SWEX Dataset Documentation

Gaviota Site Infrasound/seismometer data

- David R. Fitzjarrald
- ORCID ID: 0000-0002-3767-8558
- Atmospheric Sciences Research Center (ASRC)
  University at Albany
  Harriman Campus; ETEC Building
  1220 Washington Avenue, Room 329
  Albany, NY 12227
  dfitzjarrald@albany.edu; 518-437-8735

1.0 Data Set Description

- Introduction: One goal of this part of the project is to determine whether infrasound created by strong wind shear at the interface of the downslope windstorm and the marine layer can be readily identified at the surface, with the aim to develop a short-term forecast tool that may allow early warning of strong winds aloft in the hours before they reach the surface using only relatively simple surface observations.
- Data version number and date ***1.0 June 16, 2023***
- Data Status (Preliminary or Final) ***Final***
- Time period covered by the data ***April 1, 2022 12UT to May 15, 2022, 12UT.***
- Physical location Three sites:, these locations from GPS units at each site.

1) *latitude:* 34.475727*; longitude:* -120.214823*; elevation:* 56.6 m. *In field south of the Santa Barbara County Fire Station #38*
2) *latitude:* 34.475182*; longitude:* -120.214043*; elevation:* 51.9 m. *In field south of the Santa Barbara County Fire Station #38*
3) *latitude:* 34.47565 *; longitude:* -120.213333*; elevation:* 55.4 m. *In field south of the Santa Barbara County Fire Station #38*

- Data Frequency. ***Data recorded at 100 Hz..***
- Data set restrictions ***None.***

2.0 Instrument Description

- Location of sensors. The NCAR ISFS-1 is noted at "S1". Infrasound stations at the three locations marked "*Orelhão*". Red circle near the Fire House shows the location of the ceilometer.

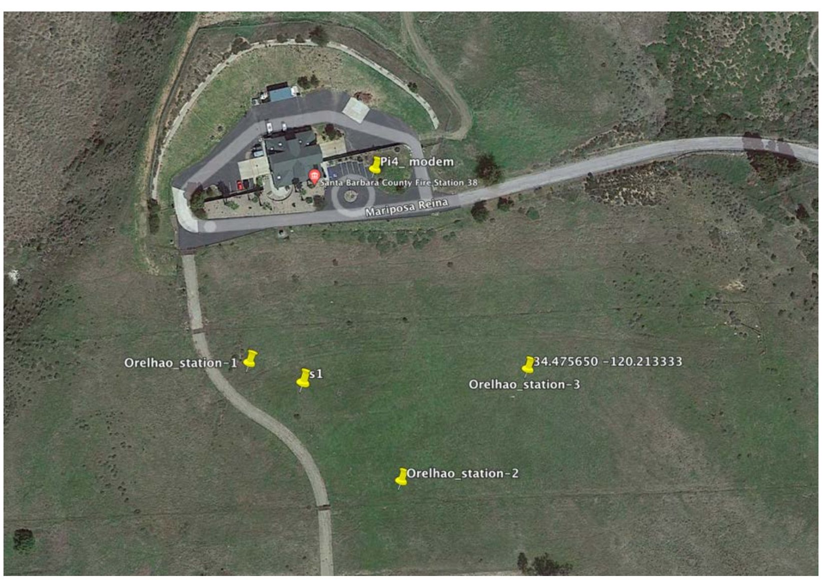

Figure 1. Locations of ASRC sensors during SWEX.

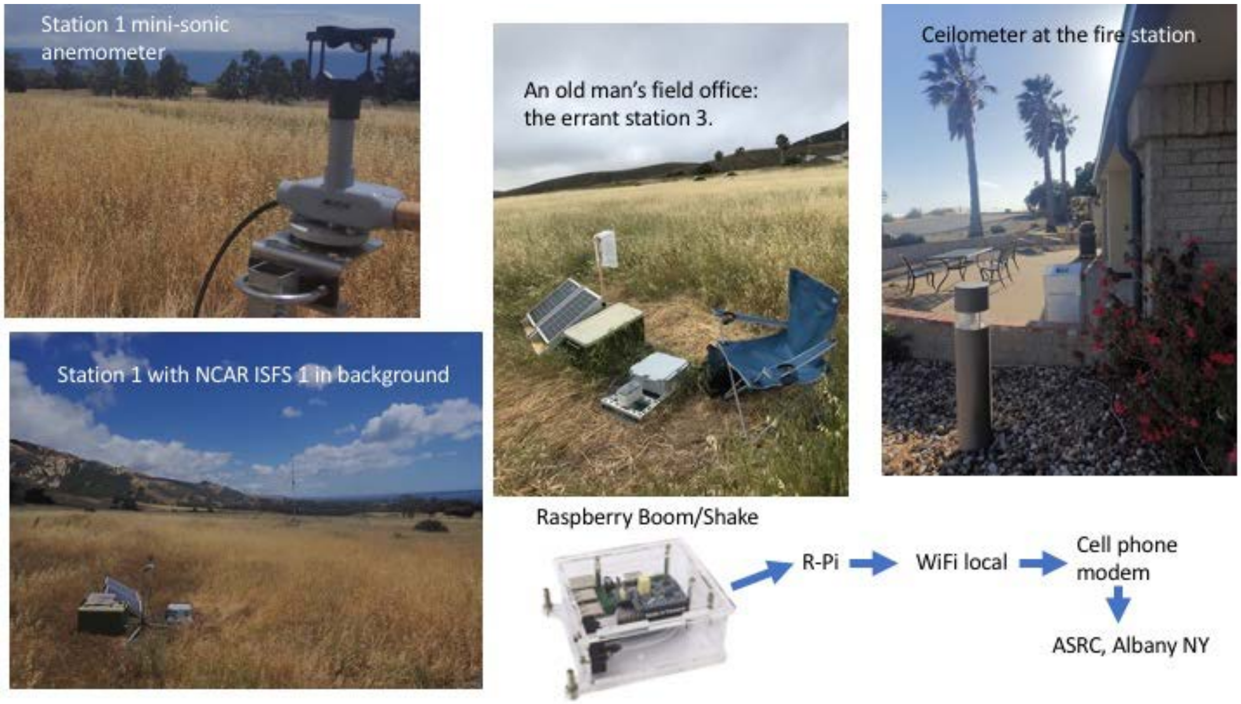

Figure 2 Images of the mini-sonic anemometer, infrasound station Py-1 and Py-3 and the ceilometer at the fire station..

- Brief text describing the instrument and how it collects data including reference. *Manufacturer*: 'The "Raspberry Shake and Boom" (RS&BOOM) personal seismo-acoustic monitors are all-in-one, IoT integrates a single vertical velocity sensors with an acoustic pressure transducer, the digitizers, the hyper dampers, and the computer into a single box.' Detailed specifications for this device are available at: https://manual.raspberryshake.org/specifications.html.

3.0 Data Collection and Processing

- Data acquisition and archiving is explained in the figure below. At each station a separate Pi-3, each running a GPS corrected clock, and files in ASCII format were put into standard files with this computer's time header. Then files were compressed (*gzip*) and sent data once daily over the local intranet to a separate Raspberry Pi (Pi-4) computer to consolidate the data. These data then were transmitted over a cell phone modem to our base computer at ASRC in Albany, New York.

Network setup

Data from Raspberry Boom/Shake sensors, Stns 1-3 & mini-sonic anemometer are sent to a Pi-3 and stored separately at two places at each station.

Local WiFi network communicates to a Raspberry Pi-4 near the trailer at Firehouse.

Cell modem sent data daily to ASRC.
Power supplied by solar panels/batteries.

Accumulating data file at ASRC in Albany

Index of / **5/13/2022**

Name	Last modified	Size	Description
PyShake-3.8887.20220419.log	2022-05-13 14:00	29K	
PyShake-2.8887.20220401.log	2022-05-13 13:00	51K	
PyShake-1.8887.20220408.log	2022-05-13 13:00	43K	
Sonic.20220408.log	2022-05-13 13:00	31K	
Sonic.20220512_23Z.dat.gz	2022-05-12 23:59	460K	
PyShake-1.8887.20220512_23Z.UDP.dat.gz	2022-05-12 23:59	2.3M	
PyShake-2.8887.20220512_23Z.UDP.dat.gz	2022-05-12 23:59	2.3M	
PyShake-3.8887.20220512_23Z.UDP.dat.gz	2022-05-12 23:59	2.3M	
PyShake-2.8887.20220512_22Z.UDP.dat.gz	2022-05-12 22:59	2.3M	
Sonic.20220512_22Z.dat.gz	2022-05-12 22:59	459K	
PyShake-3.8887.20220512_22Z.UDP.dat.gz	2022-05-12 22:59	2.2M	
PyShake-1.8887.20220512_22Z.UDP.dat.gz	2022-05-12 22:59	2.3M	
PyShake-1.8887.20220512_21Z.UDP.dat.gz	2022-05-12 21:59	2.3M	
PyShake-2.8887.20220512_21Z.UDP.dat.gz	2022-05-12 21:59	2.3M	
PyShake-3.8887.20220512_21Z.UDP.dat.gz	2022-05-12 21:59	2.2M	
Sonic.20220512_21Z.dat.gz	2022-05-12 21:59	463K	
Sonic.20220512_20Z.dat.gz	2022-05-12 20:59	443K	
PyShake-2.8887.20220512_20Z.UDP.dat.gz	2022-05-12 20:59	2.2M	
PyShake-1.8887.20220512_20Z.UDP.dat.gz	2022-05-12 20:59	2.2M	

Figure 3. Data acquisition and recording plan during field operations at the SWEX Gaviota site.

- Description of derived parameters and processing techniques used. *These data are the 'raw' uncalibrated signals.*
- Description of quality assurance and control procedures. *None beyond manufacturer's efforts.*
- Data intercomparisons: ***None so far. We have no comparable local measurements during this project.***

4.0 Data Format

- **Data file** structure and file naming conventions

Sample file name: **PyShake-1**.8887.**20220427_23Z**.UDP.dat.gz
PyShake-1 = Infrasound station #1
20220427_23Z = *Year 2022, Month 04; Day 27; Hour 23UT*
First few lines of the sample file:

Response to command: **gzcat PyShake-1.8887.20220427_23Z.UDP.dat.gz**

---> Generated by PyShake version 1.0
---> File created: 2022 04 27 23:00:00.056202 UTC
==================================
TimeStamp(RPi) **2022 04 27 23:00:00.056338** {'**EHZ**', **1650122365.021**, 16373, 16473, 16488, 16722, 16275, 16735, 16890, 16080, 17146, 16336, 16305, 17112, 15790, 16865, 16796, 16098, 16719, 16683, 16397, 16449, 16906, 16325, 16497, 16889, 16447}
TimeStamp(RPi) **2022 04 27 23:00:00.076349** {'**HDF**', **1650122365.021**, -2979, -3555, -4775, -3936, -3248, -3122, -3874, -5591, -5112, -4902, -3748, -2872, -2650, -2807, -3399, -2266, -1898, -1095, -987, -2958, -2791, -3481, -4044, -4259, -5933}

GPS time R-Pi:) **2022 04 27 23:00:00.076349**

Line '**EHZ**': infrasound signal (100 Hz)
Line '**HDF**': 1D seismometer (100 Hz)

Time series plot file example and naming convention.

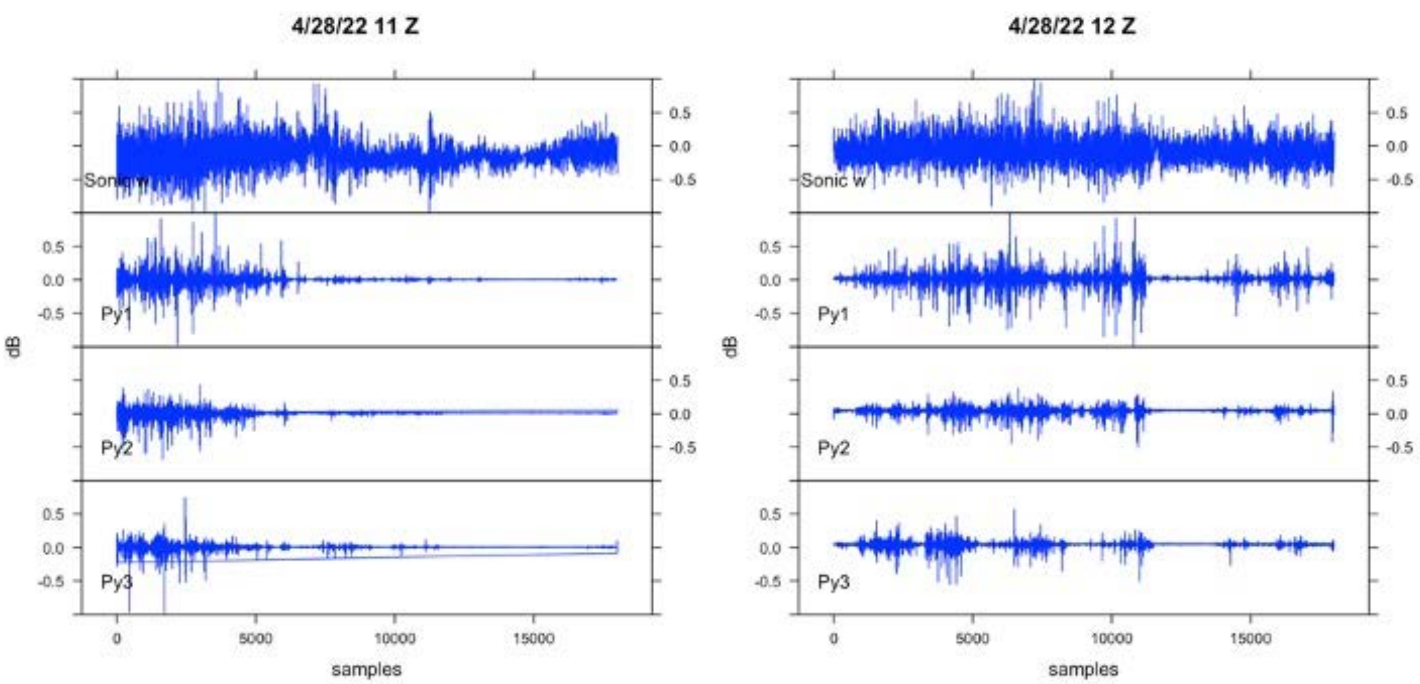

Figure 2. Sample time series for two selected hours during SWEX. Top panel: Mini-sonic anemometer vertical velocity (w') trace. Panels 2-4: Raw infrasound signal from from the three sensors at locations 1-3 as shown in Figure 1.

5.0 Data Remarks

- PI's assessment of the data (i.e., disclaimers, instrument problems, quality issues, etc.)
- Example of illustrative time series plots:
-
- Software compatibility (i.e., list of existing software to view/manipulate the data plus software repository locations/links and responsible parties' contact information)

6.0 References

Carvalho, L.M., Duine, G.J., Clements, C., De Wekker, S.F., Fernando, H.J., Fitzjarrald, D.R., Fovell, R.G., Jones, C., Wang, Z., White, L. and Bucholtz, A., 2024. The Sundowner Winds Experiment (SWEX) in Santa Barbara, California: Advancing Understanding and Predictability of Downslope Windstorms in Coastal Environments. *Bulletin of the American Meteorological Society*, *105*(3), pp.E532-E558.

Carvalho, L.V., Duine, G.J., Jones, C., De Wekker, S., DeOrla-Barille, M., Fernando, H.J., Clements, C., Fitzjarrald, D.R., Fovell, R.G., Melarkey, K. and Wang, Z., 2022, December. Downslope Windstorms in Coastal Environments and Interactions with the Continental and Marine Boundary Layers: Lessons Learn from the Sundowner Winds Experiment (SWEX-2022), Santa Barbara, CA. In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. A45E-07)

Fitzjarrald, D. R., 2022, New York State Mesonet Forum, May 13, 2022. "*Report from the field on the SWEX campaign near Santa Barbara CA*".

Fitzjarrald, D. R., 2022, Keynote address, XII Brazilian Micrometeorology Workshop, Santarém PA, Brazil, November 16, 2022: "*Sensing downslope winds using infrasound measurements in the SWEX Project, Santa Barbara California, 2022*.