

KIT Wind LiDAR at WLEF

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Data Set Overview

This dataset comprises of raw data of Doppler LiDAR range-height indicator (RHI) scans, which intersect at the location of another Doppler LiDAR operating in vertical stare mode. The vertical stare LiDAR was set up right next to the SPARC trailer and ATMONSYS LiDAR at the WLEF tall tower site. This setup constitutes a virtual tower that provides high-frequency vertical wind speed measurements (not included in this data set, please see “SSEC SPARC Wind LiDAR at WLEF”) and simultaneously facilitates the calculation of the averaged horizontal wind speed at multiple height levels above the vertical stare LiDAR.

Time period: 2019-07-04 00:00:00 – 2019-09-30 23:59:59

Location:

The location of the two scanning LiDARs (RHI 1 & RHI 2) relative to the vertical stare LiDAR is shown in figure 1.



Figure 1: Doppler LiDAR setup

Instruments

Two HALO Photonics Stream Line Doppler LiDARs as shown in figure 2 were used with the settings listed in tables 1 and 2.



Figure 2: Halo Photonics Stream Line Doppler LiDAR at the CHEESEHEAD measurement campaign

Table 1: Settings used until July 24, 2019

	RHI 1 (LiDAR_75)		RHI 2 (LiDAR_74)	
	Stare mode	Continuous scan mode	Stare mode	Continuous scan mode
Number of gates	100		167	
Range gate length (m)	18		18	
Gate length (pts)	6		6	
Pulses/ray	10000	1000	15000	1000
Focus range	300	500	300	500
Resolution (m/s)	0.0382		0.0382	

Table 2: Settings used after July 24, 2019

	RHI 1 (LiDAR_75)		RHI 2 (LiDAR_74)	
	Stare mode	Continuous scan mode	Stare mode	Continuous scan mode
Number of gates	167		167	
Range gate length (m)	18		18	
Gate length (pts)	6		6	
Pulses/ray	5000	3000	5000	3000
Focus range	1000	1250	1000	1250
Resolution (m/s)	0.0382		0.0382	

Data Collection

Both instruments performed an RHI scans in continuous scan mode between elevation angles 66° and 87° , starting and ending at the stare elevation angle at appr. 77° . Both instruments were pointed at the vertical stare lidar next to the tall tower, resulting in azimuth angles of 236° (RHI 1) and 333° (RHI 2).

Until 24 of July, the continuous scan mode started every 5 minutes, performing 2 scans, before returning to the stare position until the 5 minutes were over. Because this scan pattern resulted in a large number of NaNs, the scan schedule was changed and the continuous scan mode was started every minute, performing one scan, and then returning to the stare position.

This data set only contains raw data. Therefore, no processing or quality check is performed.

Data Format

Data version: Raw data

Data file structure:

```
>LiDAR_74 (RHI 2)
  >YYYYMMDD
    >Background_DDMMYY-HHMMSS.txt
    >Stare_74_YYYYMMDD_HH.hpl
    >User5_74_YYYYMMDD_HHMMSS.hpl
>LiDAR_75 (RHI 1)
  >YYYYMMDD
    >Background_DDMMYY-HHMMSS.txt
    >Stare_75_YYYYMMDD_HH.hpl
    >User5_75_YYYYMMDD_HHMMSS.hpl
```

Background files:

- one measurement per hour
- the scanner measures backscatter at parking position without atmospheric return
- used to remove any (non-white) noise

Stare files:

- collection of all measurements in stare-mode during one hour
- each measurement consists of decimal time (hours), azimuth (degrees), elevation (degrees), pitch (degrees), roll (degrees), range gate, Doppler (m s^{-1}), intensity (SNR + 1), beta ($\text{m}^{-1} \text{sr}^{-1}$)

User files:

- measurements of each scan
- until 2019/07/24 every 5 minutes, afterward one file per minute
- each measurement consists of decimal time (hours), azimuth (degrees), elevation (degrees), pitch (degrees), roll (degrees), range gate, Doppler (m s^{-1}), intensity (SNR + 1), beta ($\text{m}^{-1} \text{sr}^{-1}$)

Data Remarks

Until July 24, different settings were used for the two LiDARs, that might affect the data quality differently. Furthermore, the measurements of the RHI 1 LiDAR contain a large number of NaN values until this day.

In the night between September 3 and 4, a power failure because of a thunderstorm caused the instruments to point at wrong directions until they were restarted in the morning. This might have happened at other times, as well.