----- GENERAL INFORMATION -----

DATA TITLE: Iowa State University Iowa Atmospheric Observatory 120-m Tall tower measurements (5-min statistics)

DATA ABSTRACT: The data are monthly 5-min statistics from 1-Hz measurements on two 120-m tall towers at the ISU Iowa Atmospheric Observatory collected from 1 June 2016-May 31 2018. Data files were used to develop analysis of the impact of single wind turbines and a large wind farm on changes to surface cooling during the evening as described in the manuscript to *Geophysical Research Letters*: "*Observations show that wind farms substantially modify the atmospheric boundary layer thermal stratification transition in the early evening*" (2020, in review).

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COLLECTION INFORMATION:
      Time period(s): 1 June 2016 00:00:00 UTC to 31 May 2018 23:59:59 UTC
      Location(s): Within and outside of a utility scale 200-turbine Iowa wind farm

ASSOCIATED PUBLICATIONS:

D. A. Rajewski, E.S. Takle, A. VanLoocke, and S.L. Purdy, 2020: Observations show that wind farms substantially modify the atmospheric boundary layer thermal stratification transition in the early evening. *Geophysical Research Letters* (In review).

E.S. Takle, D. A. Rajewski, and S.L. Purdy, 2019: The Iowa Atmospheric Observatory: Revealing the unique boundary Layer characteristics of a wind farm. *Earth Interact.*, **23**, https://doi.org/10.1175/EI-D-17-0024.1.

----- FILE DIRECTORY -----

----- FILE LIST-----

A. 5-min_montthly_files - [Monthly netCDF files of 5-minute averages of 1-Hz tall tower measurements]
        A.a. [analog5min_YYYYMM.nc] - [5-min tall tower netCDF file corresponding to each year and month of the data record]

B. This README file explaining the dataset

C.   Python script [analog5min_to_csv.py] used to extract each 5-min_montly netCDF file into two csv files, one file for each of the towers

----- METHODS AND MATERIALS -----

----- DATA COLLECTION METHODS -----

The ISU Iowa Atmospheric Observatory features two identically configured 120-m tall towers, one placed within and one place outside of a utility scale 200-turbine wind farm to compare measurements of wind speed, wind direction, air temperature, relative humidity, and air pressure between the natural atmospheric boundary layer and a boundary layer altered by a single turbine or the entire wind farm (Takle et al 2019; Rajewski et al 2020). Data were sampled at 1-Hz resolution from each instrument (See Equipment), were stored on a data logger at each tower site, and were transmitted to a database server on the ISU campus.

----- DATA PROCESSING METHODS -----

The raw 1-Hz data in .dat files were converted into 4-hr segments of NetCDF files. The 1-Hz NetCDF files were processed by month to determine 5-minute statistical quantities (mean, minimum, maximum, median, standard deviation, median absolute deviation, and the number of samples) for each averaging period. Only 5-min statistics of these raw data files are provided in this repository. Each 5-min NetCDF file was then split into two csv files for each tower site using a python script developed by D.E. Herzmann and K. Carter, 2017. The script to separate the data from each tower is available in the root directory: */Iowa State University Iowa Atmospheric Observatory 120-m Tall tower measurements (5-min statistics) \analog5min_to_csv.py.*

------- EQUIPMENT -------

Manufacturer: Thies GmbH & Co. KG; Coesfeld, Germany
Model: Thies cup anemometer
Operating Range: -50 to 80 °C
Measurement accuracy: ±0.2 m s-1 from 0.3 to 50 m s-1 or 1%

Manufacturer: Renewable NRG Systems; Hinesburg, Vermont, USA
Model: NRG 200P wind vane
Operating Range: -55 to 60 °C
Measurement accuracy: ±1%

Manufacturer: Campbell Scientific; Logan, Utah, USA
Model: H2SC3 temperature/relative humidity probe
Operating Range: -40 to 60 °C
Measurement accuracy: T: ±0.1 °C at 23°C ±0.2 °C at 0°C & 40°C
                    RH: 0.8% at 20°C, 1.3% at 0°C & 40°C

Manufacturer: Vaisala Helsinki, Finland
Model: PTB 110 barometer
Operating Range: -55 to 60 °C
Measurement accuracy: ± 0.3 mb at 20 °C
                    ± 0.6 mb at 0 °C & 40 °C

Manufacturer: Campbell Scientific; Logan, Utah, USA

Model: CR3000 Micrologger

Embedded Software/Firmware Name: LoggerNet/CR3000 OS

Embedded Software/Firmware Version: LoggerNet 4.4-4.5/CR3000 OS 29-CR3000 OS 32.02

Operating Range: -40° to +85°C (extended)

Voltage accuracy ±(0.04% of reading + offset) at 0° to 40°C

------- SHARING / ACCESS -------