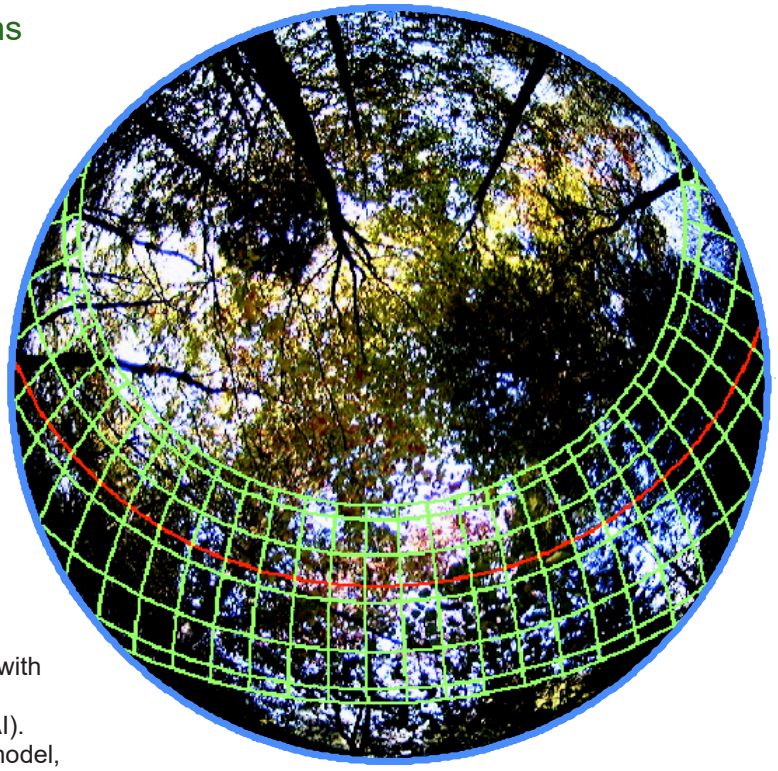
Delta-T Devices

HemiView

Canopy Analysis System – HEMIv10

Hemispherical image analysis for forest canopies

HemiView provides detailed and authoritative analysis of hemispherical photographs



- **Calculates canopy structure parameters and solar radiation indices**
- **Predicts radiation levels beneath canopy**
- **Ideal for tall irregular canopies**

Introduction

Hemispherical photography is ideal for the analysis of plant canopies, especially tall, irregular canopies, such as forests. Typically photographs are taken in uniform sky conditions, looking upwards from beneath the plant canopy using a 180° fisheye lens. A self-levelling camera mount ensures the camera is held horizontally.

HemiView uses the hemispherical image together with lens and site data to produce measures of canopy structure e.g. gap fraction and Leaf Area Index (LAI). Combining this information with a solar radiation model, HemiView can predict radiation levels above and below the canopy, and hence direct, indirect (diffuse) and global site factors.

By plotting the solar path over the canopy and allowing for the size of the solar disc, HemiView also calculates the occurrence of sunflecks and associated solar irradiance on any chosen day of the year. Results are stored in Excel compatible worksheets.

Digital SLR camera in the SLM10 Self-levelling Mount

HemiView hardware

The HemiView Canopy Analysis System consists of HemiView software, a digital SLR camera with fisheye lens, a self-levelling camera mount and a range of accessories. The camera provides excellent 20.2 megapixel resolution. The light weight self-levelling mount greatly simplifies the process of obtaining correctly oriented photographs and is essential for obtaining images high up in forest canopies. It provides LED markers fired by the flash gun that automatically places north / south orientation markers into each image taken.

Sunshine Sensor type BF5

The Sunshine Sensor can be used to monitor the direct and diffuse components of PAR over extended periods. In detailed studies such data can be used to derive transmittivity and diffuse proportion values, as required for the solar model used in HemiView.

HemiView specifications

Image file types	BMP, JPG, TIF, Photo CD.
Lens distortion	Can be specified as a polynomial relating zenith angle and radial distance.
Direct light model	Simple atmospheric transmission, with user defined settings.
Diffuse light model	Uniform or Standard overcast sky.
Data output	Excel compatible spreadsheet built-in.

Outputs

Sky Geometry	Centroid, solid angle and pixel count for each sky sector.
Gap Fraction	Proportion of visible sky by sector.
Leaf Area Index	By sky sector or overall value.
Solar Radiation	Direct and diffuse, above and below the canopy, in energy or molar units.
Site Factors	Direct, indirect (diffuse), global.
Time series and Sunflecks	Visibility of the solar disc (penumbral effects) and solar irradiance on chosen days, sampled at user-defined intervals or summarised as a sunfleck sequence.
Optional cosine correction	For any orientation of intercepting surface.
Overall values	Most outputs can be tabulated by sky sector, or aggregated into a single overall whole sky or annual value.

Features

Interactive graphical alignment tool	Precise registration of images with the hemispherical co-ordinate system. Compensates for magnetic declination.
Responsive image classification	Threshold intensity discriminates visible and obstructed pixels. The classified image view is updated in real-time.
Multiple and split views on any image	Classified and colour / grey scale views, or separate sections of a large image can be viewed side by side.
Negative images	Photographic negatives can be viewed and analysed as positives.
User-defined number of diffuse sky regions	Enables use of custom ranges of zenith and azimuth angle.
Leaf Area of a Single Tree	Excel spreadsheet provided with instructions for calculating single tree LAI using HemiView outputs
Analysis of partial images	Unwanted parts of images can be ignored by the analysis.
Configurable for site, lens, solar model	User-defined site, lens and solar model characteristics can be applied to any image by selecting from a list.
Pre-defined lens characteristics	Lens equations are provided for current and previous lens types supplied by ΔT.
Results output to Excel compatible workbook	Additional calculations can be performed using standard spreadsheet formulae. Alternatively, workbooks can be saved for further analysis using Excel. Results can be appended to existing workbooks.
User-defined output configurations	The user can define multiple custom output configurations which can be applied to different images.

Ordering information

HemiView system

HemiView Canopy System type HEMIv10 includes HemiView Software, SLM10 self-levelling camera mount, DCM10 EOS 6D Digital SLR camera, memory card, rechargeable battery & charger, SCL10 fisheye lens and MPD1 telescopic monopod.

Individual items

HemiView Software type HMV1 software and manual.

Self-levelling Camera Mount type SLM10 for DCM10 camera, includes fibre optic flash transfer assembly.

Digital SLR camera type DCM10 EOS 6D digital SLR camera with 20.2 megapixel CMOS sensor, memory card, rechargeable battery and charger. Supplied without lens.

Fisheye Lens type SCL10 for EOS 6D camera.

Telescopic Monopod type MPD1 for raising SLM10, extendable 0.69 to 1.66 m.

Optional items

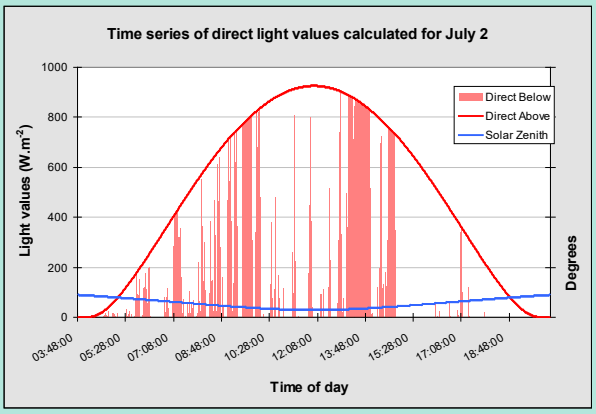
Telescopic Tripod type HMV-TD2 holds self-levelling mount.

Waterproof Case type HEMI-CC1 protective, impact resistant case to hold DCM10 camera, SCL10 fisheye lens and SLM10 camera mount.

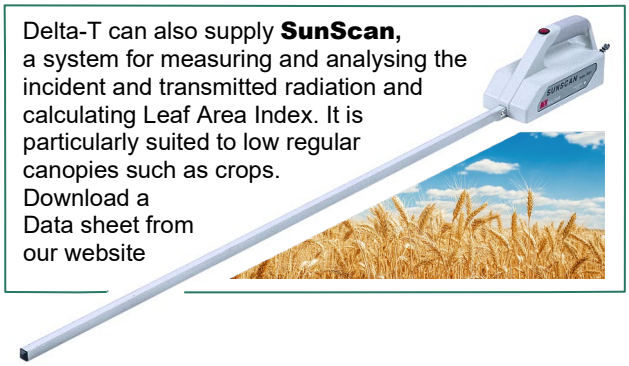
Camera upgrades

Older versions of HemiView will benefit from upgrade to the new high resolution EOS 6D digital SLR camera, but note that changing the camera will also require upgrading the self-levelling mount and fisheye lens.

Sample time-series calculation of light levels



Delta-T can also supply **SunScan**, a system for measuring and analysing the incident and transmitted radiation and calculating Leaf Area Index. It is particularly suited to low regular canopies such as crops. Download a Data sheet from our website



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