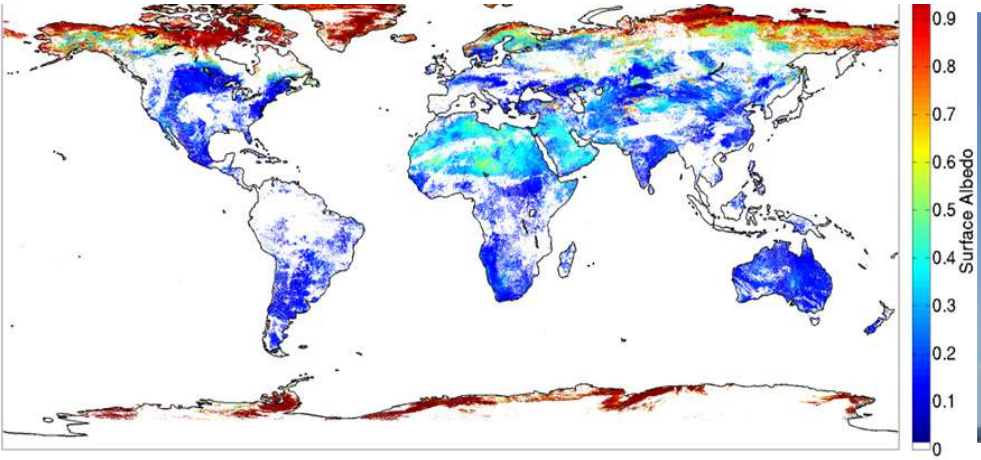
Independent Consultant | Meteorological Services

Albedo Assessment

Exploit the full potential of bifacial modules



Worldwide distribution of surface albedo from satellite data (Yu et al., 2013)

Albedometer with two photodiode pyranometers

Surface reflection relevant for PV output

In order to predict energy yields of PV plants using e.g. PVsyst, PV*SOL or SAM, albedo values are a relevant source of uncertainty. Overestimation of albedo leads to unrealistic high PV power output. But radiation gains due to strong surface reflections can also be much higher than expected.

In most cases only Global Horizontal Irradiance (GHI) is available as input. But Global Tilted Irradiance (GTI) in the actual Plane Of Array (POA) is required for accurate PV yield calculation. Most PV simulation tools derive GTI from GHI under assumptions for Diffuse Horizontal Irradiance (DHI) and albedo – both causing high uncertainty.

With increasing interest in bifacial PV modules good knowledge of the surface albedo became a high priority. Depending on surface reflections additional yield can be between 6% to 18%. Wrong estimates of surface albedo frequently lead to an incomplete exploitation of the full economic potential of PV projects with bifacial technology. This results in lower returns on investment.

What are typical albedo values?

Reflectance strongly varies spatially depending on surface type:

Surface types	Typical albedo ranges
Grassland & cropland	10% – 25%
Sand (desert)	15% - 40%
Concrete	30% - 55%
Asphalt	4% - 14%
Forest	5% - 15%
Snow	50% - 90%
Water	5% - 12%

Furthermore, albedo can have significant temporal variability.

Project Development

- ✓ Suntrace provides albedo values from satellite data. These are more representative than most albedo measurements.

Financing / Commissioning

- ✓ Measurements with HelioScale measurement stations equipped with upside-down radiometers.

PV Monitoring

- ✓ Either satellite data
- ✓ or continued measurements
- ✓ or a combination of both data sources.

Albedo Assessment

Exploit the full potential of bifacial modules

How to measure albedo?

Usual meteorological practice is to install an additional pyranometer facing downwards. However, the more economic solution using an upward and downward looking silicon photodiode is more representative for photovoltaics. With our HelioScale stations we provide three choices of radiometers from photodiodes, to ISO9060 First Class up to highest quality ISO Secondary Standard pyranometers to derive albedo at the site. Whichever solution you choose, you get highly reliable robust instruments.

Satellite-derived albedo in most cases better than measurements

- The surface across a PV site can be quite heterogenous! Installing 3 or more albedometers at a site is expensive and could still be doubtful due to undersampling.
- Albedo varies throughout the year – measurements only start after installation.
- Albedo might change with ground-works during installation of PV plant and vegetation growing in the shade of modules. Albedo of neighbouring areas could give hints on these changes to be expected.
- Reflecting or shading objects nearby an albedometer are misleading.
- For representative albedo measurements the installation height should be at least 10 meters. In this case the cleaning of radiometers is demanding. If not cleaned sufficiently and if not installed at a representative location, albedo measurements become useless.

Suntrace' solution

Full and Bankable Solar Resource Assessments include satellite-based albedo values.

Your advantages using albedo from Suntrace:

- ✓ Global data coverage with long history back to 2008 with annual variability from daily observations.
- ✓ Good spatial resolution of albedo values representative for the site.
- ✓ Combination of satellite albedo with appropriate albedo measurements to validate satellite-derived albedo.

Contact
Suntrace GmbH
Ms. Joana Zerbin
Project Manager / Sales
Mail: meteo@suntrace.de
Tel: +49 40 767 9638 13
Web: www.suntrace.de
www.helioscale.com

Suntrace GmbH
Grosse Elbstrasse 145c
22767 Hamburg
Germany

Contact
Tel.: +49 40 767 96 38 0
Fax: +49 40 767 96 38 20
E-Mail: info@suntrace.de
www.suntrace.de

Managing Directors
Boris Westphal
Martin Schlecht
Dr. Richard Meyer

Bank Details
Hamburger Sparkasse
IBAN: DE39200505501238185027
BIC: HASPDEHHXXX

Court of Hamburg
HRB: 110819
VAT: DE266610323

© 2018, Suntrace, all rights reserved