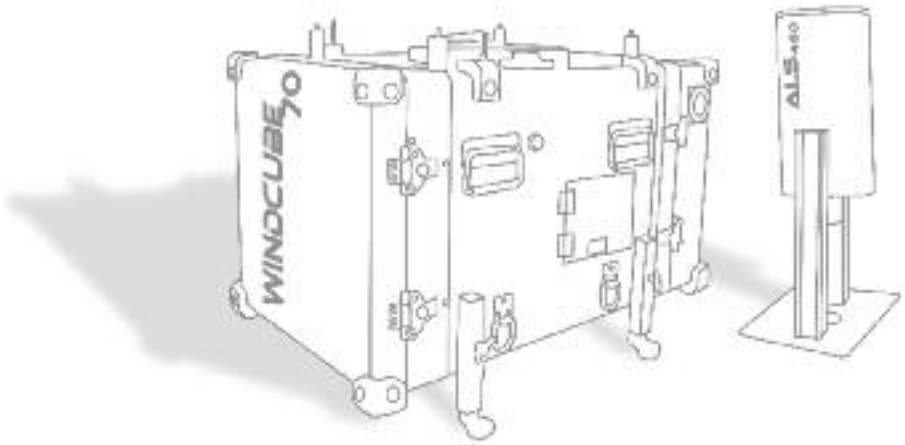
WEATHER & CLIMATE LIDAR PRODUCTS

Cloud & Aerosol Micro LIDAR Systems / Doppler Wind LIDAR Systems



LEOSPHERE®
Lidar Environmental Observations

Meteorology is modern

For all of us, meteorologists, modernism is an endless dynamic rather than a finite era. Meteorology was already considered "modern" in the early 20th century, this is even more evident today. Not only does our industry conduct continuous technological breakthroughs, but also meteorology has the ability to constantly challenge its application domains and endorse the related societal responsibilities. The confirmed commitment of met agencies to climate change and air pollution observation activities is a vibrant illustration of this willingness to think towards the future rather than just feeding the status quo.

LIDAR technology is an excellent companion of this modernism. First, it provides handsome collection of very advanced technologies, know-how and inventions in all engineering domains (fiber optics, opto-electronics, real time computing, signal processing, micromechanics...). Also, it stands today at the crossroads of atmospheric observation sciences and businesses: upper-air weather monitoring, air traffic hazard detection, climate watch and air quality studies.

LIDAR at the crossroads of weather, climate, and air quality

The latest IPCC report clearly highlights the impact of natural or anthropogenic based particles on the radiative balance. Building aerosol LIDAR networks is a clear objective today of WMO members in order to feed climate models and databases with continuous profiles of the optical properties of the atmosphere. The same LIDAR networks will help met agencies to track the upper-air transport of these particles, as they may have a strong impact on the economy, the nature, and health. This is particularly true when they land and are deposited in wild or inhabited areas, especially in Asia. For example, the aerosols accelerate the melting of glaciers by darkening their surface, they damage electrical and transport infrastructure, and of course combined with local pollution worsen air quality. Even if weather services were only concerned by traditional meteorology, they still could not avoid measuring aerosols since they also affect cloud properties: size and shape of droplets. Therefore they do also influence the water cycle, which is very evident when observing the evolution of intensity and duration of monsoons.

Where weather is concerned, the next generation of high resolution weather prediction models will require a very high level spatial and temporal continuity that only a combination of technologies can offer. Satellite observations, for global coverage, ground based instrumented networks, with high vertical and temporal resolution, will have to be interlinked. Wind observations for instance, have to be refined and downscaled. Tropospheric wind fields, measured globally, with accuracy (below 0,5m/s), are required by the newest weather forecast numeric tools. Aside the general enhancement of the weather forecast, this high-res wind data flow will help predict local severe weather and storm formation to gain priceless hours when warning populations. The same wind profiles, on a smaller scale, are now requested by airport authorities to detect hazards at the entrance of the glide slopes and within the last 400 feet above the runway. Real time, needless to say...

Reliable & operational
Easy to deploy and redeploy. With minimum maintenance required, Leosphere LIDARs act like any other meteorological sensors.

Mobile & easy to set up
Only one hour is required to install and to begin measurements

Ready to use
The data check, post-treatment, analysis and their formats are real-time model compliant.

Return on innovation
Innovation is a good investment. The LIDAR will provide you with standardized as well as detailed information on aerosol & cloud and wind which will allow you to focus on the atmospheric observations rather than on optronics or software bugs because we've already taken care of that for you.

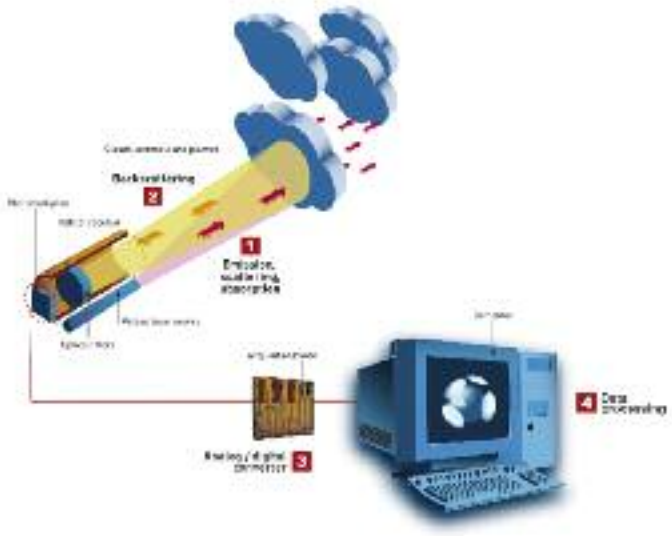
At last, based on the same kind of wind profiles, air quality forecasting models will extract wind and turbulence information within the boundary layer to enhance the quality of their output that strongly depends on the potential points of constraint on the domain of assumptions.

Do we know anything faster than light to reach upper-air and furnish these answers?

Inside the LIDAR technology

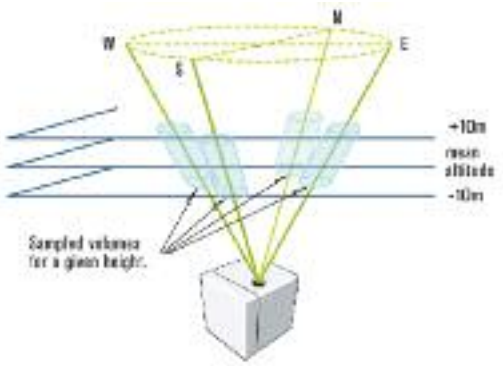
LIDAR principle

The LIDAR is an active remote sensor using a laser as an emitter. The LIDAR emits short pulses of light into the atmosphere. The emitted radiation encounters diffusion by atmospheric particles and molecules along the line of sight. A part of the radiation is scattered backward and collected by an opto-electronic device into the LIDAR reception system. The optical signal is then translated into a voltage over time and distance by multiplication of the speed of light. An accurate range dependent profile of backscattered light is obtained by calibrating the optical signal.



Measuring windspeed at the speed of light

Added to this backscattering information, a coherent LIDAR technology has been designed to provide the most accurate and fastest technology for windspeed monitoring in the atmosphere. This LIDAR enables users to measure the wind speed and direction, using the Doppler effect on small particles, as a radar could follow large droplets or planes, depending on its frequency.
Hence using several line of sights at different angles, windspeed and direction are retrieved by projection very accurately.

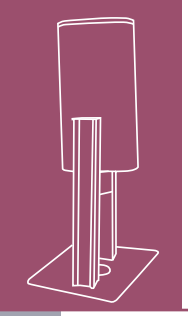


LIDAR technology is the result of 40 years of research. Its inventors have overcome major technological challenges to give birth to one of the best family of sensors ever made.

Most recent technological research have shown the advantages of using UV (for aerosol detection) and 1.54µm (for Doppler measurement) wavelengths. UV lasers allow a finer calibration of the measurement and a richer information (much higher energy enables upgradability to Nitrogen and water vapor Raman measurement, while maintaining eye-safety). 1.54µm lasers give access to a wide range of robust and affordable telecom components.

Modern meteorology requires unerring services

Because meteorology has both scientific and business responsabilities and involves more and more players at a global scale, the level of requirement and versatility needed from suppliers is very high. This is why LIDAR are not just a technology. They must be and are a service providing reliable data anytime, anywhere. LIDARs are networkable, web accessed, and supply standardized data transmitted via satellite. LIDAR networks operate 24/7, under all atmospheric conditions. We watch them, they watch the air.



Cloud & Aerosol Micro LIDAR Systems
ALS_{300} / ALS_{450}

KEY BENEFITS

- Compact & portable
- Extended range (100m to 20km), cirrus detection whatever the latitude
- Unattended, eye safe and trouble free
- Friendly software suite for real time acquisition, automatic data processing, and post visualization and treatment
- Compatible with various ancillary sensors (RS, sun-photometer)

OPTIONS

- Cross-polarisation channel for particle shape indication
- Nitrogen Raman channel for unique calibration and very accurate extinction retrieval
- Full 3D scanning capabilities

APPLICATIONS

PBL Tracking
ALS_{300} / ALS_{450} are furnished with an advanced inversion layer detection algorithm. PBL layers are detected and classified (nocturnal, convective, residual) in real time. Final display provides a 10min output with an accuracy of 15m, with confidence index.

Visibility
ALS_{300} / ALS_{450} provide an accurate determination of the extinction profile which is related to the visibility along the line of sight of the instrument.

Multiple cloud layers
ALS_{300} / ALS_{450} are able to reach simultaneously all clouds and aerosol layers up to 20km, even the highest and thin cirrus clouds in tropical regions.

Aerosol transport
ALS LIDAR networks are an answer to this urgent need of accurate and vertical observations over large areas. ALS_{300} / ALS_{450} furnish a real time detection of aerosol layers vertically and calculate their optical depth.

Cloud coverage
ALS_{300} / ALS_{450} offer possibilities to estimate the cloud cover at different heights (up to 9 layers), either by using the temporal evolution of cloud deck values, or by performing a 3D scan of the troposphere over your site.

Phase of the clouds
ALS_{300} / ALS_{450} enable the discrimination between ice and water droplets within clouds.

TECHNICAL SPECIFICATIONS

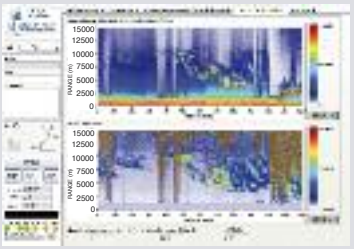
PERFORMANCES	ALS_{300}	ALS_{450}
Range min (without overlap correction)	0.15 to 12 km	0.4 to 20 km
Accumulation time	30s	30s
Vertical resolution	1.5/15m	1.5/15m
Options	3D Scanning, cross-polarisation, Nitrogen Raman auto-calibration	

ELECTRICAL	ALS_{300} / ALS_{450}
Power supply	100/240V AC 50-60 Hz
Power consumption	750 W max with heaters
ENVIRONMENTAL	
Temperature range	-10°C to 40°C(with heat conditionning option)
Humidity	0-100% (IP65)
OPTICS, ELECTRICAL AND MECHANICS	
Laser type	Nd-Yag solid state
Eye-safety compliance	EN60825-1 / ANSI-Z136.1-2007
Emitted Wavelength	355nm
Output Pulse Energy	12mJ
Pulse repetition Rate	20 Hz
Scanning Range	Horizontal: 0°-178° with 6°/second Vertical: 0°-89,9° with 6°/second
Angular Accuracy	1°/10°
Casing Certification	IP40 or IP65
WEIGHT / DIMENSIONS (FOR BASIC CASING)	
Optical Head	16 kg / 650x356x190mm
Electronics	20 kg / 480x500x300mm
DATA	
Data Format	ASCII/HDF/BINARY
Data transfer	Ethernet

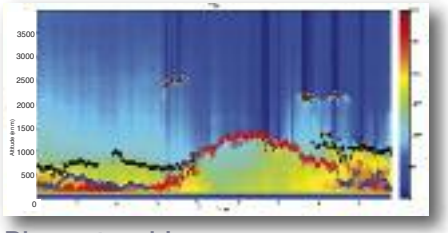
SOFTWARE / AEROSOFT

ALS 300/450 are supplied with user-friendly software, easy to maintain modules, automatic hardware control and test protocols, data transfer module, status information, real-time acquisition and post treatment of the data.

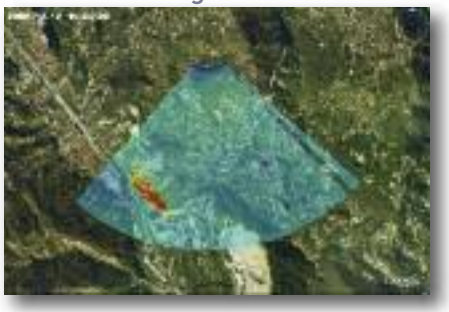
Aerosoft Level 1	- Instrument control, Data acquisition - Data shaping (correction, noise filtering, structure highlight) - Data edition (Real-time measurement display)
Aerosoft Level 2	- Instrument control features - Instrument + Scanning device control - Post processed data (out of raw data) - Specific data treatment - Operating alerts
Viewer	- Data reading & display only.



PBL Detection



Plume tracking



ADDITIONAL SERVICES & OPTIONS

Warranty 1 year (parts, labour)

Hotline diagnostic within 48 hours

Maintenance from a basic annual check to a complete maintenance & services contract

Rental LIDAR rental solution for short term use

24/7 operations Courtesy units loaned during maintenance interruptions

Doppler Wind LIDAR Systems

KEY BENEFITS

- High resolution wind profiles
- Reliable and accurate data
- Compact and mobile
- Light maintenance

APPLICATIONS

Mesoscale & national observational networks
High resolution Wind LIDAR profiler network

Atmospheric research
PBL dynamics monitoring, PBL height tracking

Air quality
Plume dispersion monitoring, horizontal mapping of urban and industrial areas to detect pollution sources

Terminal Airport Weather
Wind shear, low level jet identification, clear air turbulence, wake vortices detection

Wind energy
Site assessment, prospection, wake measurements

ADDITIONAL SERVICES

Hotline diagnostic within 48 hours

Maintenance from a basic annual check to a complete maintenance & services contract

Rental LIDAR rental solution for short term use

24/7 operations Courtesy units loaned during maintenance interruptions

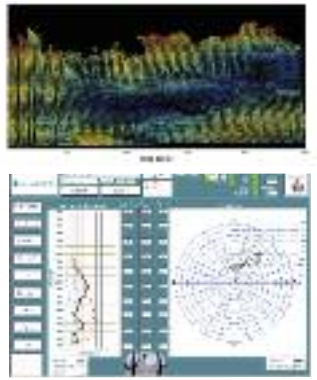
WINDCUBE$_8$ / WINDCUBE$_{70}$ / WINDCUBE$_{200}$

WINDCUBE$_8$
500m wind mapping

WINDCUBE$_{70}$
1,500m wind mapping

WINDCUBE$_{200}$
6,000m wind mapping

SOFTWARE / WINDSOFT

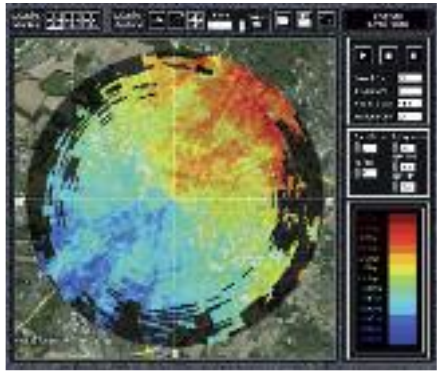


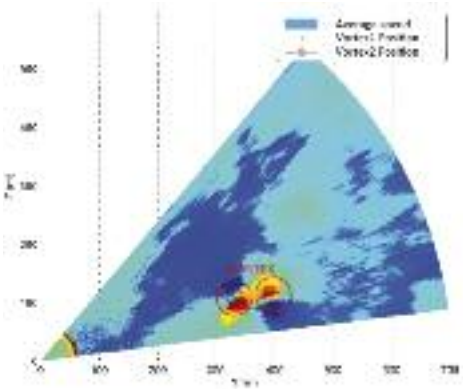
SPECIFICATIONS	PERFORMANCE		
LIDAR	**WINDCUBE$_8$**	**WINCUBE$_{70}$**	**WINDCUBE$_{200}$**
Min-Max Range (aerosols detection)	40m to 500m	100m to 1,500m	100m to 6,500m
Averaging time	1.5s to 10min	1.5s to 10min	1.5s to 10min
Vertical range resolution	20m	50m	50m
Number of programmable gates	>14	>28	>118
Wind speed accuracy	0.3m/s	0.3m/s	0.3m/s
Relative backscatter detection range (depending on visibility)	40m to 500m	100m to 1,500m	100m to 6,500m
Cloud detection		>8,000m	>12,000m
TECHNICAL			
Laser	1.54 µm pulsed fiber laser		
Eye Safety	EN/IEC 60825-1 / laser Class 1M		
Power supply - Power consumption	27 V DC - 110/220 VAC - 600 W max		
Dimensions (mm^3) - Weight (kg)	850 x 650 x 550 mm^3 - 65 kg		
Environmental protection	IP65 - waterproof and dustproof, wiper		
Temperature range	-15°C to +40°C		
Relative humidity	from 10 to 100%		
DATA			
Operating system / data format	Windows / ASCII & BUFR		
Raw data	Averaged spectral data		
Standard output data	- GPS location & time, range gates, - Horizontal, vertical wind speed and direction over selected period - Carrier to Noise Ratio (dB) - Spectral bandwidth and corresponding wind speed dispersions - Relative backscatter		

WINDCUBE$_{100S}$ / WINDCUBE$_{200S}$

WINDCUBE$_{100S}$
3,000m 3D wind mapping

WINDCUBE$_{200S}$
6,500m 3D wind mapping





SPECIFICATIONS	PERFORMANCE	
LIDAR	**WINDCUBE$_{100S}$**	**WINDCUBE$_{200S}$**
Mini-Max range (aerosols detection)	100m to 3,000m*	100m to 6,500m*
Averaging time	1s to 2s	1s to 2s
Range resolution (range gate width)	50m to 200m	50m to 200m
Number of programmable gates	58	58
Radial wind speed accuracy (with SNR < -17)	0.2 m/s	0.2m/s
Relative backscatter detection range (depending on visibility)	100m to 3,000m	100m to 6,500m
Cloud detection	>10,000m	>12,000m
SCANNER		
Azimuthal scanning	0° to 360°	
Zenithal scanning	0° to 360°	
Position precision (azimuthal-zenithal)	< 0.1°	
Maximum rotation speed	4°/s when measuring 40°/s when not measuring	
Scanner position refreshment	0.5Hz to 1Hz	
TECHNICAL		
Laser	Pulsed laser at 1.54 µm	
Eye safety	EN/IEC 60825-1 / laser Class 1M in scanning mode	
Power supply / Power consumption	24 V DC / 250 W to 1500W in DC	
Dimensions (mm)/Weight (kg)	1500 x 650 x 550 mm^3/180 kg	
Environmental protection	IP65 - waterproof and dustproof	
Temperature range	-15°C to +40°C	
Relative humidity	from 10 to 100%	
DATA		
Operating system / data format	Windows/ ASCII	
Raw data	Averaged spectral data	
Standard output data	- GPS location & time, range gates, scanner position - Radial wind speed averaged over selected period - Carrier to Noise Ratio (dB) - Spectral bandwidth and corresponding wind speed dispersions - Relative backscatter	
Scanning scenario & display	- PPI mode (Polar plan indicator) : constant zenithal - RHI mode (Range height indicator) : constant azimuthal - VAD mode (vertical wind profile)	

**Min-Ma. range can be selected*

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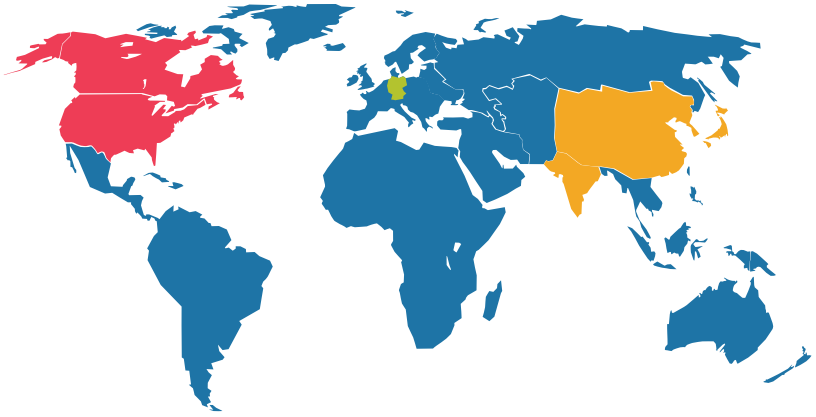

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