SLS20-A

Laser Scintillometer with Beam Steering

Photo courtesy of DWD / MOL-RAO

Features

- heat flux, momentum flux by purely optical means
- suitable for stable and unstable conditions
- measures C_n^2, C_T^2, ℓ_0
- crosswind option available
- spatially averaging technique
- high temporal resolution
- low statistical noise
- no flow distortion
- easy installation and operation
- included Signal Processing Unit performs all calculations

The Scintec SLS20-A Scintillometer measures turbulence, heat flux and momentum flux by purely optical means. In combination with other meteorological sensors the system can determine latent heat flux or evaporation.

The model SLS20-A has built-in automatic beam steering which permits operation when manual beam alignment is undesirable or difficult. It may also be useful when the pointing stability of the mounting is poor.

Each SLS Series Scintillometer consists of a laser transmitter pointing at a receiver. Temperature fluctuations in the air cause variations of the light intensity captured at the receiver. The scintillometer evaluates such variations to yield turbulence information.

The line averaging over the optical path results in spatially representative data and outstanding temporal resolution – a critical edge over data collected from conventional point sensors. The scintillometer provides high sensitivity and accuracy – without mechanical flow distortion or any moving part.

The proprietary displaced-beam technique of the SLS Series Scintillometers opens up access to mechanical turbulence quantities (momentum flux, kinetic-energy dissipation rate) without need to feed in any external wind data.

Applications

- turbulence studies
- air quality and atmospheric dispersion
- spatially-averaged wind measurements
- optical propagation conditions
- military
- surface energy balance
- evapotranspiration monitoring
- agrometeorology, forestry
- satellite data ground truth

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SLS20-A

Surface Layer Scintillometers

Data output

Data output includes (but is not limited to):

- structure parameter of refractive index fluctuations (C_n^2)
- inner scale of refractive index fluctuations (ℓ_0)
- structure parameter of temperature fluctuations (C_T^2)
- dissipation rate of turbulent kinetic energy
- sensible heat flux
- momentum flux
- Obukhov length
- path-averaged wind speed perpendicular to the beam axis (with crosswind extension)
- mean, standard deviation, minimum and maximum of intensity
- correlation coefficient of intensity
- data quality code

Description	Specifications	Remarks
Optical wavelength	670 nm	visible (red)
Mean output power	1 mW	laser safety class 2M (IIIa)
Beam divergence	3 x 8 mrad	
Beam-steering scan cone diameter	1 degree	
Path length	50 - 250 m	others optional
Analogue input channels	input range 0 - 10 V	11 optional channels, 12 bit resolution
Supply voltage and current	12 V, 1.5 A	for transmitter, receiver, SPU
	12 V, 0.2 A	for window heating
Operating temperature	-20 to +50 °C	
Dimensions	70 x 11 x 11 cm / 60 x 11 x 11 cm	transmitter / receiver
Weights	3.5 kg / 2.9 kg	transmitter / receiver

Measurement ranges [1]	from	to	unit	Depends on
Structure constant C_n^2	1×10^{-16}	3×10^{-12}	$m^{-2/3}$	path length
Inner scale ℓ_0	2	16	mm	path length
Structure constant C_T^2	1×10^{-4}	3	$K^2\ m^{-2/3}$	path length[2]
Kinetic-energy dissipation rate ε	2×10^{-4}	1	$m^2\ s^{-3}$	path length[2]
Sensible heat flux	2 -2	600 -120	$W\ m^{-2}$ $W\ m^{-2}$	path length and height, Obukhov length[2]
Momentum flux	-4×10^{-3}	-1.2	$N\ m^{-2}$	path length and height, Obukhov length[2]
Wind speed	0.01	10	$m\ s^{-1}$	(with Crosswind Extension)

[1] Typical values for path 100 m long and 2 m high; [2] Values for normal temperature and pressure

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