



Growing
ideas
through
networks

Spectral data from across Europe shared on PEARL PV platform

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CONTENTS

1. CKAN SERVER
 1. Logging in
 2. Uploading the data sets
 3. Spectral analysis folder
2. AVAILABLE SPECTRAL DATA
 1. Berlin, Germany
 2. Enschede, The Netherlands
 3. Grimstad, Norway
 4. Merklingen, Germany
 5. Utrecht, The Netherlands
3. SOLAR SPECTRUM under ECLIPSE

PEARL PV CKAN SERVER: LANDING PAGE

The screenshot shows the Pearl PV CKAN Repository landing page. At the top, there's a navigation bar with links for Datasets, Organizations, Groups, About, and Search. A red circle highlights the 'Log in' and 'Register' buttons. A large red arrow points upwards from the bottom right towards the 'Welcome' section. The main content area features a search bar with placeholder text 'E.g. environment' and a magnifying glass icon. Below it are 'Popular tags' buttons for APE, Meteorological data, and rooftop. To the left, there's a box for 'Pearl PV CKAN Repository statistics' showing 4 datasets, 5 organizations, and 1 group. The right side has a 'Welcome to the Pearl PV CKAN Repository' message, a note about development, and a quick start guide. It also includes a 'Quicklinks to help:' section with links to add or edit datasets and a 'More in the User Guide' link.

PEARL PV CKAN SERVER: UPLOADING DATA

The screenshot shows the PEARL PV CKAN Server interface. At the top right, a user profile for "Basant Raj Paudyal" is shown, with a red circle highlighting the user icon and name. Below the header, there are navigation links for "Datasets", "Organizations", "Groups", "About", and "Search". A search bar is also present. On the left side, there is a sidebar with sections for "Organizations" (listing "pearl-pv" with 30 datasets, "SpectralAnalysis" with 12 datasets, and "PV Performance Labs..." with 1 dataset), "Groups" (listing "Spectral irradiance" with 4 datasets), "Tags" (listing "no faults" with 6 datasets, "PV data" with 6 datasets, "spectroradiometer" with 5 datasets, "Berlin" with 4 datasets, "glass cracks" with 4 datasets, and "irradiance data" with 4 datasets), and a "Datasets" section. The main content area displays a list of datasets. A red circle highlights the "Add Dataset" button at the top center of the list. Another red circle highlights the "CSV" download link for the first dataset, "Eurac Test Facility (Bolzano, Italy) Data". The dataset list includes:

- Eurac Test Facility (Bolzano, Italy) Data**
Measurements data from 20 CIGS modules from the test facility of Eurac Research in Bolzano, Italy. The dataset was selected to study failures in operation, hence several outages...
[CSV](#)
- Spectral data 2020.06.15-2021.05.31 - HZB**
This dataset has no description
[CSV](#)
- Utrecht full spectral + weatherdata; synchronized timestamps**
A dataset with timestamps, spectral irradiance, GPOA, DHI, DNI, GHI, Air_Temperature, Air_Pressure, Relative_Humidity,

PEARL PV CKAN SERVER: SPECTRAL ANALYSIS

The screenshot shows the PEARL PV CKAN Server interface. At the top, there is a navigation bar with links for Datasets, Organizations, Groups, About, and a search bar. A red circle highlights the user profile icon labeled "Basant Raj Paudyal". On the left, a sidebar lists categories: Organizations (with a red circle), Groups, Tags, and Formats. Under "Organizations", "SpectralAnalysis" is selected, indicated by a red arrow pointing up from the sidebar. The main content area displays 12 datasets found, filtered by the "SpectralAnalysis" organization. The datasets listed are:

- PRIVATE Utrecht full spectral + weatherdata; synchronized timestamps**
A dataset with timestamps, spectral irradiance, GPOA, DHI, DNI, GHI, Air_Temperature, Air_Pressure, Relative_Humidity, Azimuth, Zenith from the Utrecht Photovoltaic Outdoor Test...
zip file with csv files
- PRIVATE Utrecht APE + weatherdata including GPOA, synchronized times**
Dataset with APE values, and weatherdata, for synchronized timestamps.
CSV
- PRIVATE Utrecht weather data including GPOA**

SPECTRAL DATA INTER-COMPARISON:

Common grounds of intercomparison:

- APE as a parameter
- 350-1050 nm wavelength range

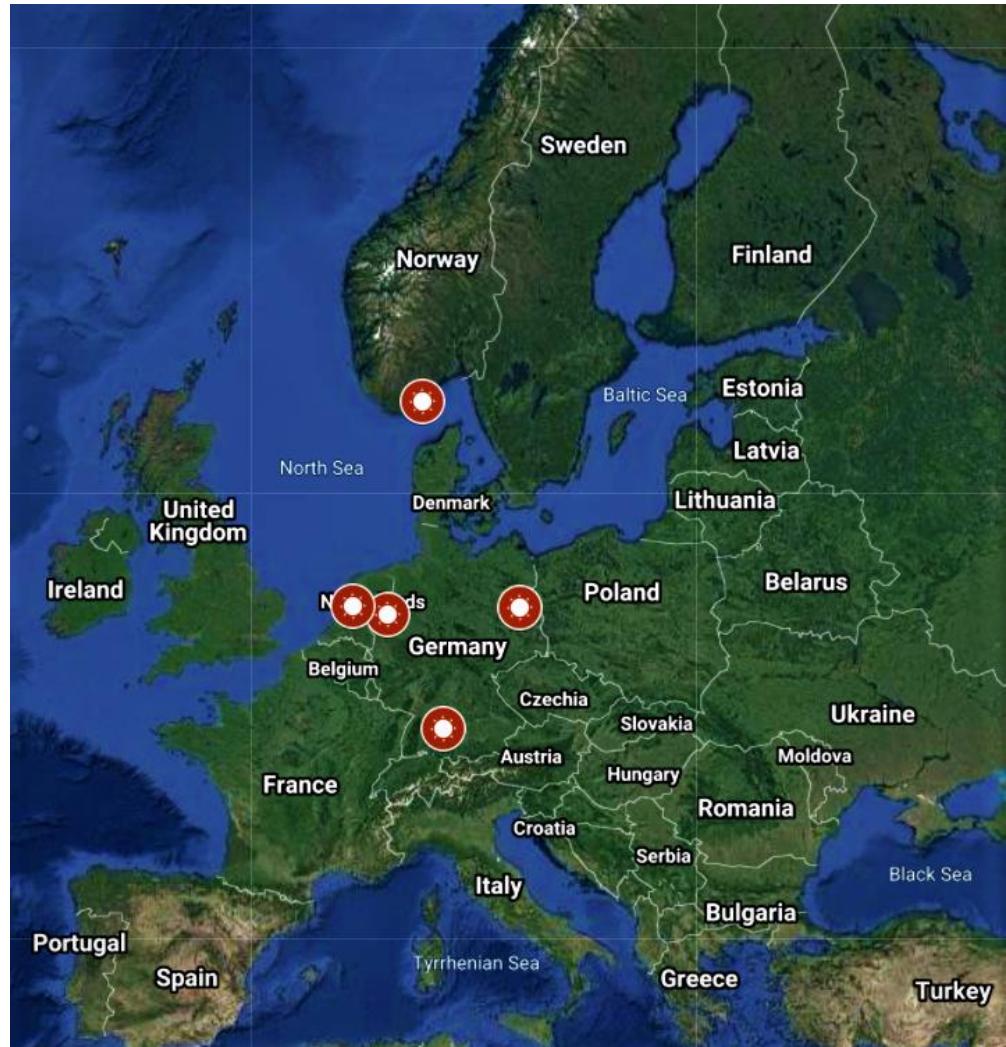
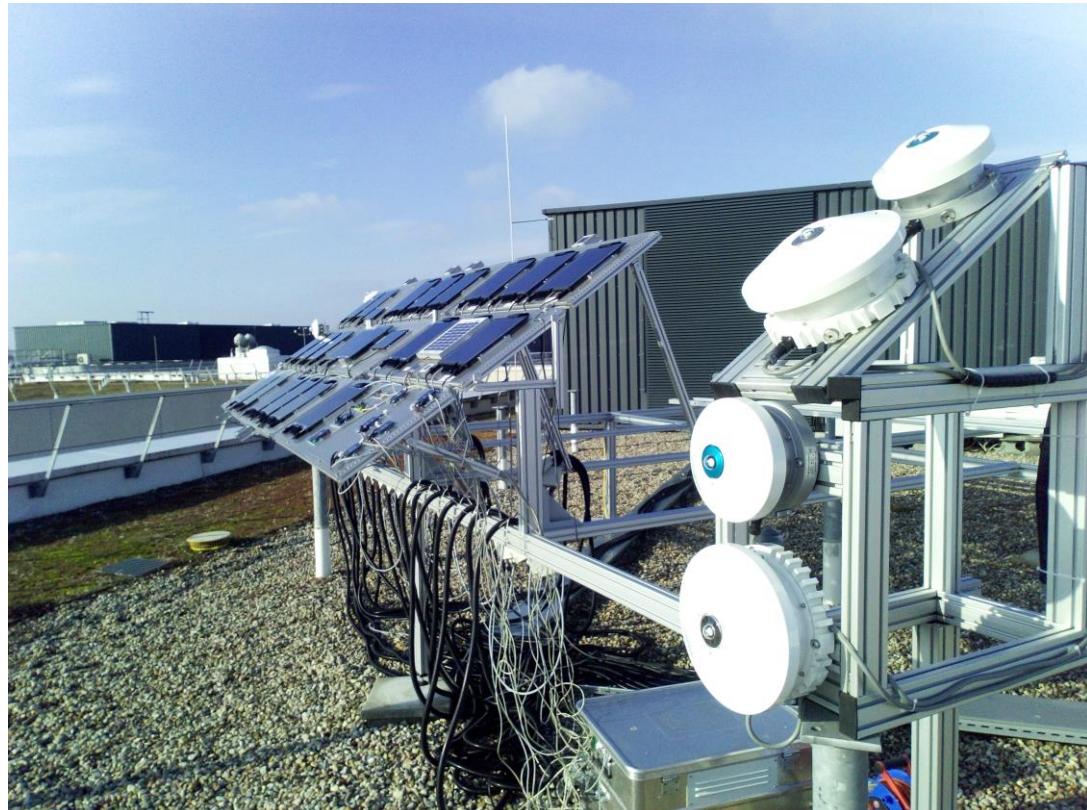


Fig. Participating locations in this study

SPECTRAL DATA - BERLIN



| Parameters | Values |
|---------------------|---------------|
| Latitude | 52.43° |
| Longitude | 13.52° |
| KG Climate | Cfb |
| Climate type | Urban, Inland |
| Instrument | EKO Wiser |
| Spectral range | 300-1700 nm |
| Time series | 2018 - 2021 |
| Temporal resolution | 5 min |
| Angular orientation | 35° S |

SPECTRAL DATA - BERLIN

Data availability : 2020 June 15- 2021
June 30

Filtering used: GPOA > 25Wm-2

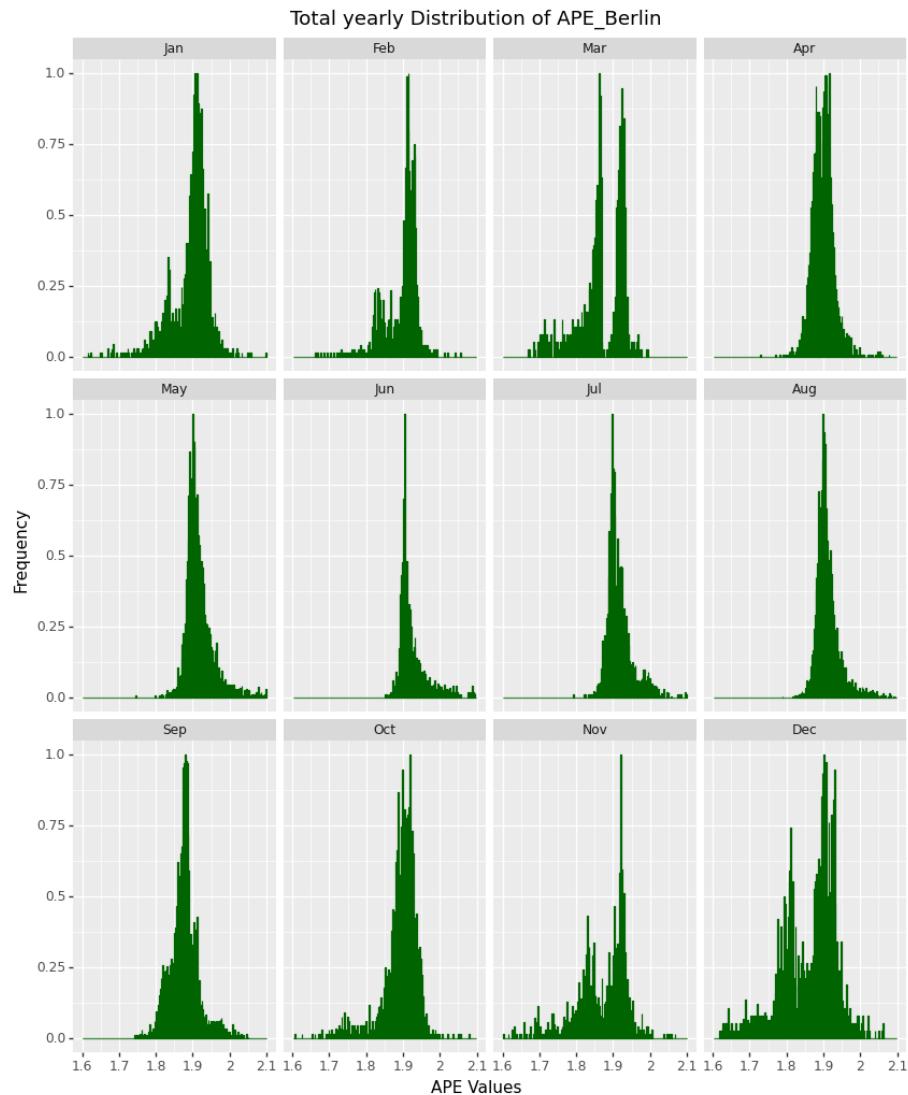
Data points: 82,114

Comments:

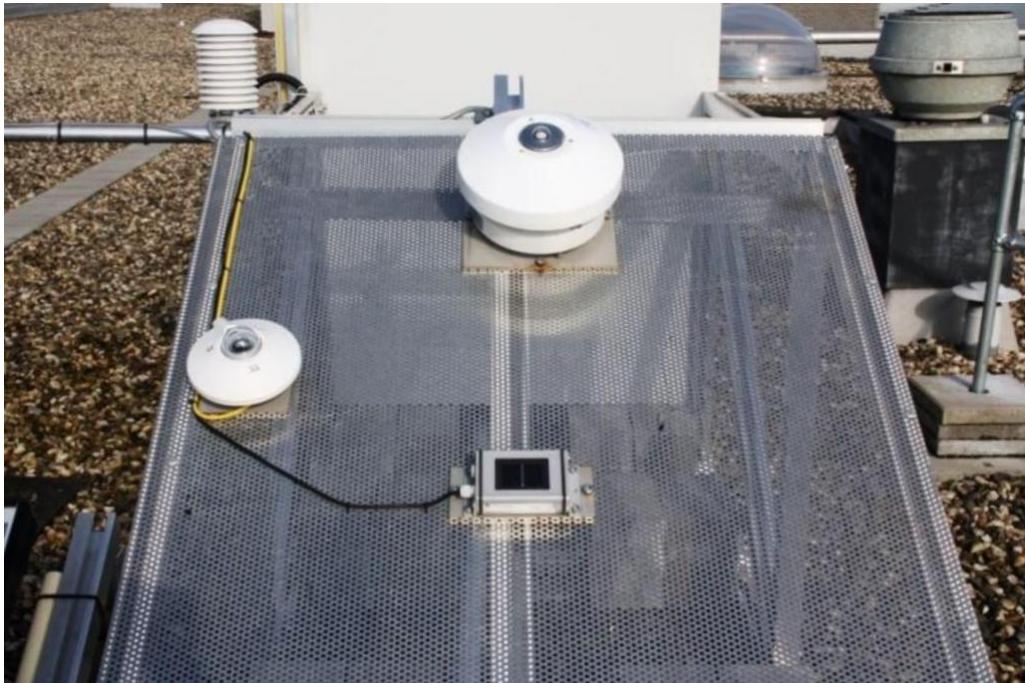
Average annual APE:
1.90 eV

Highest monthly average APE:
June - 1.93 eV

Lowest monthly average APE:
December - 1.85 eV



SPECTRAL DATA – ENSCHEDE



| Parameters | Values |
|---------------------|-------------------|
| Latitude | 52.23° |
| Longitude | 6.85° |
| KG Climate | Cfb |
| Climate type | Sub-Urban, Inland |
| Instrument | EKO MS700 |
| Spectral range | 350-1050 nm |
| Time series | 2014 - 2019 |
| Temporal resolution | 1 min |
| Angular orientation | 30° S |

SPECTRAL DATA - ENSCHEDE

Data availability : 2014 Jan 08-
2019 December 31

Filtering used: GPOA > 25Wm⁻²

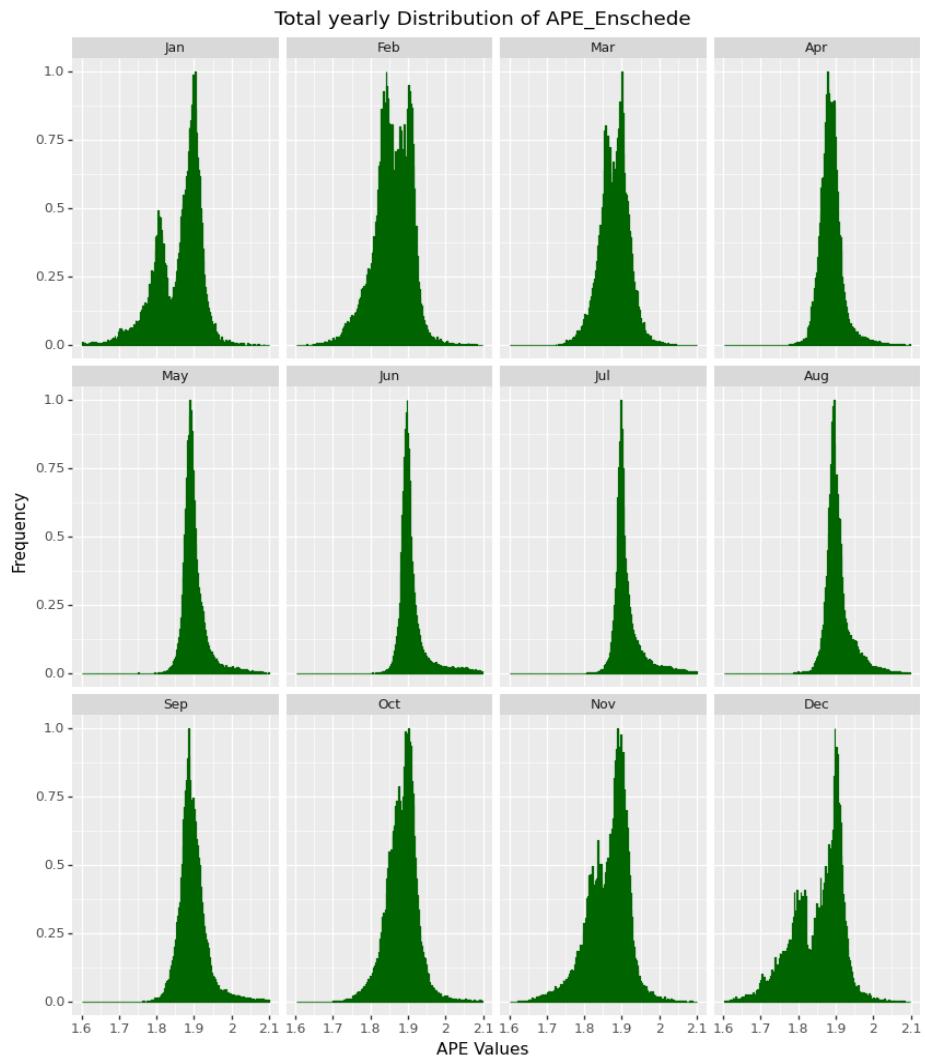
Data points: 1,311,403

Comments:

Average annual APE:
1.89 eV

Highest monthly average APE:
July - 1.91 eV

Lowest monthly average APE:
December - 1.84 eV



SPECTRAL DATA - GRIMSTAD



| Parameters | Values |
|---------------------|-------------------------|
| Latitude | 58.33° |
| Longitude | 8.58° |
| KG Climate | Cfb |
| Climate type | Sub-urban, Coastal |
| Instrument | Spectrafy SolarSIM-G |
| Spectral range | 280-4000 nm |
| Time series | 2019 - 2021 |
| Temporal resolution | 1 min |
| Angular orientation | 45° S |

SPECTRAL DATA - GRIMSTAD

Data availability : 2020 Jan 1-
2020 Dec 31

Filtering used: **GPOA > 25Wm-2**

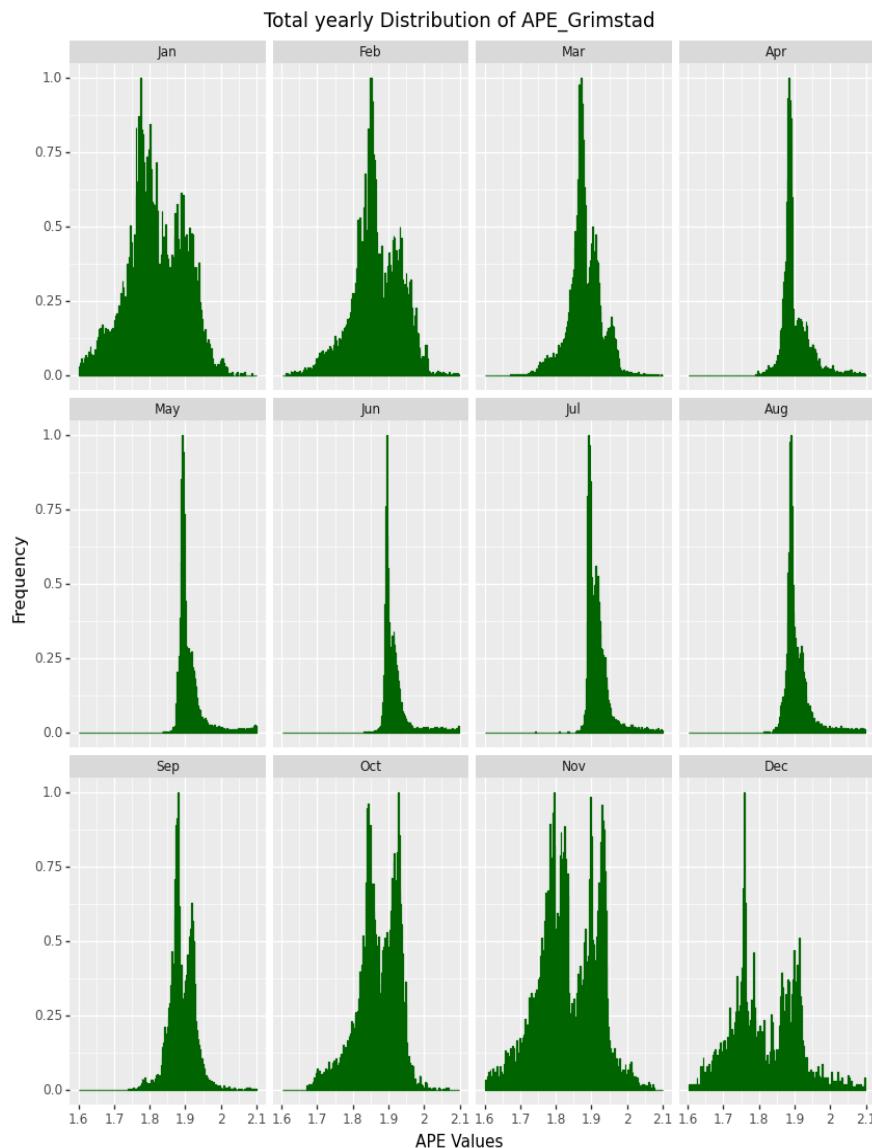
Data points: 265,420

Comments:

Average annual APE:
1.90 eV

Highest monthly average APE:
July - 1.93 eV

Lowest monthly average APE:
January - 1.81 eV



SPECTRAL DATA - MERKLINGEN



| Parameters | Values |
|---------------------|---------------|
| Latitude | 48.53° |
| Longitude | 9.71° |
| KG Climate | Cfb |
| Climate type | Rural, Inland |
| Instrument | EKO MS700 |
| Spectral range | 350-1050 nm |
| Time series | 2014 - 2020 |
| Temporal resolution | 1 min |
| Angular orientation | 40° S |

SPECTRAL DATA - MERKLINGEN

Data availability : 2014 Jan –
2020 Dec 31

Filtering used: GPOA > 25Wm-2

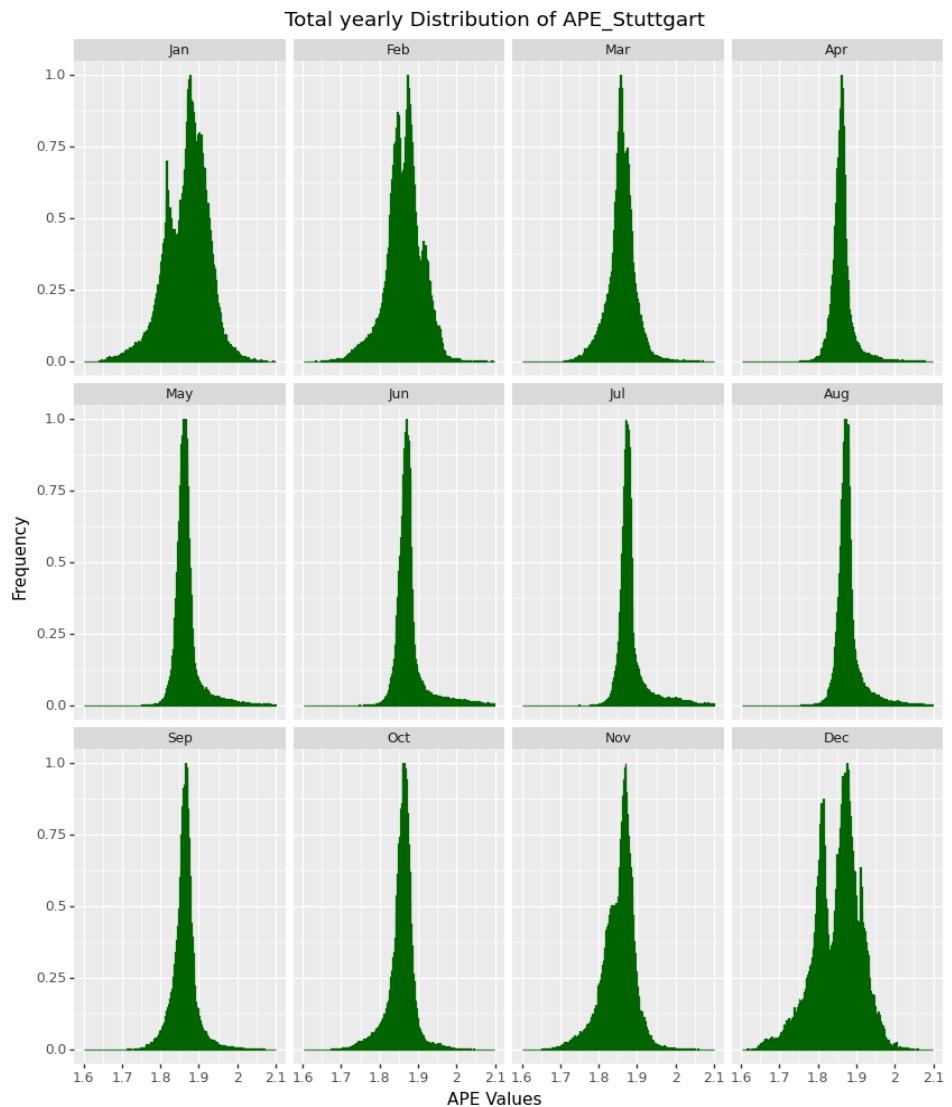
Data points: 1,822,200

Comments:

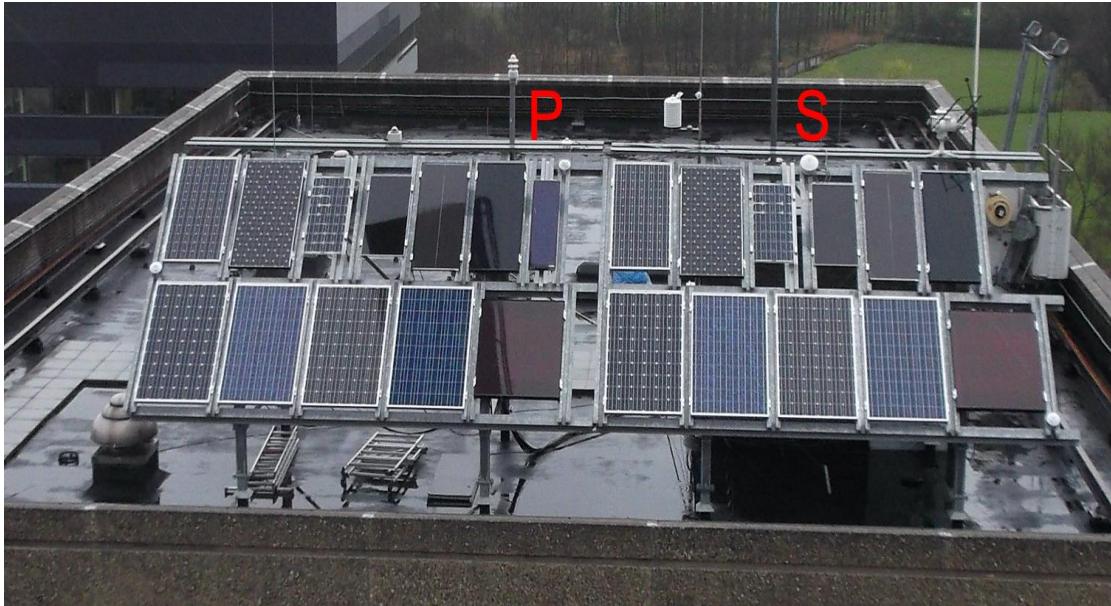
Average annual APE:
1.86 eV

Highest monthly average APE:
July - 1.88 eV

Lowest monthly average APE:
December - 1.84 eV



SPECTRAL DATA - UTRECHT



| Parameters | Values |
|---------------------|-------------------|
| Latitude | 52.5° |
| Longitude | 5.10° |
| KG Climate | Cfb |
| Climate type | Sub-urban, Inland |
| Instrument | EKO MS700 |
| Spectral range | 350-1050 nm |
| Time series | 2014 - 2017 |
| Temporal resolution | 30 sec |
| Angular orientation | 37° S |
| | 15 |

SPECTRAL DATA - UTRECHT

Data availability : 2014 Jul 19-
2018 Jan 08

Filtering used: **GPOA > 25Wm-2**

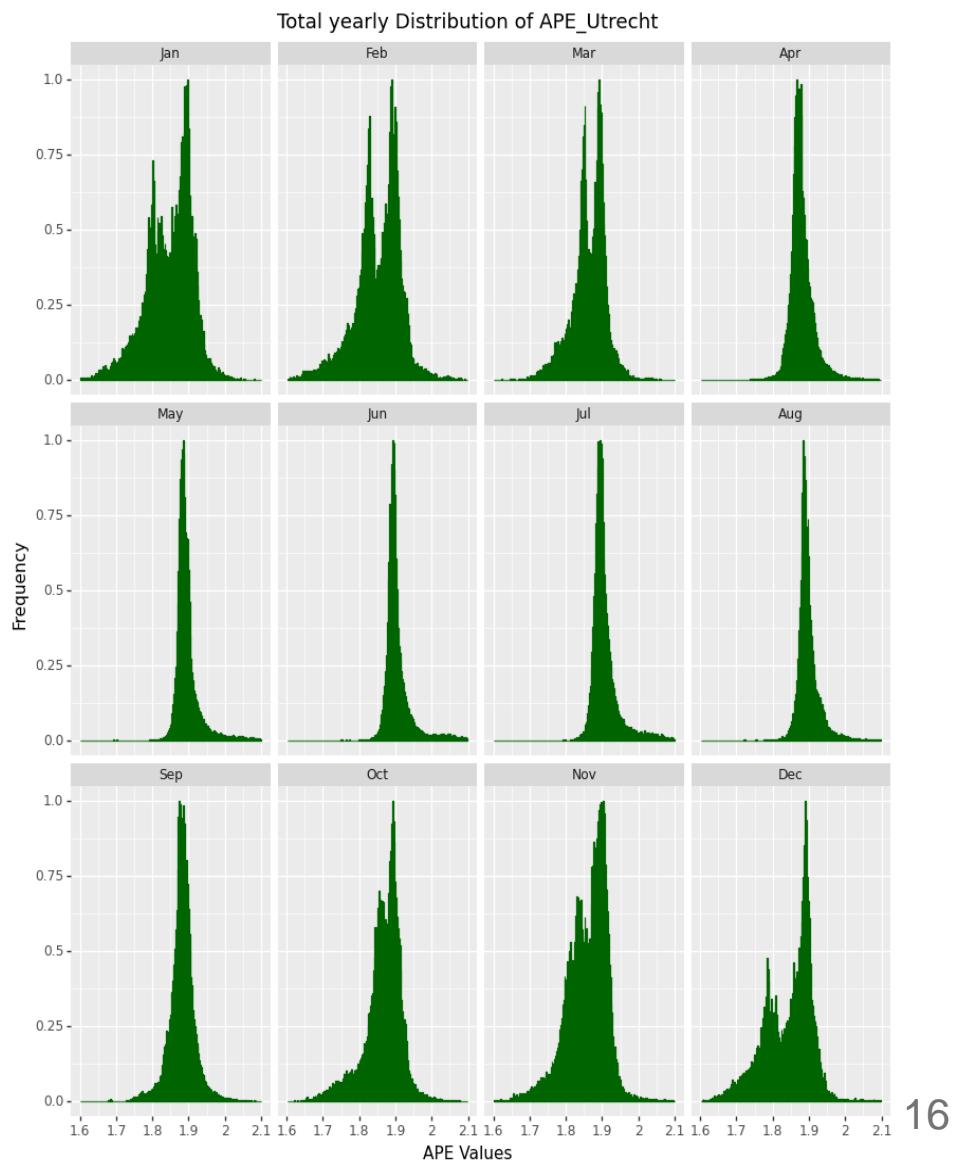
Data points: 1,147,156

Comments:

Average annual APE:
1.88 eV

Highest monthly average APE:
July - 1.91 eV

Lowest monthly average APE:
December - 1.84 eV



Solar Eclipse and Spectral variations

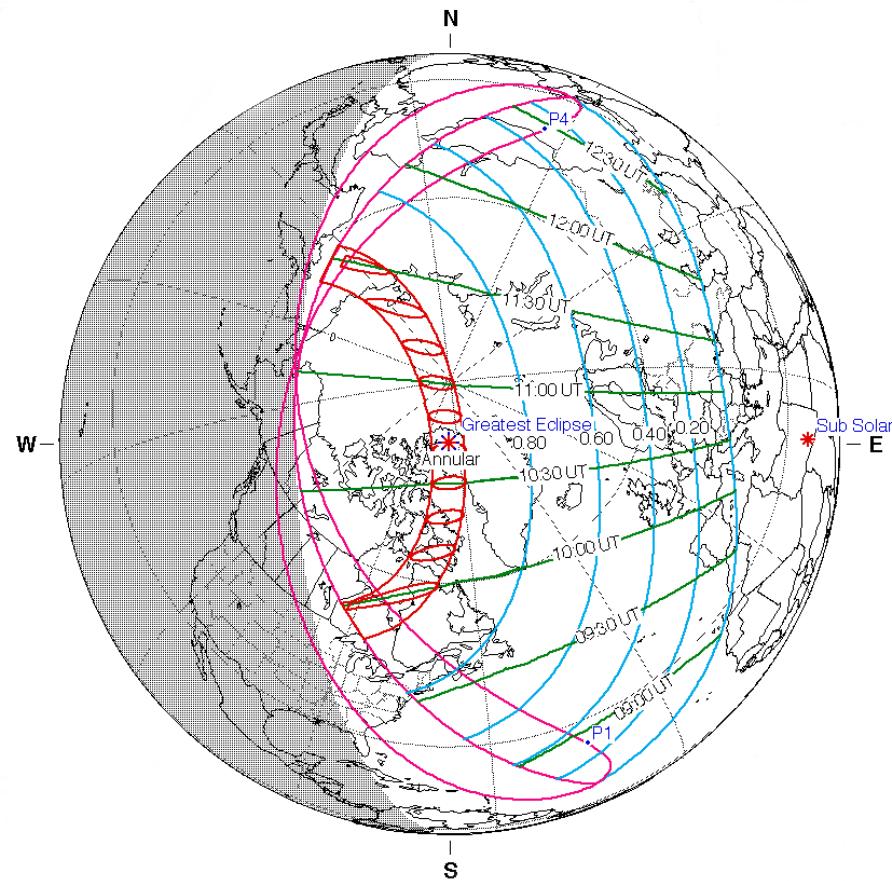


Fig. Annular solar eclipse path for 10th June 2021

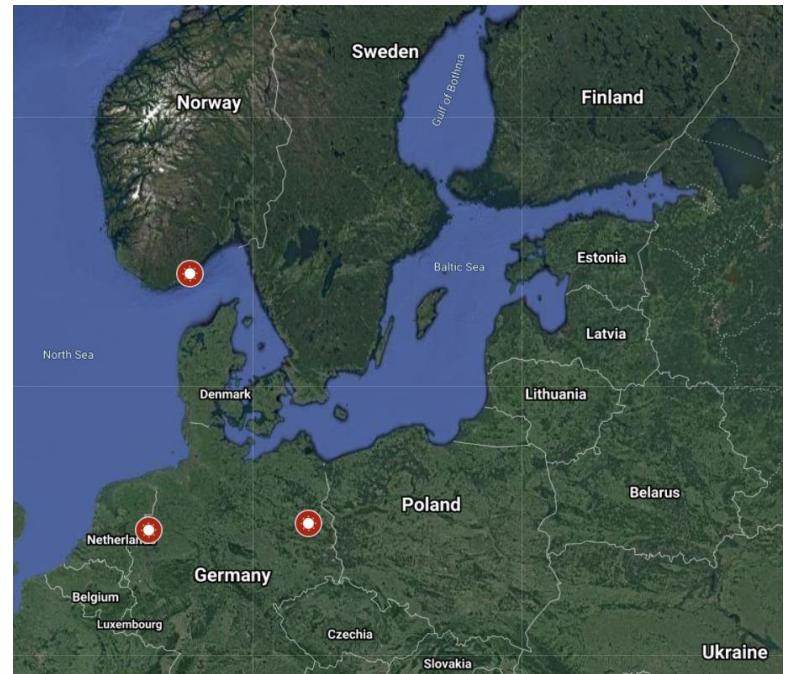


Fig. Locations under consideration

Solar Eclipse and Spectral variations

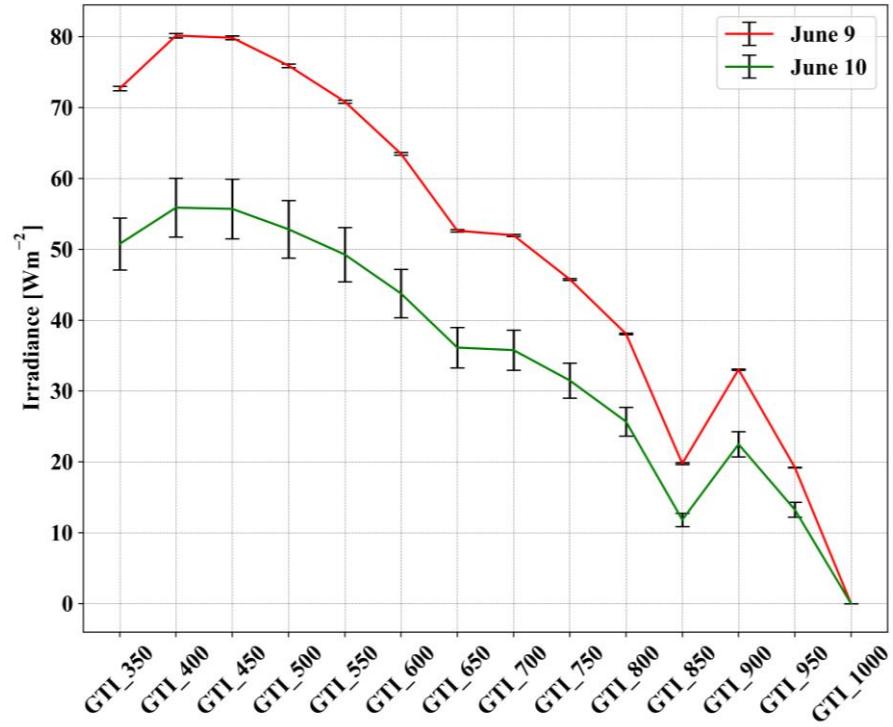
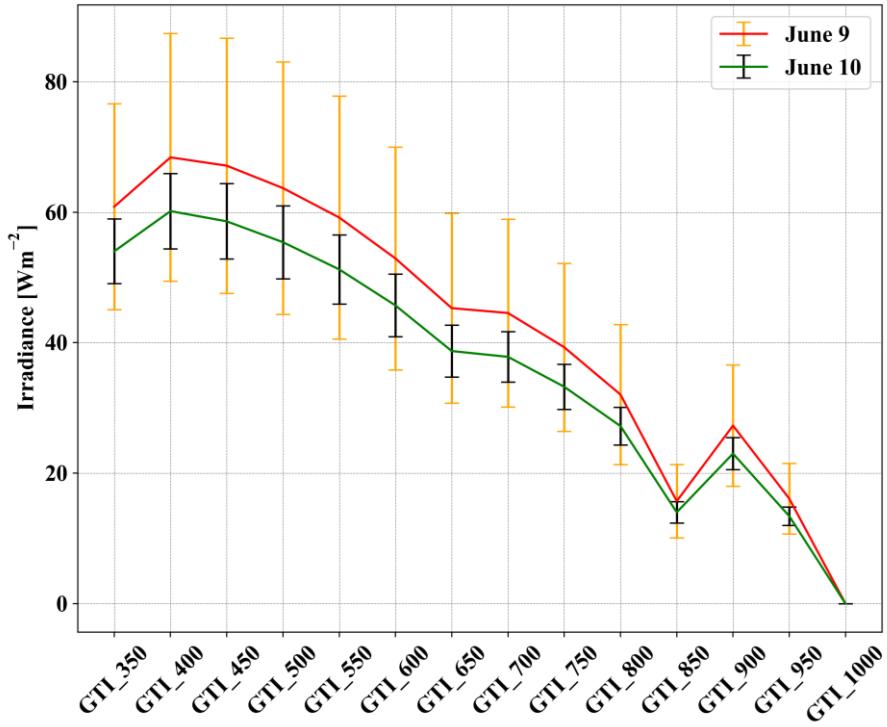


Fig. Spectral irradiance distribution on 50 nm bins within 12:00h CEST - 13:00h CEST for Enschede and Grimstad on 9th and 10th June 2021, respectively.

Future directions

- Gather more data from the southern European locations and compare the spectral distributions
- Quantify the impact of these 'measured' spectral distribution on PV performance
- Quantify the spectral distributions into a 'number' that can be used into existing PV modeling tools like PVsyst, Pvlib etc..

Thank you for your attention !!