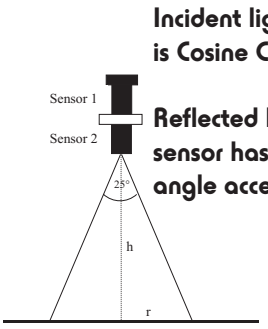
LIGHT

Sensors for NDVI

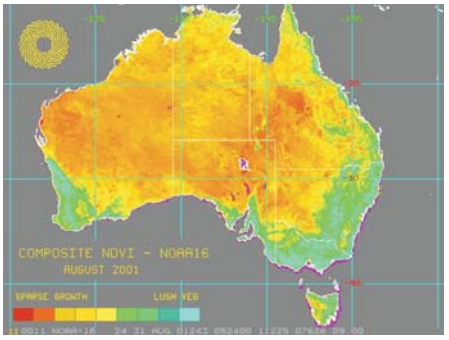
- 1, 2 and 4 channel sensors
- Incident and reflected light & radiation measurements
- Ground truth readings for Earth observation satellites
- Ideal addition to Eddy Covariance systems
- Standard and custom wavelengths available

Pair of NDVI light sensors



Incident light sensor is Cosine Corrected

Reflected light sensor has narrow angle acceptance



NDVI is defined as the Normalised Difference Vegetation Index. NDVI is calculated from observations made by earth orbiting meteorological satellites such as LANDSAT, SPOT, NOAA AVHRR, MODIS etc.

The satellites record spectral reflectivity of solar radiation at specific wavelengths, allowing the monitoring of the density and vigour of green vegetation growth.

Errors in the satellite readings are caused by several atmospheric conditions such as small area clouds, scattering by dust and aerosols, large solar zenith angles etc. Skye sensors are used to make 'ground truth' observations to make corrections to the satellite recorded data.

Long term NDVI data can be collected using these sensors attached to most dataloggers, including Skye's DataHog, or spot readings can be taken using the SpectroSense2 hand held display meter.

The Skye 2 and 4 channel sensors have a removable cosine correcting diffuser. With the diffuser in place the sensor is fully cosine corrected for incident light measurements. When the diffuser is removed the sensor has a narrow light acceptance angle and is thus suitable for measuring reflected light from crops, soil, forest canopies, etc.

Simultaneous measurements of both incident and reflected radiation are required for the NDVI calculation.

Sensor channels can be individually specified with wide or narrow wavebands calibrated between 280 and 2400nm. Choose a waveband to match the earth observing satellite bands, for example Red and Near Infra--red, or custom wavelengths according to your own study interests.

APPLICATION

Dr Caroline Nichol , University of Edinburgh has a pair of Skye NDVI sensors attached to a Skye DataHog logger installed on an eddy covariance tower in Finland.

Thanks to Dr Nichol for her kind permission to reproduce these photographs

DataHog logger collecting NDVI data

NDVI sensors on eddy covariance tower over forest canopy

Pair of NDVI incident & reflected light sensors

NOTES

Normalised Differential Vegetation Index

$$NDVI = \frac{(Chan\ 2 - Chan\ 1)}{(Chan\ 2 + Chan\ 1)}$$

ORDERING INFORMATION

Sensor

SKR 1800	2 Channel sensor (Please specify centre wavelength and bandwidth for each channel)
SKR 1850	4 Channel sensor (Please specify centre wavelength and bandwidth for each channel)
SKR 1850A	4 channel sensor with amplifier (Please specify centre wavelength and bandwidth for each channel)

Accessories

SKM 222	Sensor levelling /mounting unit

Dataloggers & Meters

SDL 5000 series	DataHog datalogger
SKL 904	SpectroSense2
SKL 908	SpectroSense2+

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LIGHT

2 and 4 Channel Sensors

- **Removable cosine correcting head**
- **Head on cosine corrected for incident light**
- **Head off narrow angled for reflected light**
- **Choose wavelengths between 280-2400 nm**
- **Ideal for NDVI, PRI and satellite ground truthing**

Skye Instruments have been specialising in light and radiation sensors since 1983. All are designed, manufactured and calibrated to the highest standards. Each is supplied with a Calibration Certificate traceable to the UK's National Physical Laboratory (NPL).

This sensor is a multichannel radiometer, essentially two or four sensors in one. It has a removable cosine correcting head offering a choice of light collecting geometries. With the head in place it is suitable for measuring incident or downwelling light. When the head is removed it receives light from a narrow 25° cone, suitable for measuring reflected light from a defined area.

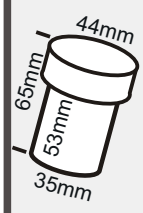
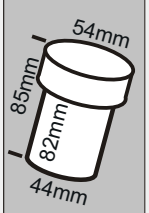
Usually a pair of identical sensors are used to measure incident and reflected light simultaneously, to eliminate variations in natural solar radiation during measurement. Sensors can be installed on a hand-held pole, on meteorological or CO_2 flux towers, or are light enough to be used on aircraft.

Skye's calibration facility scope is between 280 and 2400 nm with bandwidths from 5 nm to several hundred nm (broadband). Popular choices include Red & Far-Red, Red & Near Infra Red or channels matching satellite bands.

Sensors are suitable for use in natural solar radiation or any lamp or light source. Each is fully waterproof and guaranteed submersible to 4m depth.

As with all Skye sensors, the 2 and 4 Channel sensors have been quoted in many scientific references, please ask for a list of publications. They are compatible with Skye SpectroSense2 NDVI meters and DataHog2 loggers, and are also available with amplifiers for connection to other manufacturers' equipment.

SPECIFICATIONS

2 Channel	4 Channel	Construction	Cable	Sensor	Detector	Filters	Sensitivity -current (1)	Working range (2)
 180g. (with 3m cable)	 400g. (with 3m cable)	Removable cosine corrected head Material Dupont 'Delrin' and anodised aluminium Sealed to IP68	Multi core screened DEF std	Cosine corrected head	Photodiode dependant on wavelength selected	Metal interference and/or glass depending on wavelengths & bandwidths chosen, to military spec	Dependant on wavebands chosen	

Linearity error	Absolute calibration error (3)	Cosine error (4)	Azimuth error (5)	Temperature coefficient	Longterm stability (6)	Response time (7)	Temperature Range	Humidity Range
<0.2%	typ. <3% 5% max	3%	<1%	±0.1%/°C	±2%	10ns	-25 to +75°C	0-100% RH

NOTES

(1) Current output varies from sensor to sensor. Each individual unit will have a slightly different output. A calibration certificate is supplied with each sensor

(2) All Skye sensors will work at levels of irradiance well above that found in terrestrial sunlight conditions, room or growth chamber lighting

(3) Main source of this error is uncertainty of calibration of Reference Lamp. Skye calibration standards are directly traceable to N.P.L. standard references.

(4) Cosine error to 80º is typically 5% max. Figures shown are for normal use sources, e.g., sun plus sky, diffuse sun, growth chambers, etc.

(5) Measured at 45º elevation over 360º

(6) Maximum change in one year. Calibration check recommended at least every two years. Experience has shown that changes are typically much less than figures quoted

(7) Times are generally less than the figure quoted, which is in nanoseconds. They may be slightly increased if long leads are fitted, or those of a higher capacity cable

ORDERING INFORMATION

Sensor

SKR 1800	2 Channel sensor with 3m cable *
SKR 1850	4 Channel sensor with 3m cable *
SKR 1850A	4 Channel sensor with integral voltage amplifier and 3m cable *

* Please specify centre wavelength and bandwidth for each channel

Accessories

SKM 222	Levelling unit for one sensor
SKM 226	Pole mount for one levelling unit
SKM 226/NDVI	Pole mount for 2 sensors for NDVI
SKP 220	2 channel voltage amplifier for 2 channel sensor

Meters and dataloggers

SKL 904	4 channel SpectroSense2 meter
SKL 908	8 channel SpectroSense2+ NDVI logging meter
SKL 925	8 channel SpectroSense2+ NDVI logging meter with GPS
SDL 5000 series	DataHog2 datalogger

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