

Plains Elevated Convection at Night (PECAN) Kansas Mesonet One and Five Minute Data Set

1.0 Contacts

NCAR/EOL:

Scot Loehrer

loehrer@ucar.edu

Kansas State University:

Christopher Redmond

christopherredmond@k-state.edu

2.0 Dataset Overview

This data set contains the one and five minute resolution observations from the 50 Kansas Mesonet stations (Fig. 1) for the period 1 May – 31 July 2015. These data were collected, quality controlled, and archived by Kansas State University.

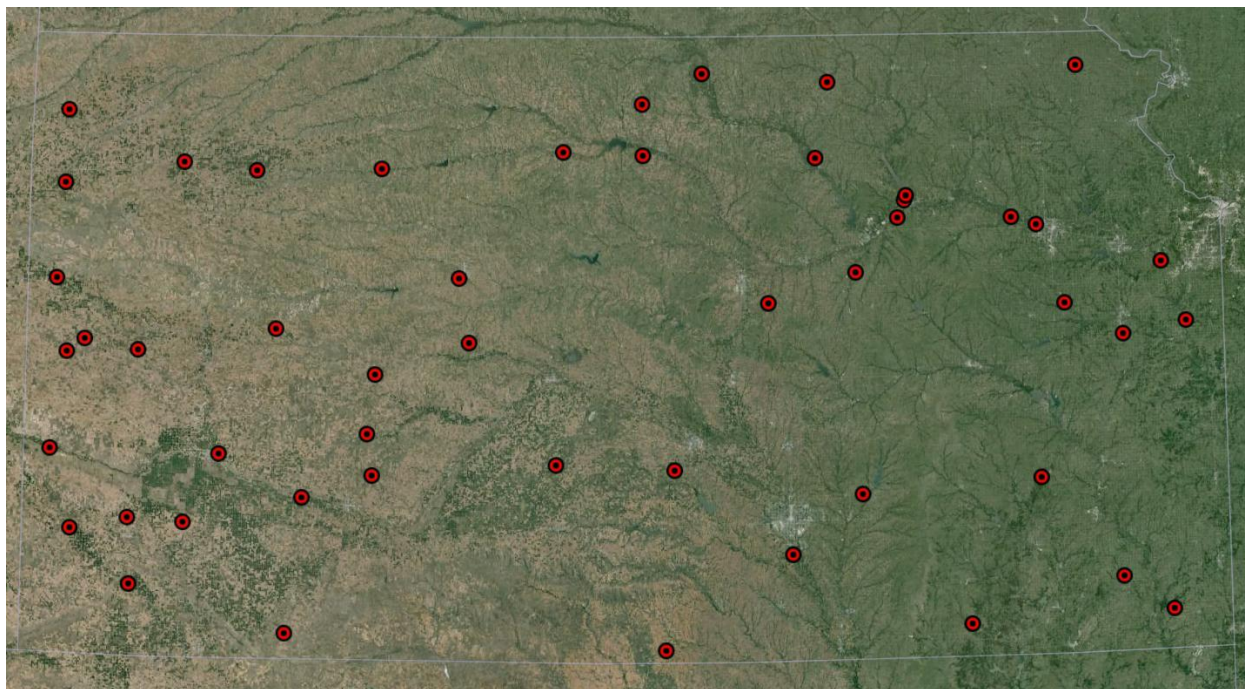


Figure 1. Map of Kansas Mesonet locations.

3.0 Project Overview

Plains Elevated Convection At Night (PECAN) was a multi-agency project designed to advance the understanding of continental, nocturnal, warm-season precipitation. It focused on nocturnal convection in conditions over the central United States plains states with a stable boundary layer (SBL), a nocturnal low-level jet and the largest convective available potential energy located above the SBL. Three aircraft (University of Wyoming King Air, NOAA P-3, and NASA DC-8) as well as a large array of fixed and mobile ground instrumentation were deployed out of Kansas from 1 June to 15 July 2015.

4.0 File Format Description

The one and five minute resolution Kansas Mesonet (KSMeso) data are in a comma-delimited ASCII format. Each file contains the one or five minute data for one station for the complete time period.

The one (five) minute parameters and units are described in the "1 minute data" ("5 minute data") tab of the file 150616-header-info-raw-files.xlsx that is included with this data set.

All times in the files are in Central Standard Time (UTC – 6).

The files use NAN as the missing value.

5.0 Instrumentation

All stations were equipped with the CR1000 or CR3000 series Measurement and Control microprocessor built by Campbell Scientific Inc.

Solar Radiation

An Apogee PYR-P Pyranometer measures incoming solar radiation in watt-hours per square meter. Every five minutes, the sensor is sampled for the most recent five-second measurement.



Apogee CS300 Silicon Pyranometer (PYR-P)

Measurement	Unit	Range	Resolution	Accuracy
Solar Radiation	W/m ²	0—2000	0.2 mV(W/m ²)	~5%

Air Temperature + Relative Humidity

A Vaisala HMP45, HMP60, or HMP155 probe is installed inside of a non-aspirated radiation shield. Both relative humidity and air temperature are measured.



Vaisala HMP45, HMP60, HMP155 Temperature & Relative Humidity Probe

Measurement	Unit	Range	Resolution	Accuracy
Air Temperature	°C	-40—60	0.1 °C	~0.2 °C @ +20 °C ~0.3 °C @ 0,+40 °C ~0.4 °C @ -20,+60 °C
Relative Humidity	%	0—100	1%	~2% @ 0—90% ~3% @ 90—100%

Wind Speed + Direction

The wind monitor is a propeller anemometer mounted to the site tower. Wind speed and direction are measured by the revolution of the propeller and vane body, respectively.



RM Young 05103-5 Wind Monitor

Measurement	Unit	Range	Resolution	Accuracy
Wind Speed	m/s	0–60	0.3 m/s	~0.3 m/s
Wind Direction	°	0–360	1°	~3°

Precipitation

Precipitation is measured with a tipping bucket rain gauge. Most of the stations use a TB525 tipping bucket rain gauge built by Texas Electronics Inc., Dallas, TX, USA. Several have been upgraded to heated siphon tipping bucket rain gauges built by Hydrological Services America, Lake Worth, FL, USA.



TE 525mm Texas Electronics Tipping Bucket Rain Gauge

Measurement	Unit	Range	Resolution	Accuracy
Rain + Snow	mm	0–700	0.254 mm	~1% @ <250 mm
				~3% @ 10–20 mm
				~5% @ 20–30 mm



TB4 Hydrological Services Heated Siphon Tipping Bucket Rain Gauge

Measurement	Unit	Range	Resolution	Accuracy
Rain + Snow	mm	0—700	0.254 mm	~2% @ <250 mm ~3% @ 250—500 mm

Barometric Pressure

PTB110 Barometric Pressure Sensor built by Vaisala. This sensor utilizes the Vaisala BAROCAP silicon capacitive sensor.



Vaisala PTB110 Barometric Pressure Sensor

Measurement	Unit	Range	Resolution	Accuracy
Air Pressure	Mb	-40—60		~1 Mb @ -20—45 °C

Soil Temperature

All weather stations take soil temperature measurements at 2 and 4 inch depths. Built by Campbell Scientific, these sensors utilize the BetaTherm 100K6A1IA Thermistor.



Campbell Scientific 107 Temperature Probe

Measurement	Unit	Range	Resolution	Accuracy
Soil Temperature	°C	-35—50		~0.2 °C

Soil Moisture

Selected weather stations have Soil Moisture Probes installed to measure the sub-surface soil moisture content at multiple depths. Most weather stations use probes built by Stevens Water Monitoring Systems Inc., Portland, OR, USA. Several weather stations use CS655 Time Domain Reflectometer probes built by Campbell Scientific.



The station location information are available in the file KSMeso-Station-Metadata.csv which is included with this data set. The stations in this file that have the "Admin Unit" Kmesonet have the winds measured on a 10m tower, while those with the "Admin Unit" KSRE have the winds measured on a 2m tower.

6.0 Data Quality Control Procedures

These data were processed and quality controlled by the Kansas Mesonet.

Data Quality Assessment algorithms are incorporated into the data logger operational program as well as into near real-time post processing at the Kansas State University Weather Data Library. These QA/QC processes identify potential problems to the maintenance technicians.

The pressure sensors on the Kansas Mesonet stations were added just prior to or during the PECAN field phase. The Kansas Mesonet made a software change early on 19 June that led to an error and invalid pressure data being recorded. This problem was corrected early on 29 June and most pressure data from then on were correct. The table below summarizes the time periods of invalid pressure data for each station in the network.

<u>Station</u>	<u>Invalid Pres Data</u>
AshlandBottoms	none
Butler	none
Cherokee	none
Cheyenne	6/19 - 6/28
Clay	5/1 - 6/28
Colby	none
GardenCity	none
Grant	5/1 - 6/28
Gray	5/1 - 5/21, 6/19 - 6/28
Gypsum	5/1 - 5/14
Hamilton	6/19 - 7/30
Harper	6/19 - 6/28
Haskell	5/1 - 6/28
Hays	none
Haysville	5/1 - 6/28
Hiawatha	6/19 - 6/28
HillCity	6/19 - 6/28
Hodgeman	none
Hutchinson10SW	none
Jewell	5/1 - 5/14
LaCrosse	6/19 - 6/28
Lane	5/1 - 5/18, 6/19 - 6/28
Leoti	6/19 - 6/28
Manhattan	none
Meade	5/1 - 6/28
Miami	none
Mitchell	none
NessCity	5/1 - 6/28
Olathe	5/1 - 6/28
Osage	5/1 - 6/28

Osborne	none
Ottawa	6/19 - 6/28
Parsons	none
RockSprings	5/1 - 5/14, 6/19 - 6/28
RockyFord	5/1 - 5/8, 6/19 - 6/28
Rossville	none
Scandia	none
Sedan	5/1 - 6/28
Sheridan	All pres data invalid, sensor failure
Sherman	6/19 - 6/28
SilverLake	none
Spearville	none
Stanton	5/1 - 6/28
Stevens	5/1 - 6/28
StJohn	none
Tribune	none
Tribune6NE	All pres data invalid, sensor failure
Wallace	6/19 - 6/28
Washington	5/1 - 5/14
Woodson	6/19 - 6/28

NCAR/EOL has not conducted any additional processing or quality control on these data.

7.0 References

Kansas State University Kansas Mesonet Network Architecture web site (accessed 31 August 2015): <http://mesonet.k-state.edu/about/network/>