

	<b>Wavelength</b>
<b>Ceilometers</b>	
Campbell CS135	905 nm
Lufft CHM 15k NIMBUS	1064 nm
PSI Compact Ceilometer	1550 nm
MiniMPL-532-C (Micro Pulse)	532 nm
Vaisala CL51 Ceilometer	910 nm
Vaisala CL31 Ceilometer	910 nm
<b>Balloon Soundings</b>	
Windsond	-
Vaisala RS41 Radiosonde	-
InterMet iMet-1 Radiosonde	-
Graw DFM-09 & DFM-17	-
<b>Doppler Sodar</b>	
Mini-Doppler Sodar-RASS DSDPA.90-24	
Metek PCS2000	
Metek RASS 915 or 1290 MHz	
Remtek PA-XS and PA-0	
Scintec SFAS & MFAS	
<b>Radar Wind Profiler</b>	
915 or 1290 MHz Radar Wind Profiler (Scintec LAP3000)	0.33 m
449 MHz Radar Wind Profiler (Scintec LAP8000)	0.67 m
Radiometrics RAPTOR	0.33 m
<b>Lidar Wind Profiler &amp; other Lidars</b>	
Lockheed Martin WindTracer	1,617/2,023 nm
HALO Photonics XR Streamline	1,500 nm
Leosphere WindCube 100S/200S/400S	1540 nm
Leosphere WindCube v2 profiling lidar	1540 nm
ZX300 profiling lidar	1560 nm
NRG SpiDAR lidar	

Metek Wind Scout and Wind Ranger NOAA coherent High-Resolution Doppler lidar	2,022 nm
Raymetrics Raman Lidar	355 nm
Purple Pulse Raman Lidar	355 nm
Vaisala DIAL	910 nm
<b>Passive Infrared and Microwave</b>	
Radiometrics MP-1500A / 2500A / 3000A	~ 1cm
AERI	3 - 25 $\mu$ m

Pulse Freq	Power	Vertical Range
10,000 Hz	470 W (max)	10 km
5,000 - 7,000 Hz	250 W (standard) 800 W (max, with heating)	15 km
--	20 W (typical)	7 km
2,500 Hz	100 W (typical)	15 km
6,5000 Hz	310 W (typical)	15 km
10,000 Hz	310 W (typical)	7.5 km
-	100 mW (max)	8 km
-	60 mW (min)	~30 - 40 km
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SODAR: 1,598 Hz RASS: 2,897 Hz	100 – 250 W	400 - 600 m
1,500 - 2,300 Hz	60-170 W 140 W	15-300 m 40-1000 m 300m / 600m
	20 - 100 W	400 m / 800 m
-	100 W (average) - 600 W (max)	2 - 5 km
-	2,000 W (max)	8 - 10 km
	800 W - 2 kW (peak)	1 - 20 km
500 - 700 Hz	10,000 W	300 m - 15 km
15,000 Hz	130 W, up to 490 W with cooling	up to 12 km
10,000 Hz	500 W to 1600 W	up to 14 km
-	45 W	40 to 200 m
-	70 W, up to 150W with cooling	10 to 300 m
	35 - 100W	10 - 200 m

	36 W	10 - 100 m
200 Hz	-	20 m - 9 km
20 Hz	800 - 2500 W	11-14 km
200 Hz	20 W	3-5 km
		up to 3 km
	200 W	~ 5 km
	3000 W	~3 km

Temporal Res.	Vertical Res.	Weight
2 - 600 s	5 m	33 kg
2 - 600 sec	5 m	70 kg
30 s	30 m	10 kg
1 - 900 s	5 m	13 kg
6 - 120 s	10 m	46 kg
2 - 120 s	10 m	31 kg
1 s	depends on ascent speed	13 g
1 s	depends on ascent speed	109 g
10 - 20 s	5 - 50 m	
600 - 1800 s	>5 m	50 kg (without enclosure) 100 kg (including antenna)
1 - 60 m	5 - 20 m	7 kg / 20 kg 12 kg / 32 kg
Vert: 1 - 2 min Hor: 15 - 30 min	Low: 60 & 100 m High: 250 & 500 m	-
30 s - 5 min	150 - 500 m	-
5 - 30 minutes	60 - 500 m	
1 s	45-80 m	1,630 - 2,250 kg
1.67 s	18-120 m	85 kg
0.1 to 10s	25 - 200 m	232 kg
1 s	10 - 20 m	45 kg
1 s	0.07 to 7.7m	55 kg

1s		40 kg
0.02 s	30 m	-
1 - 10 s	7.5 m	250 kg
1-10 s	7.5 m	900 kg
	100 - 500 m	130 kg
5 minutes	~ 1 km in ABL	27 kg
8 minutes	~ 200 - 500 m in ABL	200 kg

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## Basic Information

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High signal-to-noise ratio, high detector sensitivity, and single-lense design helps ceilometer detect 4 cloud layers and maintain high performance during precipitation events.

Rugged ceilometer with heating and cooling system, able to withstand extreme conditions and remain reliable for long-term use. Measures cloud penetration depths, and aerosol and boundary layer heights.

Compact ceilometer requiring minimal power, operable across a wide temperature range, with the ability to measure cloud heights. Compact (mini) but delicate instrument requiring extreme care, designed to operate in controlled environments for high-precision measurements for better aerosol determination.

Designed to measure high-range cirrus clouds (up to 13 km and 3 cloud layers) without surpassing low and middle range cloud heights. Diagnostics with little to no maintenance required.

Previous generation to the CL51 and not as capable but still used as a standard at NWS A

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Small, recoverable, and reusable sondes reporting real-time wind, temperature, humidity, and pressure. KIT2 Ground Station: Includes hard case GC1, radio receiver RR2, Software license WS-250, 4 radiosondes SII, and battery charger. Sondes come with balloons BA9 and batteries.

Replacement for venerable RS92 sonde. Radionsonde works to streamline launch preparations, reduce costs, and improve data quality.

Used at universities and various labs. At least two flavors of ground station deployment.

Used at universities and various labs. At least three flavors of ground station deployment.

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Used for continuous measurements of the vertical profiles of wind and (virtual) temperature between the surface and 10 km. Ranging)/RASS (Radio Acoustic Sounding System) system transmits acoustic pulses upward, capable of providing wind and temperature profiles resulting from reflected pulses.

Add on to DSDPA.90-24 or PCS2000 to profile virtual temperature and humidity.

Compact sodar, comes in various formats, can add RASS.

Sodar in various formats, can add RASS.

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Fixed ultra high frequency radars designed to measure wind and precipitation profiles (and virtual temp through rain rate). Compact and easy to build and operate than a 404 MHz (NPN) profiler, but lack height coverage above 10 km.

All-weather modular wind profiler can observe winds and turbulence profiles in the lower atmosphere even under adverse conditions.

The so-called 1/4 scale profiler combines the best sampling attributes of both.

Various models ranging from boundary layer to full troposphere.

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Measurement technique is based on Doppler effect, which allows for tracking of moving objects (e.g., aerosols) and a characterization of their properties. Compact scanning Doppler lidar system, low power consumption, light weight and portable operation.

Compact scanning lidars with ranges 3 / 6 / 10 km for the 3 models 100S / 200S / 300S. Profiling lidar for observing wind components.

Profiling lidar for observing wind components above the canopy, within open canopies, and in the surface layer or SB. Profiling lidar for observing wind components above the canopy, within open canopies, and in the surface layer or SB.

Very compact. Scout only measures at one level,  
Capable of measuring and mapping atmospheric velocity  
and backscatter with the high precision and sampling  
resolution (~10 s). Enables detection of  
profiles between sunset and sunrise  
and temperature profiles at turbulence  
resolution (~10 s). Enables detection of  
Allows continuous observations of humidity profile

BL, lower above), but also compact, low power and low ma

Atmospheric Emitted Radiance Interferometer, passive infrared device. Cannot penetrate cloud

<b>Ceilometers</b>	<b>Price</b>	<b>Wavelength</b>
Campbell CS135	\$26,000 USD	905 nm
Lufft CHM 15k NIMBUS	\$28,000 USD	1064 nm
PSI Compact Ceilometer	\$70,000 USD	1550 nm
MiniMPL-532-C (Micro Pulse)	\$120,000 USD	532 nm
Vaisala CL51 Ceilometer	\$38,000 USD	910 nm
Vaisala CL31 Ceilometer	\$32,000 USD	910 nm
ICOS Leosphere ALS 300	--	355 nm

<b>Balloon Soundings</b>	<b>Price</b>	<b>Power</b>
Windsond	\$5,000 USD	100 mW (max)
Vaisala RS41 Radiosonde	\$120 each (?)	60 mW (min)
NWS Radio/Rawinsonde LMS-06 & Vaisala RS92-NGP	\$325 each (?)	Vaisala 60 mW (min)

<b>Doppler Sodar</b>	<b>Pulse Frequency (Length)</b>
Mini-Doppler Sodar-RASS	SODAR: 1598 Hz (100 ms)
DSDPA 00 24	RASS: 2807 Hz (100 ms)

<b>Radar Wind Profiler</b>	<b>Wavelength</b>	<b>Frequency</b>
915 MHz Radar Wind Profiler (Vaisala LP3000)	0.33 meters	Radar: 915 MHz RASS: 2000 Hz
449 MHz Radar Wind Profiler	0.67 meters	449 MHz

<b>Lidar Wind Profiler</b>	<b>Wavelength</b>	<b>Pulse repetition frequency</b>
WindTracer (Lockheed Martin Coherent Technologies)	1,617/2,023 nm	500 - 700 Hz
HALO Photonics Streamline wind lidar	1,500 nm	15,000 Hz
Leosphere WindCube 400s	1540 nm	
WindCube v2 profiling lidar	1540 nm	
ZephIR300 profiling lidar	1560 nm	50 Hz
NOAA coherent High-Resolution Doppler lidar	2,022 nm	200 Hz

<b><i>Additional Information (Online Presentations and Papers)</i></b>	
Upper Air Meteorology:	<a href="#">Sonoma Technology Instruments</a> <a href="#">KIT Doppler-Wind-LIDAR Setup</a> <a href="#">NASA Vaisala LP3000 Profiler</a>

<b>Pulse Freq (Length)</b>	<b>Power</b>	<b>Vertical Range</b>	<b>Temporal Res.</b>
10 kHz (100 ns)	470 W (max)	10 km	2 - 600 sec
5 - 7 kHz (1 ns)	450 W (max)	15 km	2 - 600 sec
--	20 W (typical)	7 km	30 sec
2.5 kHz (15 ns)	100 W (typical)	15 km	1 - 900 sec
6.5 kHz (100 ns)	310 W (typical)	15 km	6 - 120 sec
10 kHz (100 ns)	310 W (typical)	7.7 km	2 - 120 sec
20 Hz (5 ns)	750 W (max)	15 km	10 - 30 sec

<b>Vertical Range</b>	<b>Temporal Res.</b>	<b>Weight</b>	
8 km	1 second	13 grams	KIT2 Ground Static
~30 - 40 km	1 second	109 grams	Radions
~30 - 40 km	1 second	250 - 500 grams	Since the late 1930s and

<b>Vertical Range</b>	<b>Temporal Res.</b>	<b>Vertical Res.</b>	
400 - 600 meters	10 - 20 seconds	5 - 20 meters	Sodar (Sonic Detec

<b>Power</b>	<b>Vertical Range</b>	<b>Temporal Res.</b>	<b>Vertical Res.</b>
400 - 600 W (max)	2 - 5 km	Vert. 1 - 2 min Hor. 15 - 30 min	Low: 60 & 100 m High: 250 & 500 m
2000 W (max)	8 - 10 km	30 sec - 5 min	~100 m

<b>Power</b>	<b>Vertical Range</b>	<b>Temporal Res.</b>	<b>Vertical Res.</b>
10,000 W	up to 15 km	-	45 - 56 m
W, up to 490W with coo	up to 12 km	1.67 s	30 m
up to 1600 W	up to 10 km	0.1 to 10s	75 m
45 W	40 to 200 m	1 s	20 m
V, up to 150W with coo	10 to 300 m	every 15 s	aries from 0.07 to 7.7i
-	typically 3 km max. 9 km	0.02 s	30 m

[Radar Wind Profiler Systems](#)  
[High Spectral Resolution LiDAR](#)  
[Article Listing Profiler Locations](#)

Vertical Res.	Height (Weight)	MLH/PBL
5 meters	1 m (33 kg)	MLH (Gradient)
5 meters	0.5 m (70 kg)	PBL (MXL)
30 meters	0.25 m (10 kg)	MLH
5 meters		PBL
10 meters	1.5 m (46 kg)	MLH (Gradient)
10 meters	1.2 m (31 kg)	MLH (Gradient)
15 meters	1.2 m (36 kg)	PBL

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### Basic Information

on: Includes hard case GC1, radio receiver RR2, Software works to streamline launch preparations, reduces time, the NWS has taken upper air observations with radiosondes and 7 km. Rawinsondes measure the typical radiosonde

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### Cost of National Weather Service Radiosonde

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### Basic Information

tion and Ranging)/RASS (Radio Acoustic Sounding S

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### Wind Res.

Speed: ~1 m/s	temp through RASS) through the boundary layer
Dir: ~ 5 deg	All-weather modular wind profiler
--	atmosphere even under clear skies with 1/4 scale profiler combination

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### Wind Res.

< 1 m/s	Measurement technique for tracking of moving objects (clouds)
< 0.1 m/s	Compact 12km sampling interval light wind
< 0.1 m/s	ing lidar to 10km. Portable operation
0.1 m/s	ove the canopy, within open canopies
0.1 m/s	ove the canopy, within open canopies
0.05 m/s	Capable of measuring and tracking with the high precision and accuracy



[CS Website](#)

[CHM15K](#)

Height  
tation

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[LIDAR](#)

[Specs](#)

[windsond](#)

[Evaluation](#)

[RS41 Flyer](#)

[Vaisala](#)

[Manual](#)

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[LAP3000](#)

[Flyer](#)

[LAP8000](#)

[Flyer](#)

[NOAA report](#)