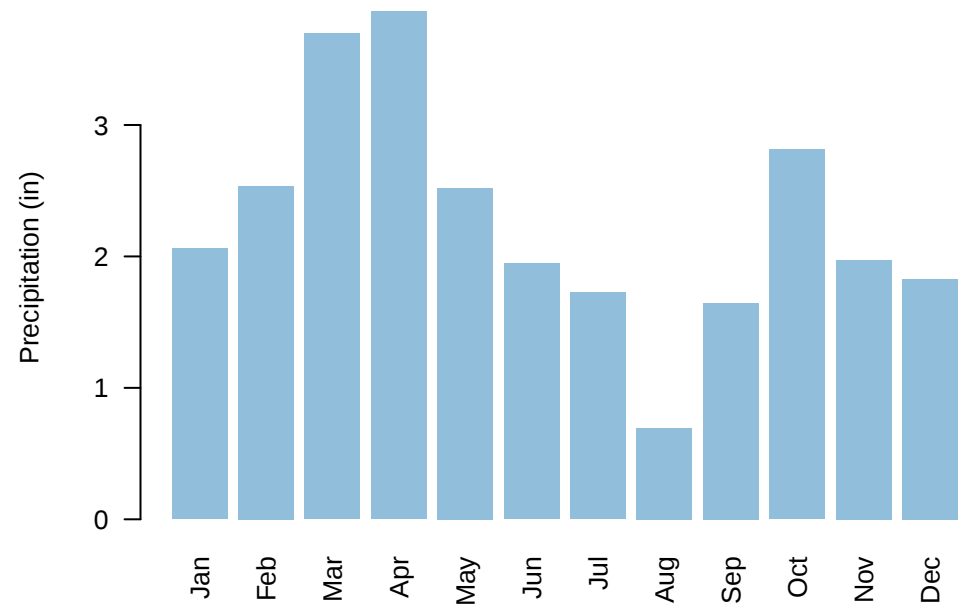


## Moisture & Cloud Cover -- KUTA, 2021–2025

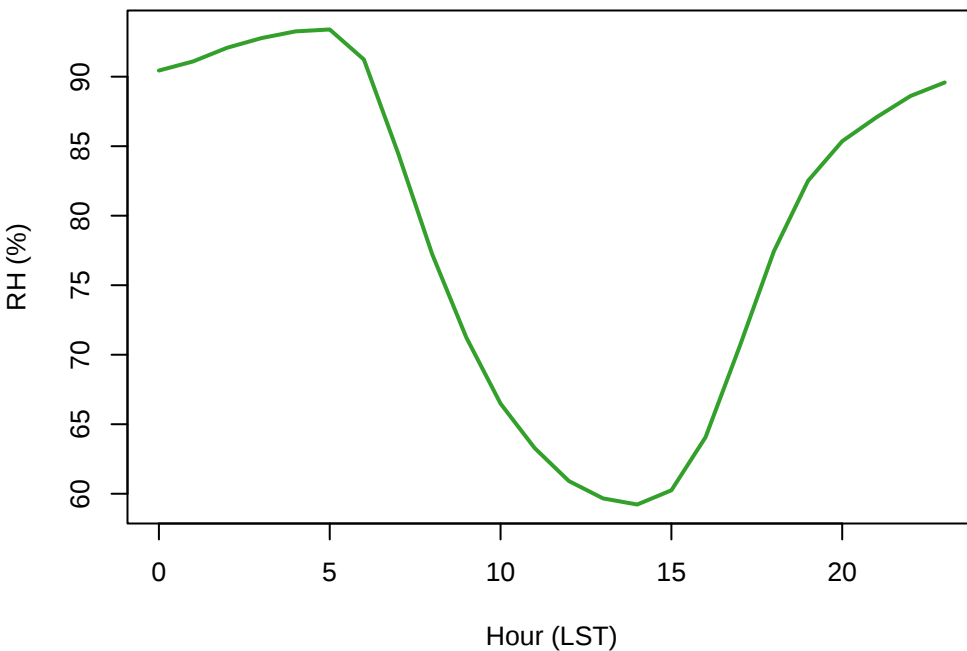
### Annual precipitation



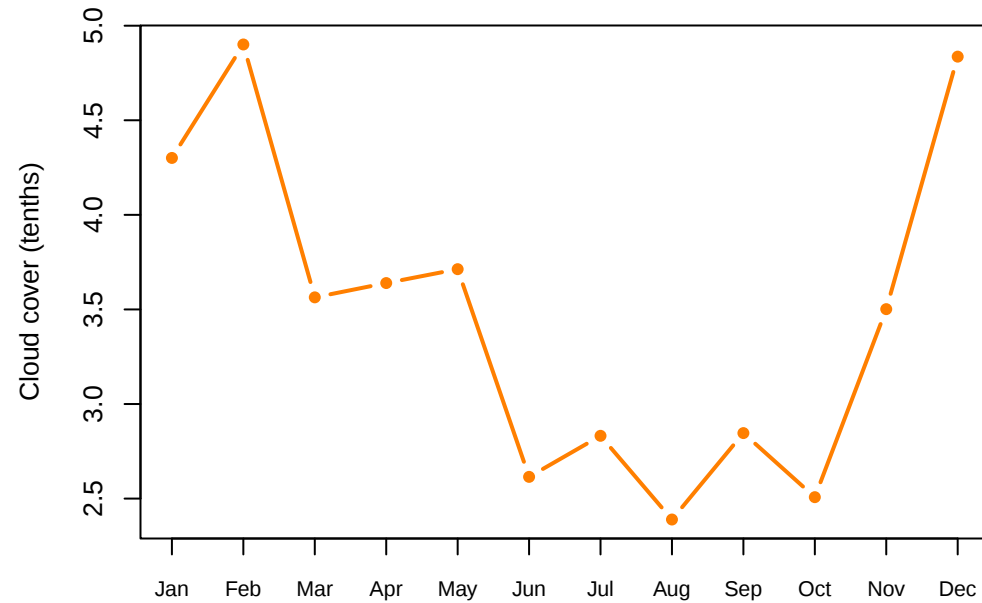
### Mean monthly precipitation



### Diurnal relative humidity



### Monthly mean cloud cover



## Surface Characteristics -- KUTA (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 34.681111, -90.346667 (NAD83)  
 Surface moisture Average; Arid: N  
 Continuous snow cover N  
 Non-airport sectors 1 3  
 Sectors 4  
     sector 1: 20.0 to 130.0 degrees  
     sector 2: 130.0 to 200.0 degrees  
     sector 3: 200.0 to 310.0 degrees  
     sector 4: 310.0 to 20.0 degrees

### Monthly values applied by AERMET

| Month | S1 alb | S1 Bo | S1 z0 | S2 alb | S2 Bo | S2 z0 | S3 alb | S3 Bo | S3 z0 | S4 alb | S4 Bo | S4 z0 |
|-------|--------|-------|-------|--------|-------|-------|--------|-------|-------|--------|-------|-------|
| Jan   | 0.18   | 0.64  | 0.033 | 0.18   | 0.64  | 0.027 | 0.18   | 0.64  | 0.052 | 0.18   | 0.64  | 0.029 |
| Feb   | 0.18   | 0.64  | 0.033 | 0.18   | 0.64  | 0.027 | 0.18   | 0.64  | 0.052 | 0.18   | 0.64  | 0.029 |
| Mar   | 0.14   | 0.31  | 0.044 | 0.14   | 0.31  | 0.029 | 0.14   | 0.31  | 0.065 | 0.14   | 0.31  | 0.032 |
| Apr   | 0.14   | 0.31  | 0.044 | 0.14   | 0.31  | 0.029 | 0.14   | 0.31  | 0.065 | 0.14   | 0.31  | 0.032 |
| May   | 0.19   | 0.48  | 0.176 | 0.19   | 0.48  | 0.037 | 0.19   | 0.48  | 0.192 | 0.19   | 0.48  | 0.039 |
| Jun   | 0.19   | 0.48  | 0.176 | 0.19   | 0.48  | 0.037 | 0.19   | 0.48  | 0.192 | 0.19   | 0.48  | 0.039 |
| Jul   | 0.19   | 0.48  | 0.176 | 0.19   | 0.48  | 0.037 | 0.19   | 0.48  | 0.192 | 0.19   | 0.48  | 0.039 |
| Aug   | 0.19   | 0.48  | 0.176 | 0.19   | 0.48  | 0.037 | 0.19   | 0.48  | 0.192 | 0.19   | 0.48  | 0.039 |
| Sep   | 0.19   | 0.48  | 0.176 | 0.19   | 0.48  | 0.037 | 0.19   | 0.48  | 0.192 | 0.19   | 0.48  | 0.039 |
| Oct   | 0.19   | 0.64  | 0.174 | 0.19   | 0.64  | 0.035 | 0.19   | 0.64  | 0.185 | 0.19   | 0.64  | 0.036 |
| Nov   | 0.19   | 0.64  | 0.174 | 0.19   | 0.64  | 0.035 | 0.19   | 0.64  | 0.185 | 0.19   | 0.64  | 0.036 |
| Dec   | 0.18   | 0.64  | 0.033 | 0.18   | 0.64  | 0.027 | 0.18   | 0.64  | 0.052 | 0.18   | 0.64  | 0.029 |

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 -- KUTA (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                    123042  
Rejected: NCEI suspect or erroneous    509  
Rejected: decoded wind vs METAR text   0  
Itemised log                               KUTA\_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 | 14.9 m/s | −17.0 C  | 35.0 C   | 0             | 0                  |
| 2022 | 13.9 m/s | −16.1 C  | 38.1 C   | 0             | 0                  |
| 2023 | 18.0 m/s | −4.0 C   | 40.8 C   | 0             | 0                  |
| 2024 | 13.9 m/s | −16.5 C  | 38.8 C   | 0             | 0                  |
| 2025 | 14.4 m/s | −11.8 C  | 39.2 C   | 0             | 0                  |

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

