
TEXAS TECH UNIVERSITY STICKNET DOCUMENTATION FOR PERiLS 2023

CONTENTS:

- 1.0 DATASET OVERVIEW
- 2.0 INSTRUMENT DESCRIPTION
- 3.0 DATA COLLECTION AND PROCESSING
- 4.0 DATA FORMAT
- 5.0 REFERENCES



AUTHOR/CONTACT INFORMATION

Dr. Chris Weiss

Department of Geosciences
Texas Tech University
Box 41053, Lubbock, TX 79409
Phone: (806) 834-4712
E-mail: Chris.Weiss@ttu.edu

Joshua Ostaszewski

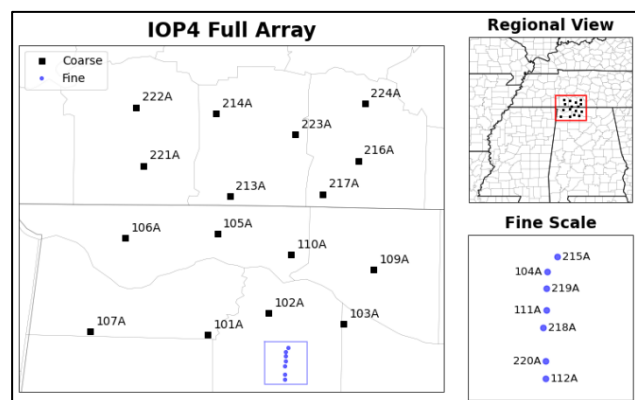
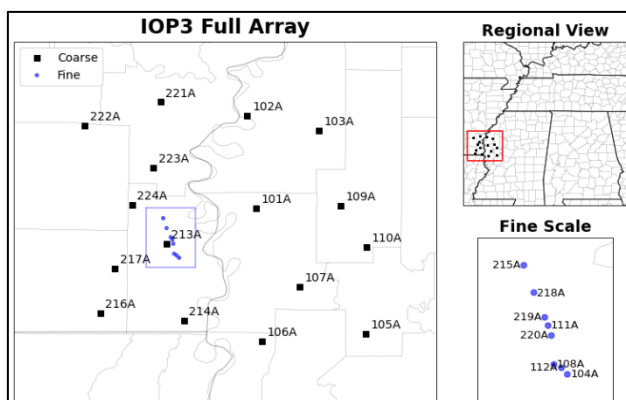
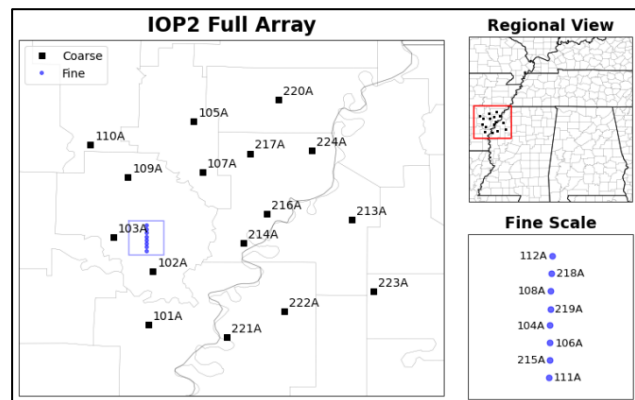
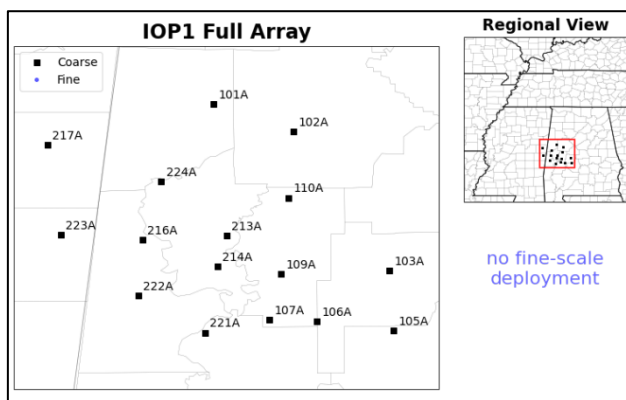
Department of Geosciences
Texas Tech University
Box 41053, Lubbock, TX 79409
E-mail: Joshua.Ostaszewski@ttu.edu

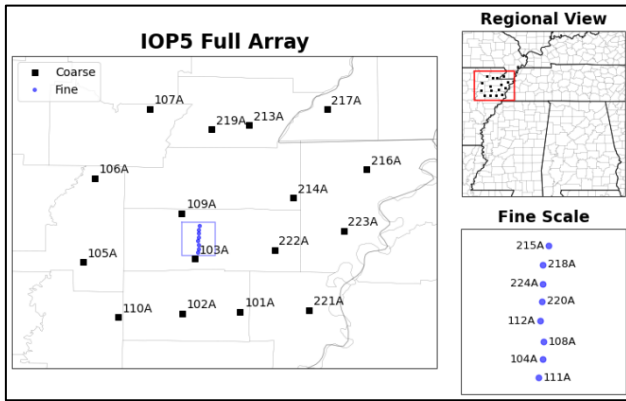
1.0 DATA SET OVERVIEW

This document provides information concerning the Texas Tech University StickNet data from year two of the 2022-2023 PERiLS (*Propagation, Evolution, and Rotation in Linear Storms*) field campaign. There were five IOPs during year two of PERiLS:

IOP	Date	Domain
1	16 February 2023	Brooksville
2	3 March 2023	Clarksdale
3	24 March 2023	Lake Providence
4	31 March 2023	Tennessee Valley
5	5 April 2023	Kennett

During each IOP, 24 StickNets were deployed within the chosen domain. 16 of the StickNets were deployed the day before each event as a coarse array (~20 km spacing), and the remaining 8 (none for IOP1 and only 7 for IOP4) were deployed during the event in front of ongoing convection (~1 km spacing). The following figures display the StickNet locations for each IOP, along with their corresponding ID:



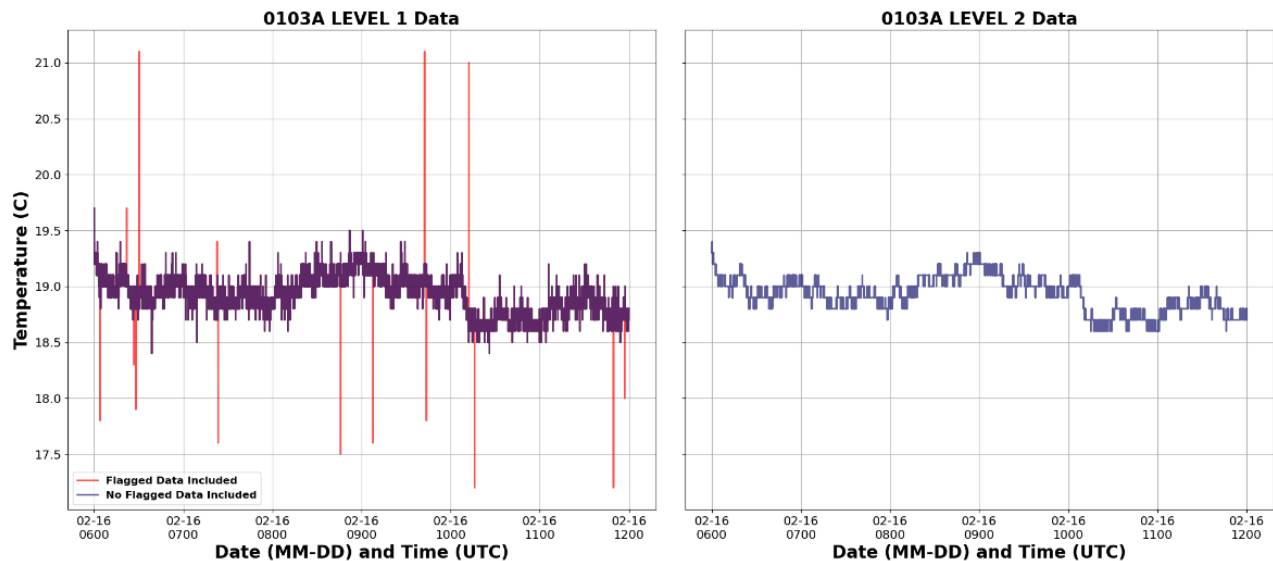


The data are available at two different levels:

Level 1: Raw 10-Hz data. The data are run through a QC algorithm (see Section 3.0) to flag potentially erroneous data. No other quality control or processing is done.

Level 2: Processed 1-Hz data. Level 1 data are averaged to 1-Hz and has been bias corrected. The biases are determined using mass tests that were done immediately after each IOP deployment (see Section 3.0). ***Recommended for analysis work.***

Below is a 6-hour example time series (103A from IOP1) of Level 1 (with and without the removed flagged data) and Level 2 data. Level 2 is a scalar offset to Level 1 due to the bias correction.



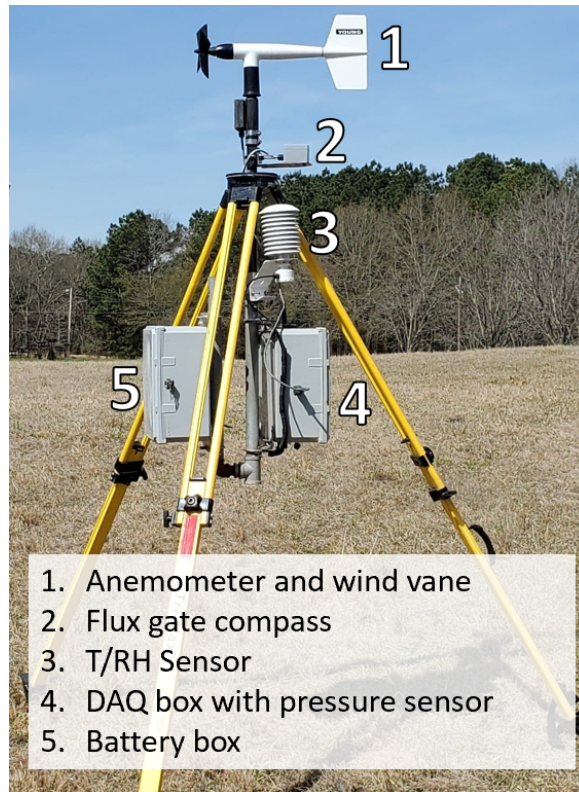
2.0 INSTRUMENT DESCRIPTION

The StickNet is an approximately 2-m tall observing station that records temperature, relative humidity, pressure, wind direction, and wind speed (Weiss and Schroeder 2008). They have been used in many field campaigns to document thermodynamic data in the presence of convection (e.g., Skinner et al. 2011, Weiss et al. 2015, Klees et al. 2016, McDonald and Weiss 2021).

STICKNET INSTRUMENT SPECIFICATIONS

Instrument	Model	Accuracy
Wind	R. M. Young 05103V	WS \pm 1 m s ⁻¹ , WD \pm 3 deg
T/RH	R. M. Young 41382	T \pm 0.3 C, RH \pm 2%

STICKNET WITH LABELED COMPONENTS



3.0 DATA COLLECTION AND PROCESSING

LEVEL 1 DATASET:

All data have been run through an objective QC algorithm. Two flags have been appended to the end of each data string (0 = pass, 1 = fail):

- a thermodynamic flag (tflag) for potentially erroneous values of T, RH, and/or P
- a kinematic flag (wflag) for potentially erroneous values of WS and/or WD

Each data file contains StickNet data for one IOP for a single probe. The sampling rate is 10-Hz.

LEVEL 2 DATASET:

The Level 1 10-Hz data was averaged to 1-Hz and a bias correction was applied for all data (T, RH, P, WD, WS) where appropriate. Biases were determined using mass tests that were performed after each IOP, resulting in slightly different bias corrections for each IOP dataset. The biases applied for each IOP are included in a csv file in this dataset.

Data Remarks:

- *IOP1 only had 16 probes deployed since no feature of interest occurred to place a fine-scale array.*
- *Caution in the wind measurement validity for 0222A (coarse-scale array probe) in IOP1 due to surface exposure issues. Wind speeds are consistently weaker, thus causing larger spread in wind directions measured.*
- *0108A (fine-scale array probe) in IOP4 is not included in either Level 1 or Level 2 datasets due to voltage instrument issues causing unreliable collected data.*
- *Time delta between outputted computer time vs actual GPS time have an error bar of 5-10 seconds. Caution must be taken if doing very detailed temporal comparisons with other non-StickNet platforms.*

4.0 DATA FORMAT

DATA FILES:

Each file name depicts the probe ID, IOP number, and data level (see Sections 1.0 and 3.0).

Sample: 0102A_IOP1_level2.txt

Probe: 0102A
IOP: IOP1
Level: Level 2

The data is output in the following order: Time, T, RH, P, WS, and WD. Each file contains a header with this information.

Variable	DATA UNITS Units
Time:	UTC format: YYYY-MM-DD HH:mm:ss (year-month-day hour:minute:second)
Temperature:	°C
Relative Humidity:	%
Barometric Station Pressure:	hPa
Wind Speed:	m s ⁻¹
Wind Direction:	deg

Sample: 2022-03-23 18:13:11, 12.0, 41.8, 984.9, 0.3, 170.4

Time: 3 March 2023, 18:13:11 UTC
T: 12.0 °C
RH: 41.8%
P: 984.9 hPa
WS: 0.3 m s⁻¹
WD: 170.4 deg

Level 1 only:

For Level 1 files, the data string will have two additional columns for the tflag and wflag (in that order). If a data point does not pass the QC algorithm, the corresponding flag is set to 1, otherwise it is set to 0. The time string will also include tenths of seconds in the time string (HH:mm:ss.s; hour:minute:second.tenth of second).

ADDITIONAL FILES:

StickNet Locations:

For each IOP, there is a file with StickNet location information (e.g., IOP1_StickNet_Locations.csv for IOP1).

Each file contains every StickNet's ID, Latitude (deg), Longitude (deg), Elevation (m), and Array Type, in that order. The Array Type is either "Coarse" or "Fine", depending on if the StickNet was used in the coarse array (set up the day before each event) or used in the fine-scale array deployed the day of the event.

Sample: 213A, 32.231392, -86.29392, 83.9, Fine

ID: StickNet 0213A
Latitude: 32.231392 deg (N)
Longitude: 86.29392 deg (W)
Elevation: 83.9 m
Array type: fine scale

Biases:

This file (Bias_Sticknet.csv) contains the biases **subtracted** from the Level 1 data to create the Level 2 data. The data is output in the following order: IOP number, StickNet ID, T bias, RH, bias, P bias, WS bias, and WD bias. The units are the same as in the data files.

Sample: IOP2, 101, 0.1, -0.3, -0.2, -0.1, 1.0

IOP: IOP 2 (3 March 2023)
ID: StickNet 0101A
T bias: 0.1 °C
RH bias: -0.3 %
P bias: -0.2 hPa
WS bias: -0.1 m s⁻¹
WD bias: 1.0 deg

5.0 REFERENCES

- Klees, A.M., Y.P. Richardson, P.M. Markowski, C. Weiss, J.M. Wurman, and K.K. Kosiba, 2016: Comparison of the tornadic and nontornadic supercells intercepted by VORTEX2 on 10 June 2010. *Mon. Wea. Rev.*, **144**, 3201–3231, <https://doi.org/10.1175/MWR-D-15-0345.1>
- McDonald, J. M., & Weiss, C. C. (2021). Cold pool characteristics of tornadic quasi-linear convective systems and other convective modes observed during VORTEX-SE. *Mon. Wea. Rev.*, **149**, 821-840, <https://doi.org/10.1175/MWR-D-20-0226.1>
- Skinner, P. S., C. C. Weiss, J. L. Schroeder, L. J. Wicker, and M. I. Biggerstaff, 2011: Observations of the surface boundary structure within the 23 May 2007 Perryton, Texas, supercell. *Mon. Wea. Rev.*, **139**, 3730–3749, <https://doi.org/10.1175/MWR-D-10-05078.1>.
- Weiss, C. C., D. C. Dowell, J. L. Schroeder, P. S. Skinner, A. E. Reinhart, P. M. Markowski, and Y. P. Richardson, 2015: A comparison of near-surface buoyancy and baroclinity across three VORTEX2 supercell intercepts. *Mon. Wea. Rev.*, **143**, 2736–2753, <https://doi.org/10.1175/MWR-D-14-00307.1>.
- Weiss, C. C., and J. L. Schroeder, 2008: StickNet - A new, portable, rapidly-deployable, surface observing system. Preprints, 88th Annual Meeting of the American Meteorological Society, New Orleans, LA, 4A.1