PECAN FP2 SODAR Wind Profile Measurements

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1. Data Set Overview

During PECAN, the Naval Postgraduate School conducted wind profile measurements with an ASC Model 4000 MiniSODAR at FP2 in Greenburg Business Park in an open grassy field. The miniSODAR made from measurements from June 6, 2015 to July 14, 2015. Figure 1 shows the SODAR at the FP2 site.

Figure 1. NPS SODAR deployed at Greensburg, Kansas (FP2) during PECAN.

2. Instrument Description

(From manufacturer) The miniSODAR is a high-frequency Doppler sodar system that was designed to measure the atmospheric wind profile from 15 meters to 150/200 meters (data is often available to 250 meters) in 5-meter increments. It operates by generating a short tone burst (30 ms to 100 ms) in the frequency range of 4 kHz to 6 kHz. It monitors the low-level acoustic signal echoed by the atmosphere. The echo is processed with for its frequency content. The shift in the received frequency with respect to the transmitted frequency is called the Doppler shift, which is directly related to the radial motion of the echo volume with respect to the miniSODAR acoustic antenna

Maximum Altitude	200 meters
Minimum Altitude	15 meters
Height Resolution	5 meters
Transmit Frequency	4500 Hz
Wind Speed Range	0 to 45 meters / second
Wind Speed Accuracy	< 0.5 meters / second
Wind Direction Accuracy	± 5 degrees

3. Data Processing

(From manufacturer) Digital data is processed via Fast Fourier Transform based algorithms to extract the Doppler shift and intensity of the received signal. These data are processed into wind and turbulence information and formed into data packets, which are transferred to DOPLMAIN++ for the creation of wind tables.

4. Data Format

5 minute averaged data for the duration of PECAN from the ASC miniSODAR are put into daily netCDF files named ddmmyysodar.nc, where dd is for day, mm for month, and yy for year. The variable names and their descriptions are summarized below. Each variable has 2 dimensions of, Time and Gate, where time is UTC_matlab_time and Gate is height of measurement in meters above ground. Each variable generally has a size of 288 x 49.

Variable Name	Units	Description
UTC_matlab_time	Day	UTC fractional day from Jan 0, 0000
YEAR	YEAR	Year (UTC)
MONTH	MONTH	Month (UTC)
DAY	DAY	Day (UTC)
HOUR	HOUR	Hour (UTC)
MINUTE	MINUTE	Minute (UTC)
Height	m	Height above ground
VAL1	None	Number of validations in beam 1
VAL2	None	Number of validations in beam 2
VAL3	None	Number of validations in beam 3
SNR1	None	Signal to noise ratio * 10 in beam 1
SNR2	None	Signal to noise ratio * 10 in beam 2
SNR3	None	Signal to noise ratio * 10 in beam 3
BS1	None	Backscatter intensity in beam 1
BS2	None	Backscatter intensity in beam 2
BS3	None	Backscatter intensity in beam 3
U	$m\ s^{-1}$	Wind Speed
Dir	deg	Wind Direction
Ug	$m\ s^{-1}$	Gust wind speed
Dirg	deg	Gust wind direction
u	$m\ s^{-1}$	East wind component
std_u	$m\ s^{-1}$	Standard deviation of east wind component
v	$m\ s^{-1}$	North wind component
std_v	$m\ s^{-1}$	Standard deviation of north wind component
w	$m\ s^{-1}$	Vertical wind component
std_w	$m\ s^{-1}$	Standard deviation of vertical wind component