New Trends in Solar Resource Assessment

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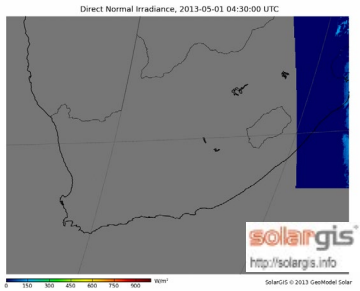
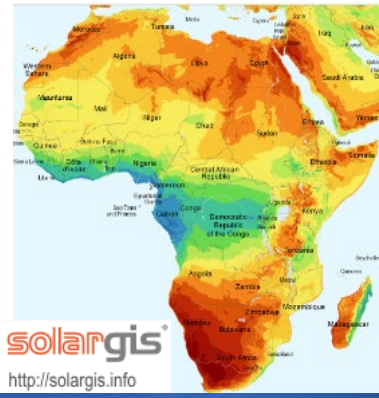
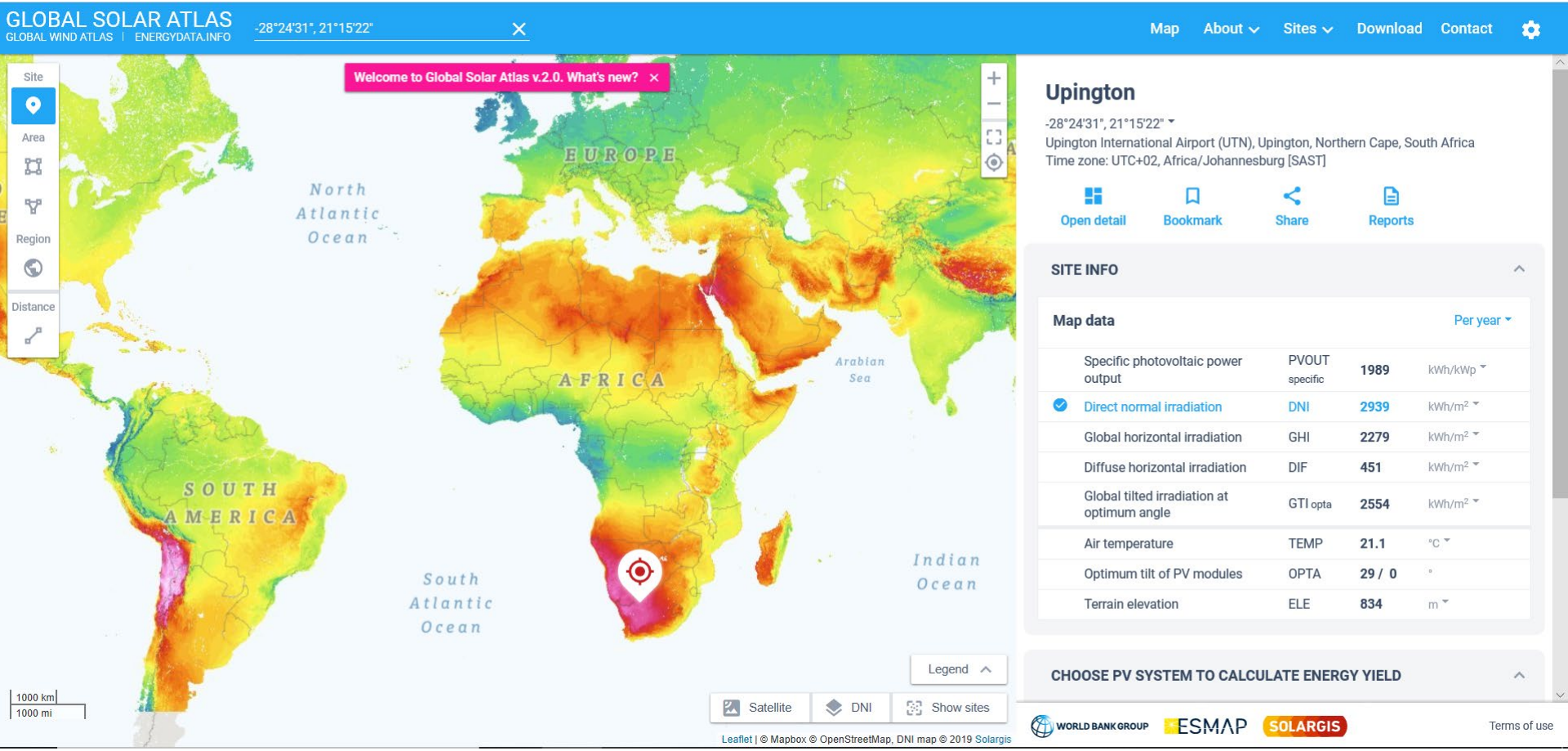




www.globalsolaratlas.info



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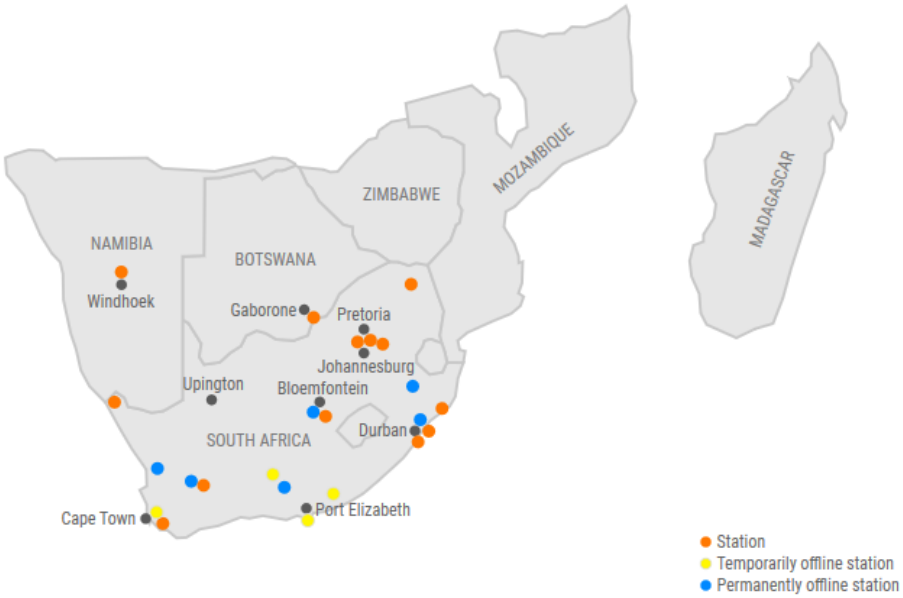
Southern African Universities Radiometric Network

Solar Radiometric Data for the Public

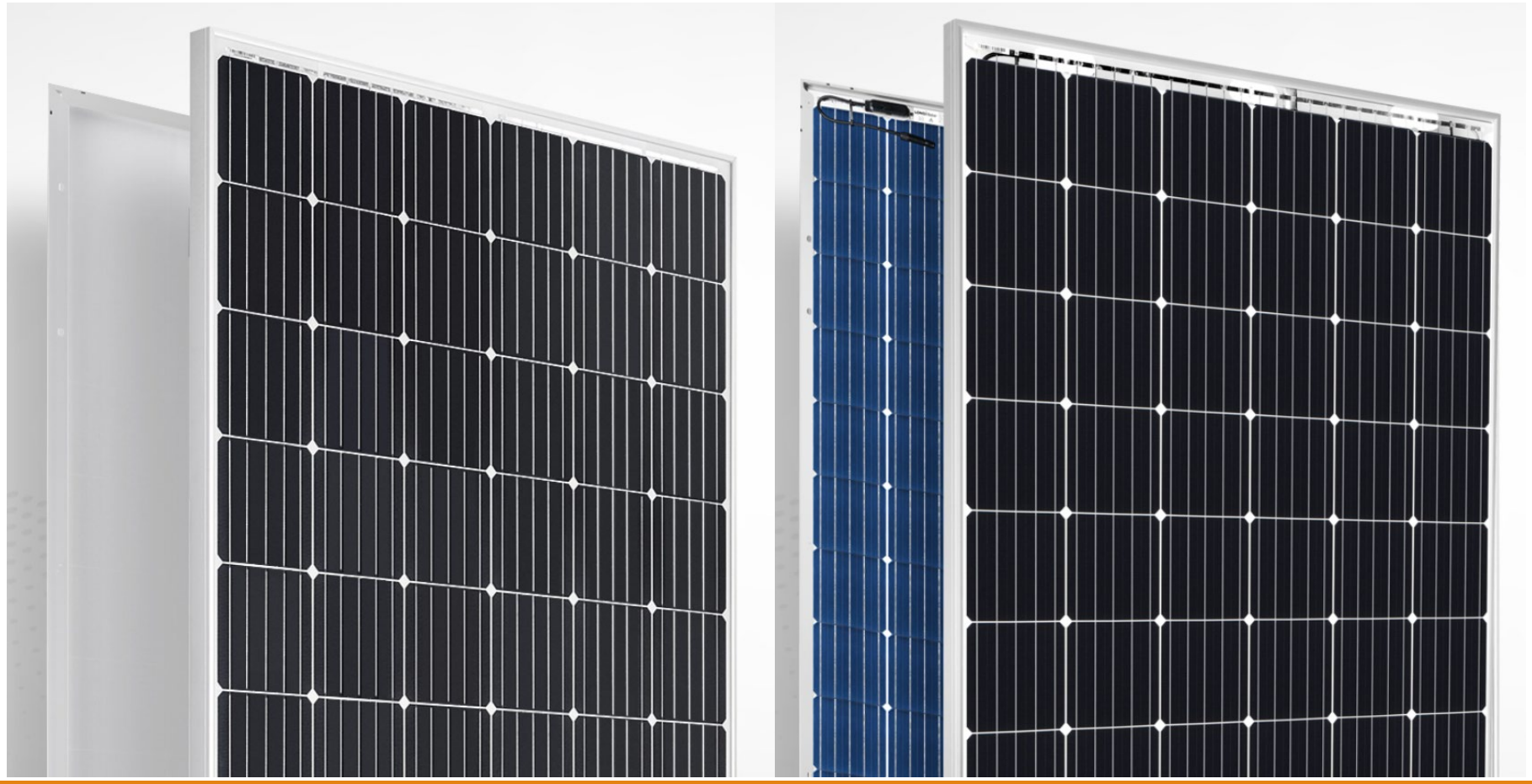


PV Technology Trends – Floating PV

Bi-facial PV modules

Traditional mono-facial

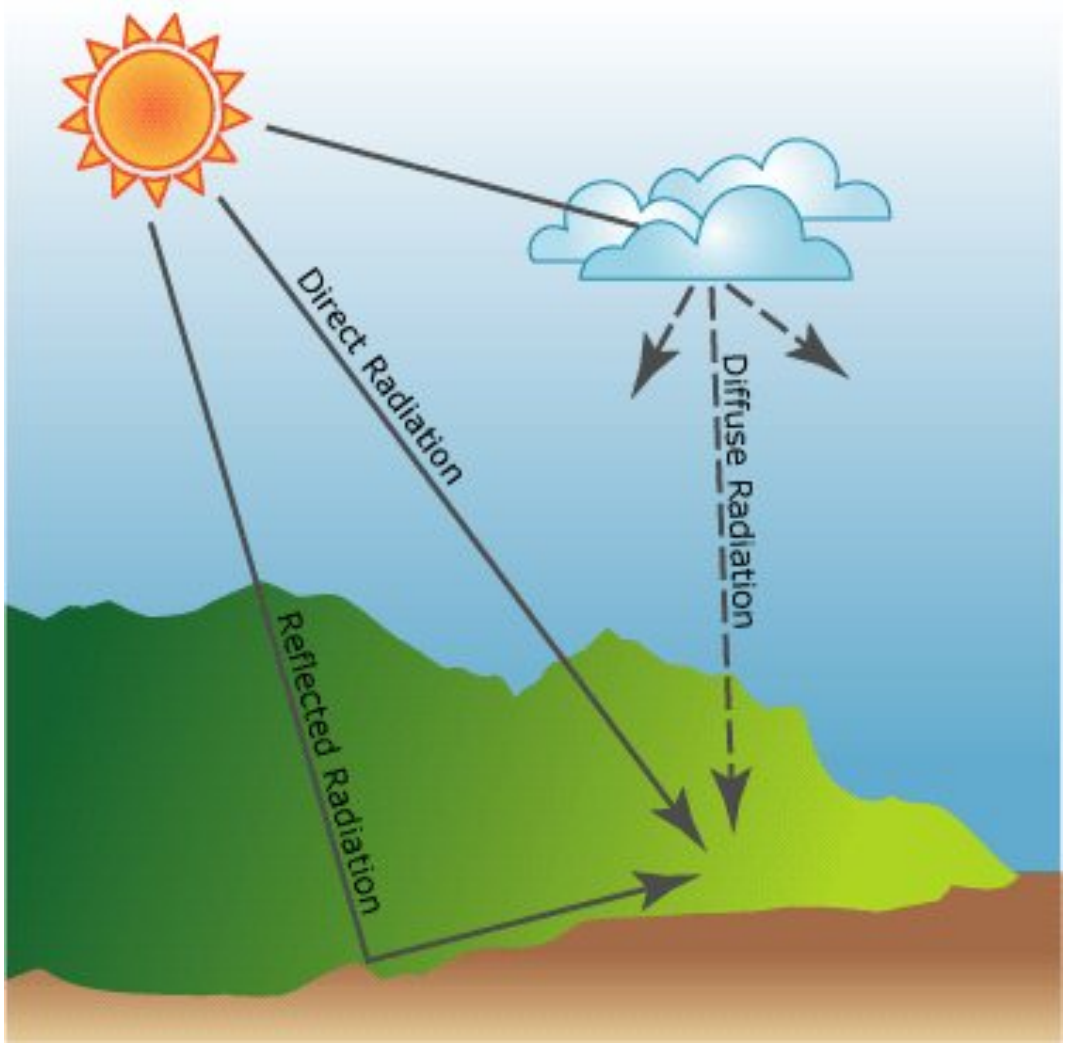
Bi-facial



PV Technology Trends – Bifacial PV

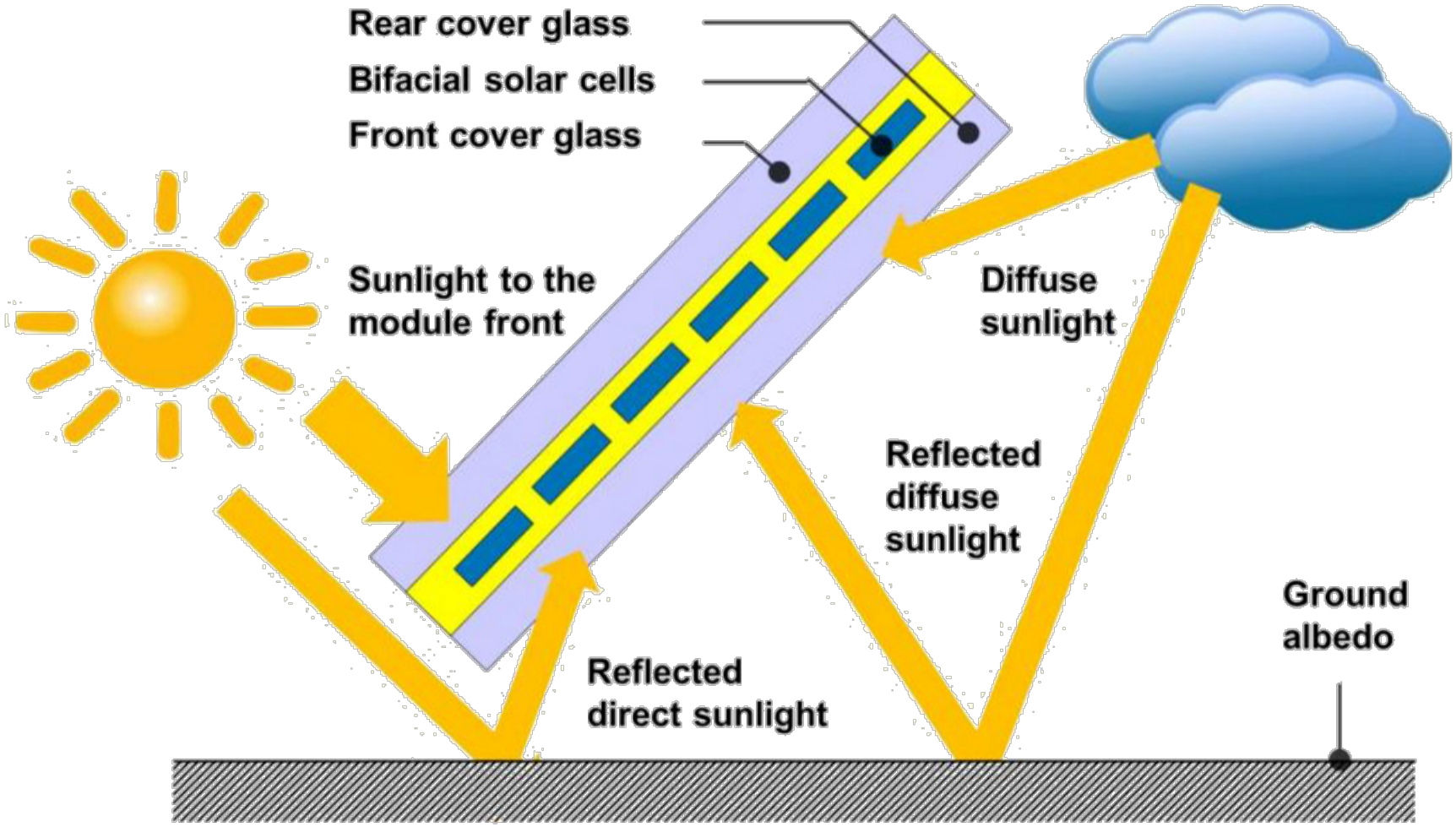
PV Technology Trends – Bifacial Floating PV

Solar Resource 101

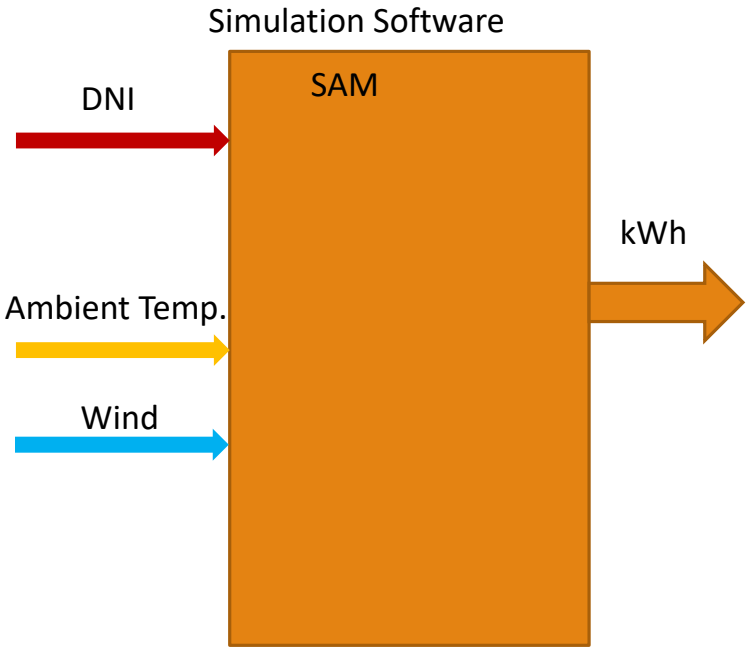


Traditional pyranometers and pyrheliometers are used to record global horizontal, diffuse and direct irradiance.

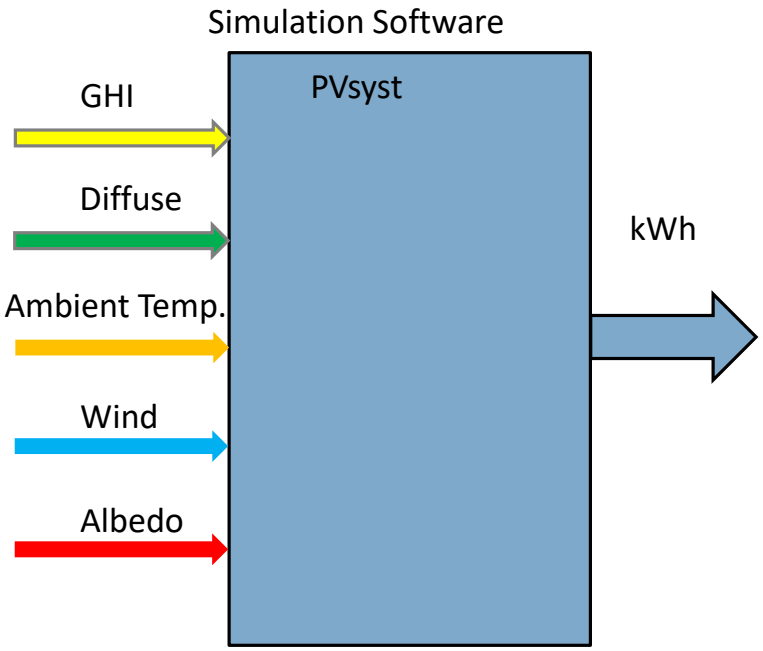
Albedo and bifacial PV explained



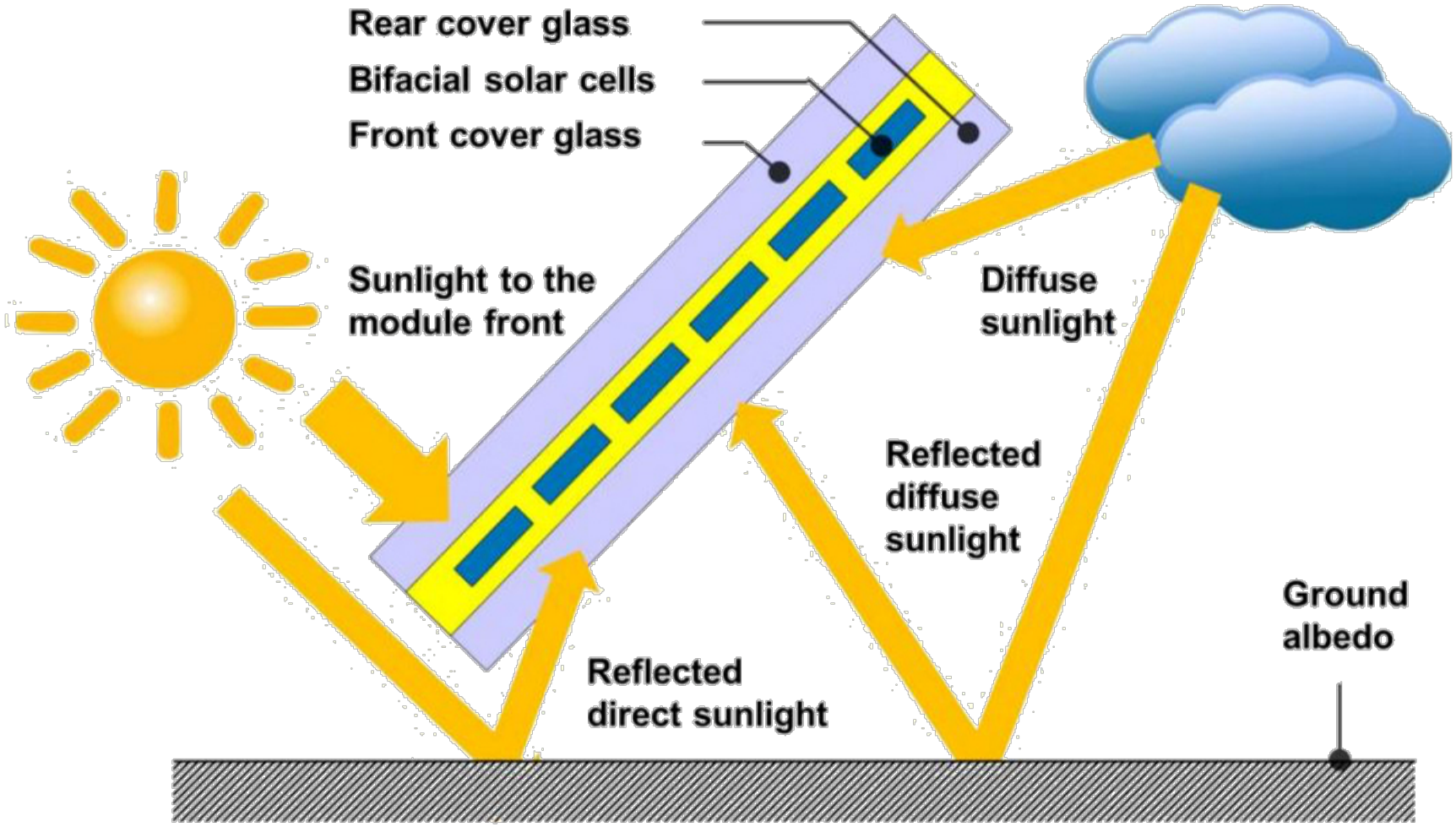
CSP



PV Bi-facial



Albedo and bifacial PV explained



Cost benefit of bi-facial modules

Bifacial PV modules can have a realistic increased annual yield of 5 – 20% depending on the surface type and if the modules are tracking or fixed tilt, row spacing, etc.

Surface Type	Albedo
Green Field grass	23%
Concrete	16%
White Painted Concrete	60-80%
White gravel	27%
White roofing metal	56%
Roofing membrane Light- grey	62%
Roofing membrane - White	>80%

*

Natural surface types	Typical albedo values
Forest	5% – 15%
Grassland	10% – 25%
Sand	15% – 40%
Snow	50% – 95%
Water	5% – 12%

*

Bifacial PV modules cost between USD 0.01/W and USD 0.03/W more compared to similar mono-facial PV modules. This results in an increased total plant capital cost of 1% - 3% (assuming a plant capital cost of USD 1.00/Wp). So in best case scenarios, the plant cost 1% more and yields 20% more electricity.

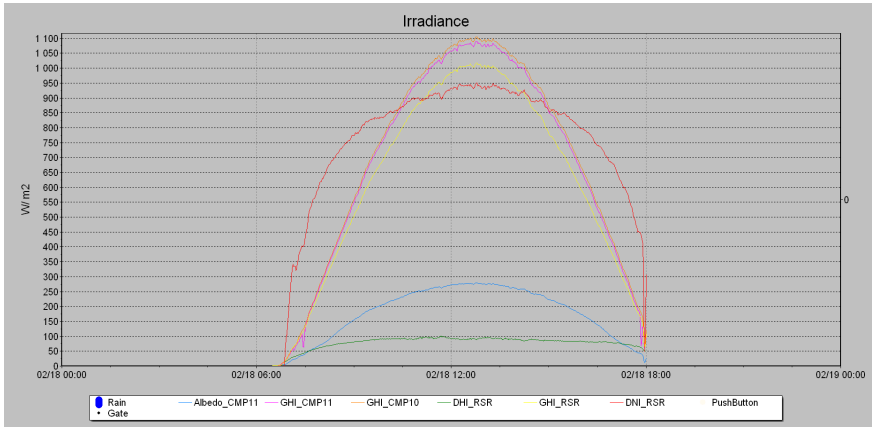
*Source: ISES Webinar November 2018: Albedo effects on PV yields

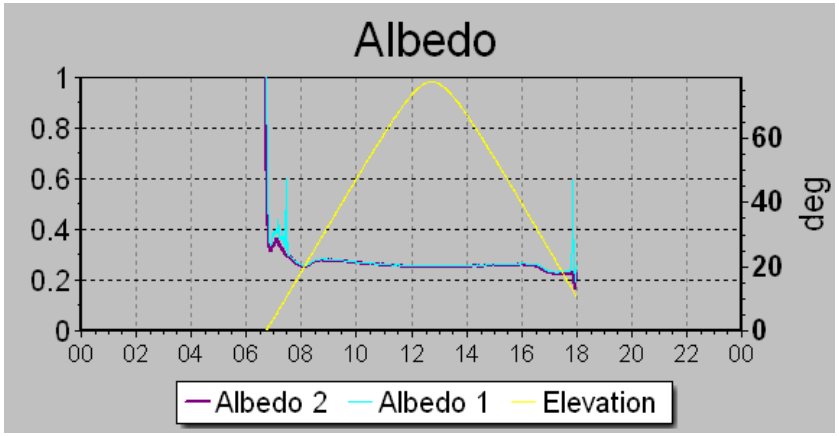
How to determine albedo: Ground measurements

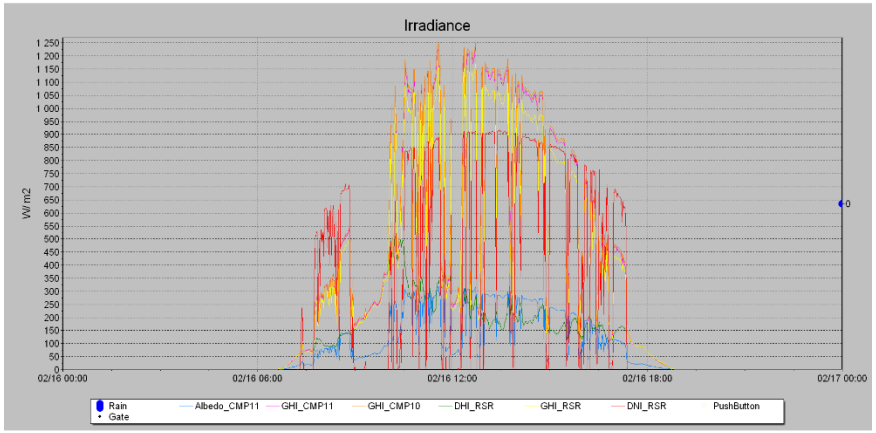
Albedo-meter (integrated design)

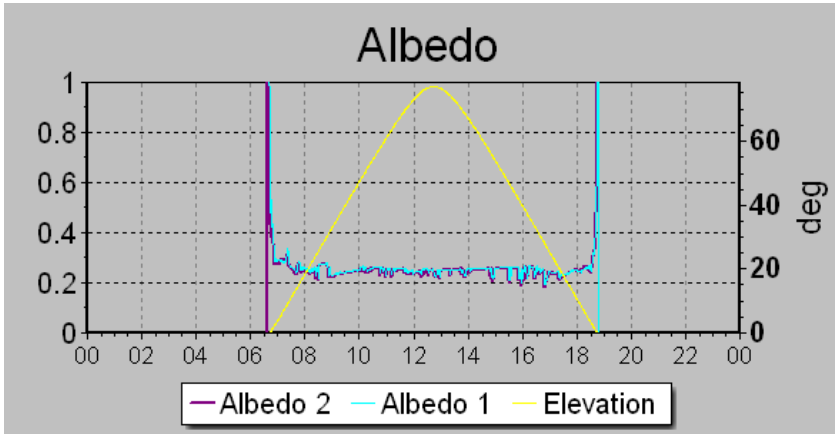
Albedo-meter – consisting of two standard pyranometers (preferred from a maintenance and calibration perspective)

How to determine albedo: Ground measurements







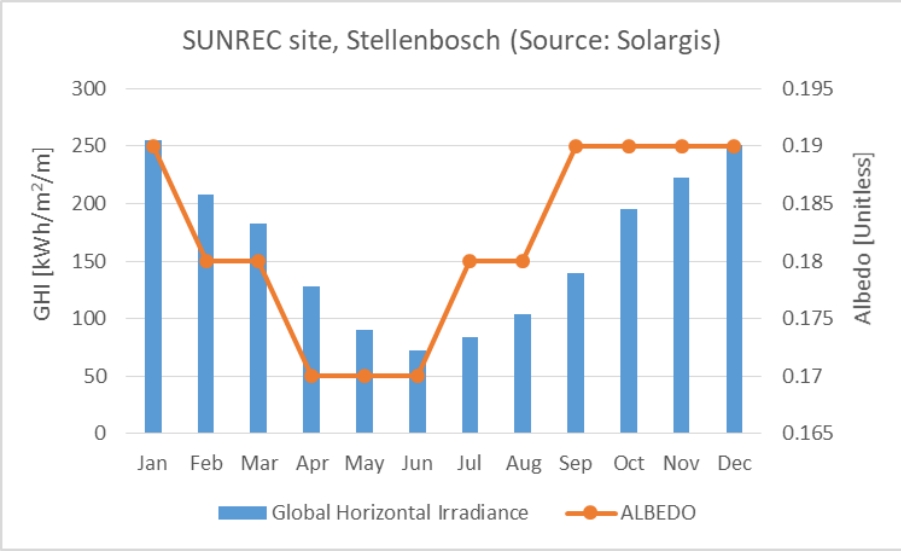


How to determine albedo: Ground measurements

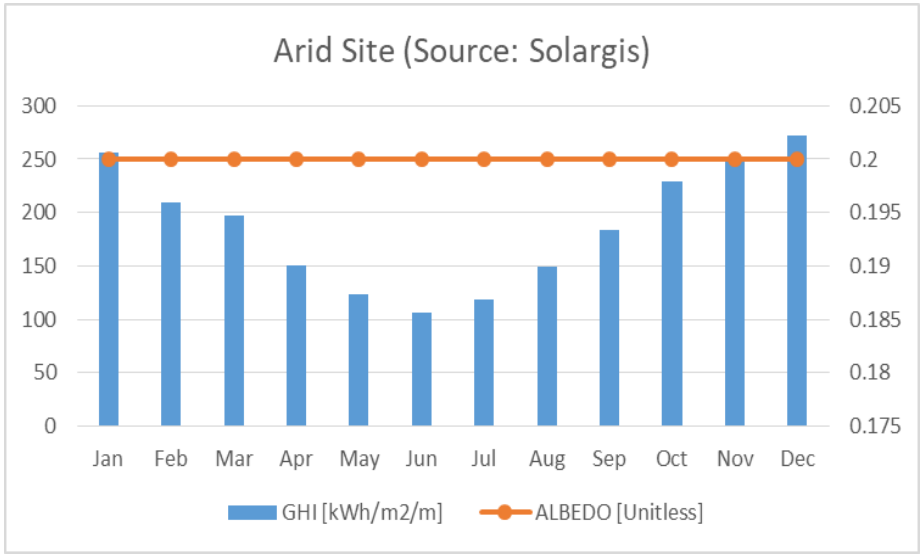
On some sites the albedo vary with the seasons due to changes in vegetation.

SUNREC site, Stellenbosch. Seasonal variation in albedo is to be expected.

The seasonal variation of a site can be assessed by consulting site specific satellite derived albedo data.



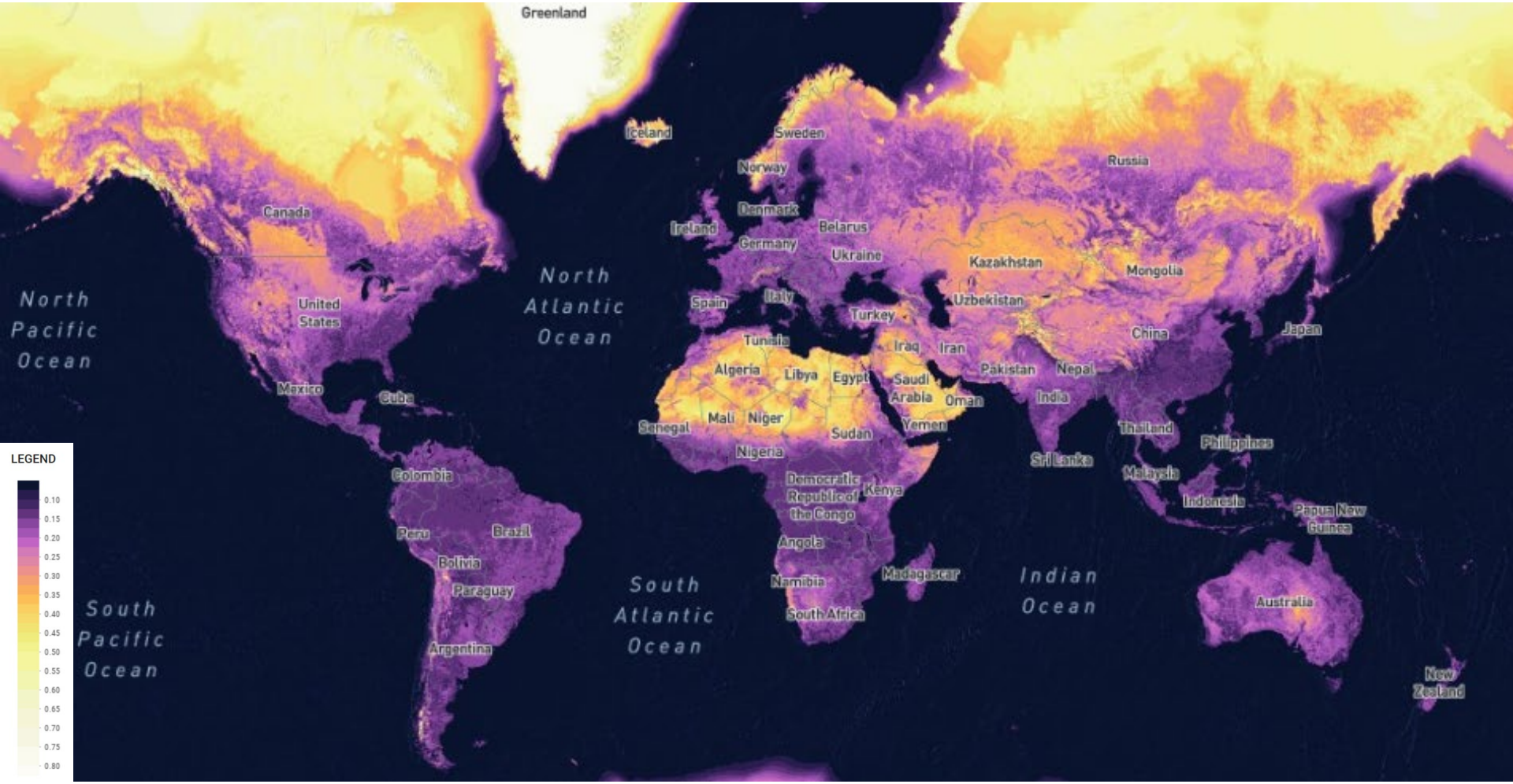
Satellite derived data confirms seasonal changes in albedo (the photos presented on the previous page refers). For these sites multiple short term or a 12-month albedo campaign is recommended – or a combination of both.



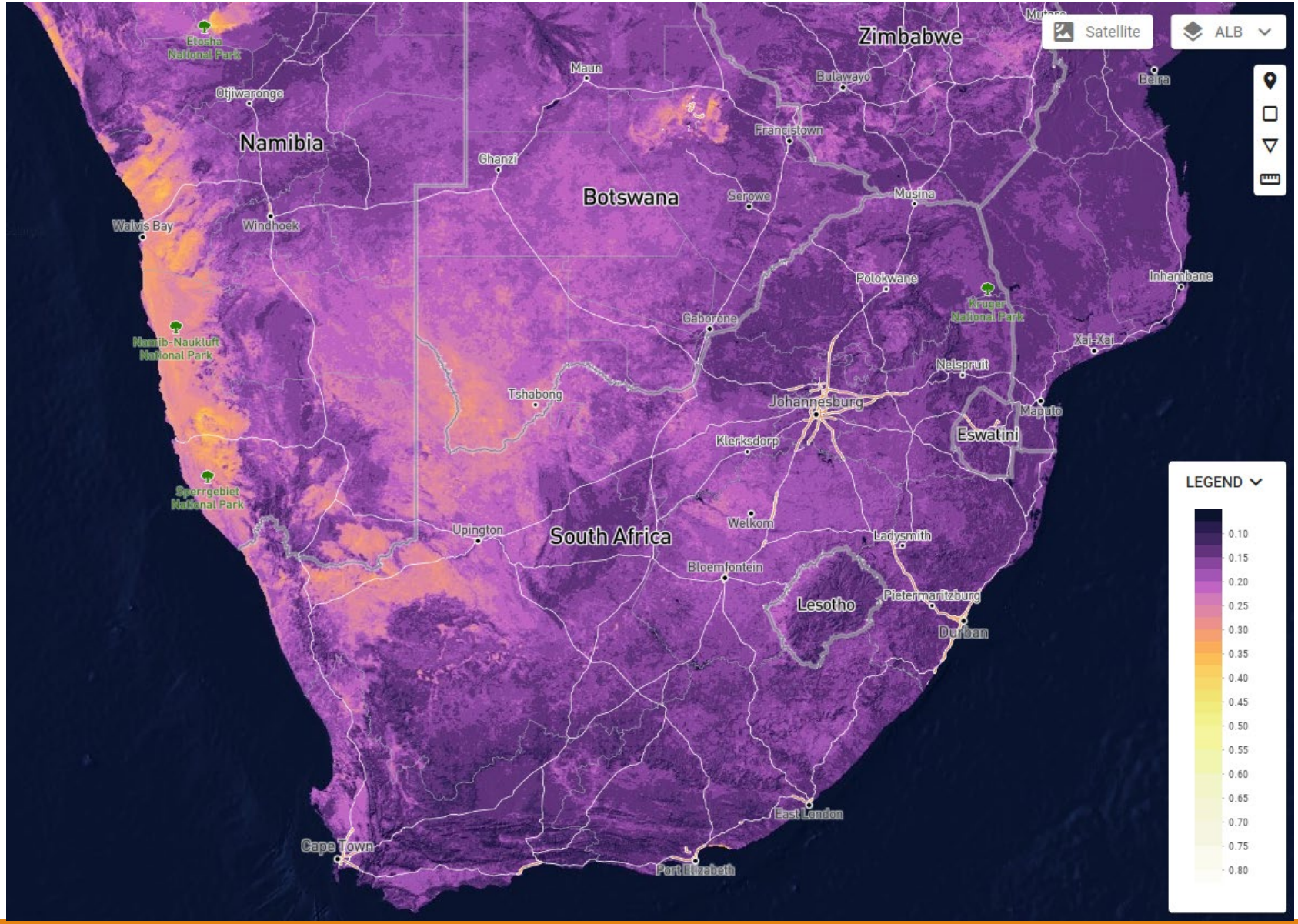
Satellite data confirms no seasonal changes in albedo (the site is located in an arid area).

Typical short-term albedo measurements.

Satellite derived data

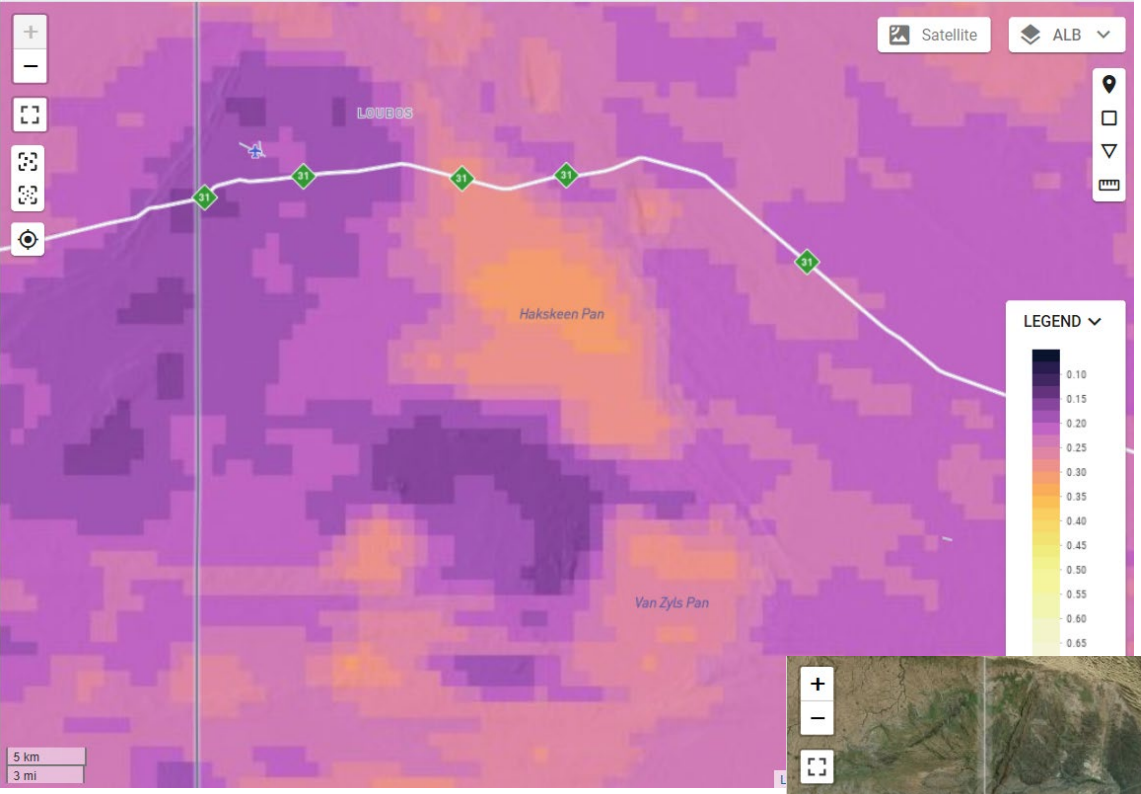


Satellite derived data



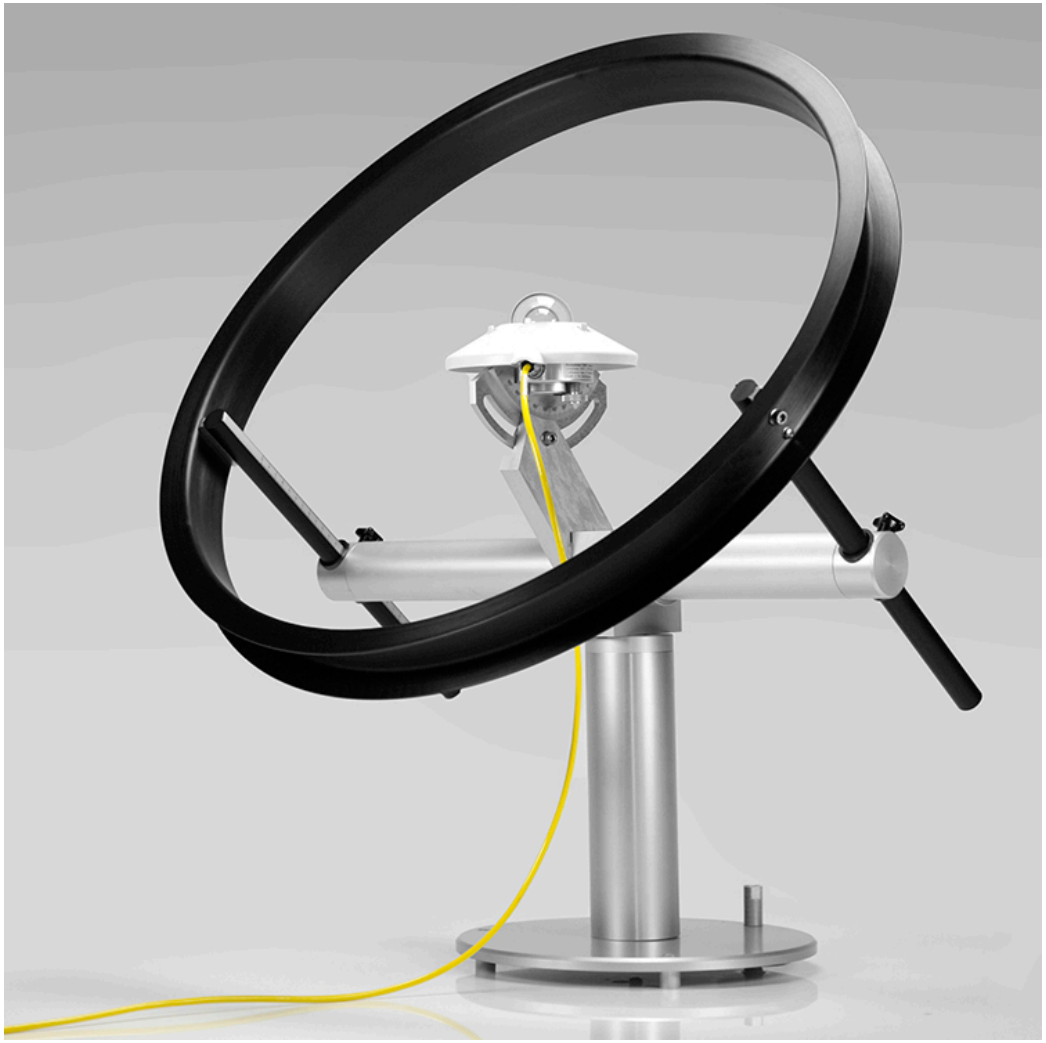
Satellite derived data

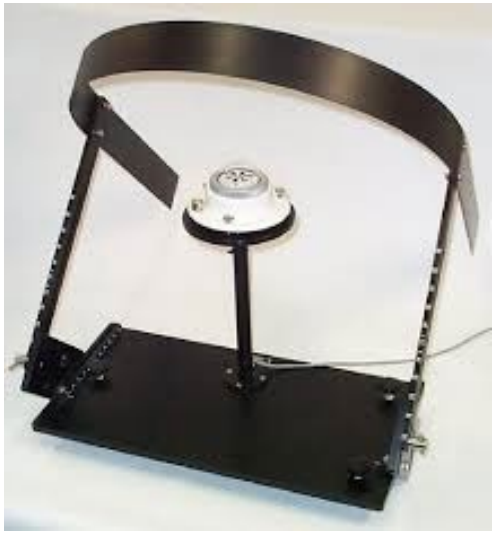
Spatial resolution of 500 m



Hakskeenpan area

Diffuse Measurements – Shadow Ring





Diffuse Measurements – Shadow Ball

Diffuse Measurements – Other commercially available options

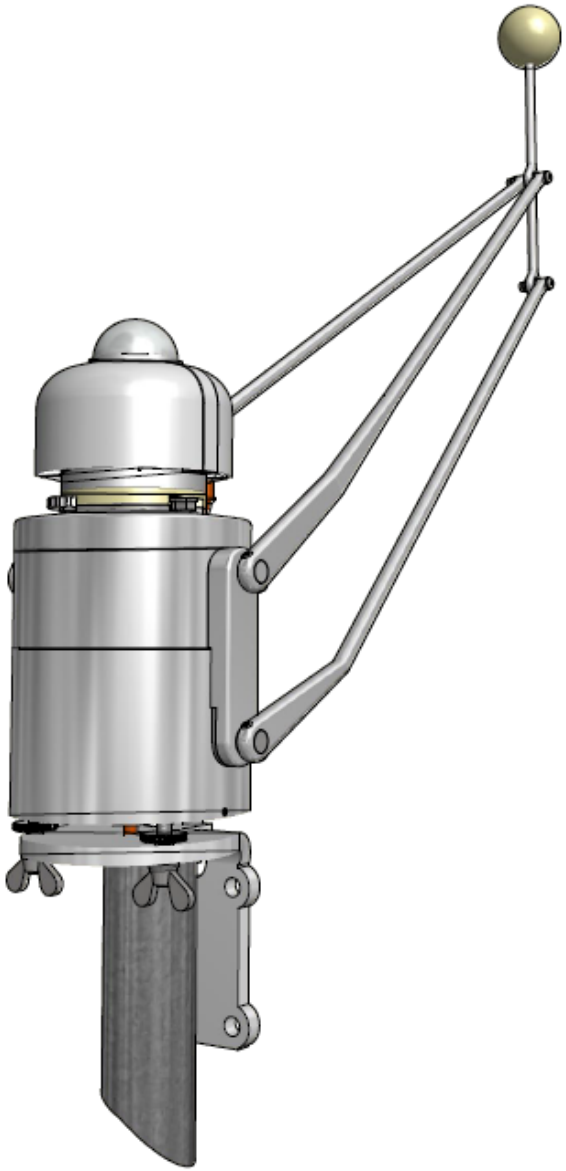
Small trackers

SPN1

Rotating Shadowband Radiometer (RSR)

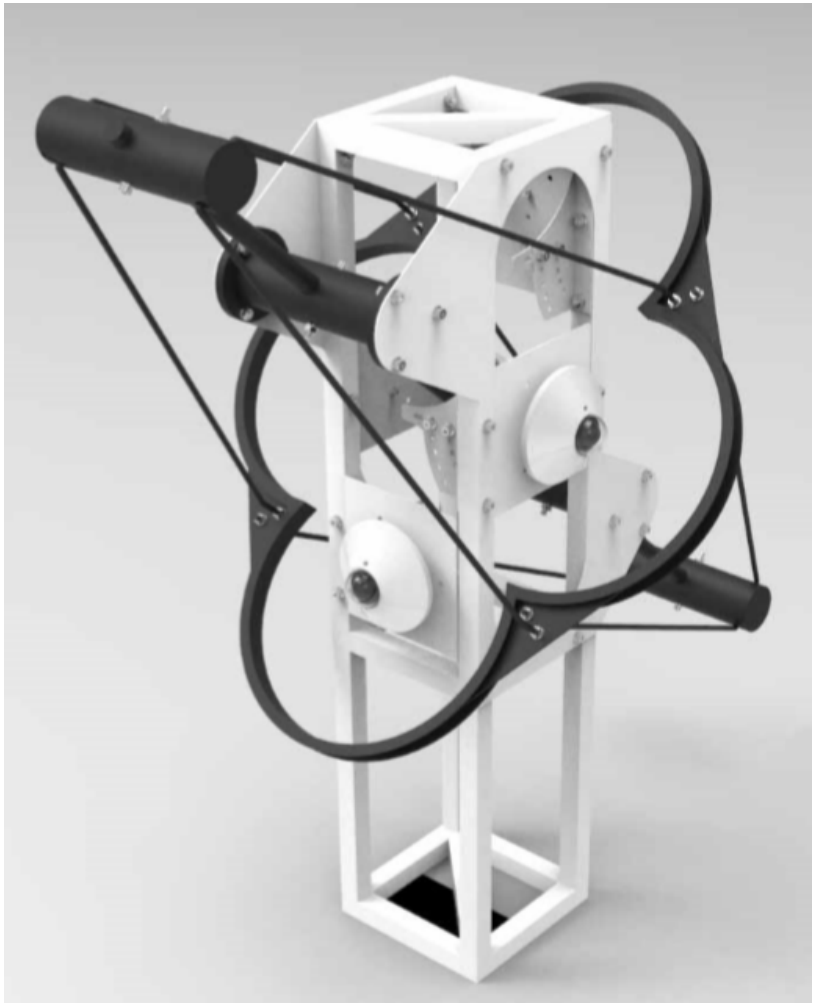
New Concepts

www.sunto.technology/sensing/captpro/



GeoSUN Africa

New Concepts



Simón-Martín, M. de, Díez-Mediavilla, M., Alonso-Tristán, C., González-Peña, D., New device for the simultaneous measurement of diffuse solar irradiance on several azimuth and tilting angles, Solar Energy (2015

Thank you for your attention

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