AUTOMATIC SUN TRACKING PHOTOMETER CE 318

MAN(CIMEL)-003.000

SPECIFICATIONS

Two types:
CE 318-1 : standard model with 5 filters
440, 670, 870, 936,1020 nm
CE 318-2 : polarized model with 8 filters
440, 670, 870, 870,870, 936, 1020
Components:
Optical head with 2 collimators
FOV:
Solar collimator: 1.2°
Sky collimator: 1.2°
Bandwidth:
10 nm at full width at half maximum
Detector:
UV enhanced silicon detector for the sun
Silicon detector for the sky

Electronic box
Robot for sun tracking

Operating temperature:
-30 to +60°C
Sun tracking method:
Tracking in zenith and azimuth planes
Active tracking by a 4-quadrant detector
Accuracy better than 0.1°
Power requirements:
Internal batteries for the optical head
External batteries for the robot
Rechargeable by solar panels or 220VAC
Data output and transfer:
Local reading
Storage in EPROM readable on a PC
Data Collection Systems through satellites in option

PRESENTATION

The CE 318 automatic sun tracking photometer has been designed and realized to be a very accurate sun photometer with all the qualities of a field instrument : motorized, portable, autonomous (solar powered) and automatic. Its main purpose is to measure sun and sky radiance in order to derive total column water vapor, ozone and aerosols properties using a combination of spectral filters and azimuth/zenith viewing controlled by a microprocessor.

The sun photometer CE 318 is composed of an optical head, an electronic box and a robot.
The optical head has two channel systems : the sun collimator, without lens, and the sky collimator with lenses. The sun tracking is equipped with a 4- quadrant detector.

The electronic box contains two microprocessors for real time operation for data acquisition and motion control.
In automatic mode, a 'wet sensor' detects precipitation and forces the instrument to park and to protect the optics.
The robot is moved by step-by-step motors in two directions : in the zenith and azimuth planes. The computation of sun equations (like air mass) is performed by two CPU cards.

Measurement sequences are available to measure sky and sun radiance. Different scenarios, detailed on the next page, have been created to make various kinds of measurement automatic.

The data from the memory of the sun photometer can be transferred to a PC or via the Data Collection Systems (DCS), to one of the three geostationary satellites : GOES, METEOSAT or GMS and then retransmitted to the appropriate ground receiving station. The data can be retrieved for processing either by modem or internet linkage resulting in near real-time acquisition from almost any site on the globe excluding pole ward of 80° latitude.

CIMEL Electronique www.cimel.fr
172, rue de Charonne – 75011 PARIS – Tél. 00.33.(1).43.48.79.33 – Fax. 00.33.(1).43.48.62.61

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MEASUREMENT SEQUENCES

Direct measurements of the sun and the sky can be made with several programmable sequences. The direct sun measurement is made in eight spectral bands and requires approximately 10s. A sequence of three such measurements can be made 30s apart creating a triplet observation per wavelength. Triplet observations are made during morning and afternoon Langley calibration sequences and at standard 15-minute intervals.

A single spectral measurement of sky radiance (Langley sky) is made immediately after the Langley sun measurement, 20° from the sun. Two basic sky observation sequences are made, the 'almucantar' and 'principal plane'. The philosophy is to acquire aureole and sky radiance observations through a large range of scattering angles from the sun through a constant aerosol profile to retrieve size distribution, phase function and aerosol optical thickness. An 'almucantar' is a serie of measurements taken at the elevation angle of the sun for a specified azimuth angle relative to the position of the sun. The range of scattering angles decreases as the solar zenith angle decreases, thus 'almucantar' sequences made at an optical air mass of 2 or more achieve scattering angles of 120° or larger.

	Spectral range (nm)	Target	Number of observations	Interval between observations
BASIC DIRECT SUN	340 to 1020	Sun	1 per filter	~8s between 2 obs. with the same filter
Triplet observation	340 to 1020	Sun	3 times the basic direct sun every 30s	~10s for 3 consecutive obs and 30s apart
Standard measurement	340 to 1020	Sun	Variable	Every 15 mn between m=2am and m=2pm
Langley	340 to 1020	Sun	17	m=2 to 5 every 0.25 m=5 to 7 every 0.5
BASIC SKY	440 to 1020	Sky	1 per filter	none
Langley sky	440 to 1020	Sky	17	m=2 to 5 every 0.25 m=5 to 7 every 0.5
Almucantar	440 to 1020	Sky	72	m=4, 3, 2, 1.7 then hourly between 9am and 3pm
Polarization	870	Sky	42	hourly between m=3am and m=3pm
Principal plane	440 to 1020	Sky	42	hourly between m=3am and m=3pm

Measurement sequences of the CIMEL sun/sky scanning spectral radiometer (m: air mass)

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