Lidar solutions

lidarCube

High altitude lidar for atmospheric measurements

Main benefits

- High accuracy 3D-wind and temperature profiles up to 100 km
- Continuous and unmanned 24/7 operation - day and night
- Additional measurement of aerosols
- Rugged design for high performance in challenging environments
- Extensive software suite for data product generation and fleet management

Key specifications	
Measurements	Wind and temperature profiles up to 100 km, density, aerosols
Optical technology	Tuneable Alexandrite Laser, non-coherent detection of Mie and Raman scattering as well as resonance fluorescence
Size and weight	1 m³, < 250 kg
Required infrastructure	Single phase power, network connection

Product description

The Graw lidarCube is the first commercial lidar system capable of wind and temperature profiling throughout the entire atmosphere. The lidarCube's small and rugged design, value for money and comprehensive software suite make it ideal for large synoptic network installations, while its unique capabilities enable researchers as well as space and defence organisations to enhance their atmospheric profiles.

The combination of decades of optical systems development, advanced mechanical design and construction techniques and modern software make the Graw lidarCube an instrument in a league of its own.

Features

Detection technology

The device uses a diode-pumped narrowband alexandrite laser tuneable by means of a second seeder laser, highly complex filter circuits, and a multi-stage detection bank. However, high accuracy can only be achieved through high-precision stabilisation of the alexandrite laser and a precise knowledge of the current filter characteristics. For this reason, continuous reference measurements are carried out in real time, the result of which is incorporated into the control of the laser and the filters, as well as into the mathematical evaluation.

Design and construction

lidarCube outperforms instruments that are several times its size. This is only achievable through sophisticated design and an extensive use of advanced simulations. Our effort has paid off: lidarCube is an instrument built for field use and for unmanned operations with a high degree of protection from extreme wind, rain and temperature shifts.

Management and data retrieval

Sophisticated software supports easy-to-use data. Advanced data processing automatically generates atmospheric profiles as well as the relevant synoptic messages. Additionally, data can be processed individually per the user's needs so that not only wind and temperature, but also lidar-typical data such as turbulence, extinction, and cloud heights can be evaluated. Built as a device for network installations, extensive fleet management software is also available, which makes overseeing a large deployment of units easily manageable.

Synoptic lidar

lidarCube is the first lidar which is suitable for large-scale synoptic installations. Upper air soundings are limited in space and time, and during adverse weather conditions it is difficult to justify where additional observations are useful. A network of lidarCube devices can augment existing instrument setups, eliminating these problems and always providing additional observation data. A rugged design, compact footprint, and minimal maintenance make lidarCube the perfect device for deployment at existing synoptic ground measurement sites.

Unique applications

Special and defence applications can benefit from the availability of high-altitude data which was not readily attainable before. This greatly increases confidence in marginal conditions, potentially avoiding costly delays and cancellations. Research users meanwhile can profit from a far superior instrument in the same form-factor as the small wind-lidars they are accustomed to.

Availability

lidarCube is currently in pre-production and will be available to support select applications in the near future.

Technical data

Temperature	
Range	0-100 km altitude
Accuracy 0-10 km	< 0,1 K
Accuracy 10-50 km	< 1 K
Accuracy 50-70 km	< 10 K
Accuracy 80-100 km	< 5 K
Resolution < 1000 m	1 m
Resolution < 5000 m	10 m
Resolution > 5000 m	200 m

Wind	
Range	0-100 km altitude
Accuracy 0-10 km	< 0.1 m/s
Accuracy 10-50 km	< 1 m/s
Accuracy 50-70 km	< 10 m/s
Accuracy 80-100 km	< 10 m/s
Resolution < 1000 m	1 m
Resolution < 5000 m	10 m
Resolution > 5000 m	200 m

Air density	
Range	0-100 km altitude
Accuracy 0-10 km	< 1 %
Accuracy 10-50 km	< 5 %
Accuracy 50-70 km	< 10%
Accuracy 80-100 km	< 1 %
Resolution < 1000 m	1 m
Resolution < 5000 m	10 m
Resolution > 5000 m	200 m

Aerosols	
Range	0-80 km altitude
NLC (noctilucent clouds)	10-10 m-1 sr-1 (99% detection probability)
PSC (polar stratospheric clouds)	10-10 m-1 sr-1 (99% detection probability)
Background aerosols	accuracy 99.9% (up to 25 km)
Backscattering accuracy	10-11 m-1 sr-1

Colourspace of the sky	
Spectral range colour sensor	1000 - 1800 nm
Resolution colour sensor	256 px (<10 nm)
S/N colour sensor	> 10000
Spectral range HD camera	300 - 950 nm
Resolution colour sensor	12.3 megapixel

Terrestrial weather	
Accuracy air temperature	0.3 °C (at 20 °C)
Accuracy wind speed	5% (at 10 m/s)
Accuracy wind direction	+/-3° (at 10 m/s)
Accuracy rel. humidity	+/-5% (at 20°C)

Environmental conditions	
Operating temperature	-40°C to +50°C
Hurricane proof	up to category 3
Rain proof	up to 40 l /m² per hour

Electrical	
Power supply	220V / 50 Hz or 110V / 60 Hz
Power consumption	< 1 kW
Interfaces	LAN, WLAN

Dimensions	
Size	100 cm x 100 cm x 130 cm
Weight	< 250 kg

Impressum/Disclaimer

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Errors and omissions excepted!