

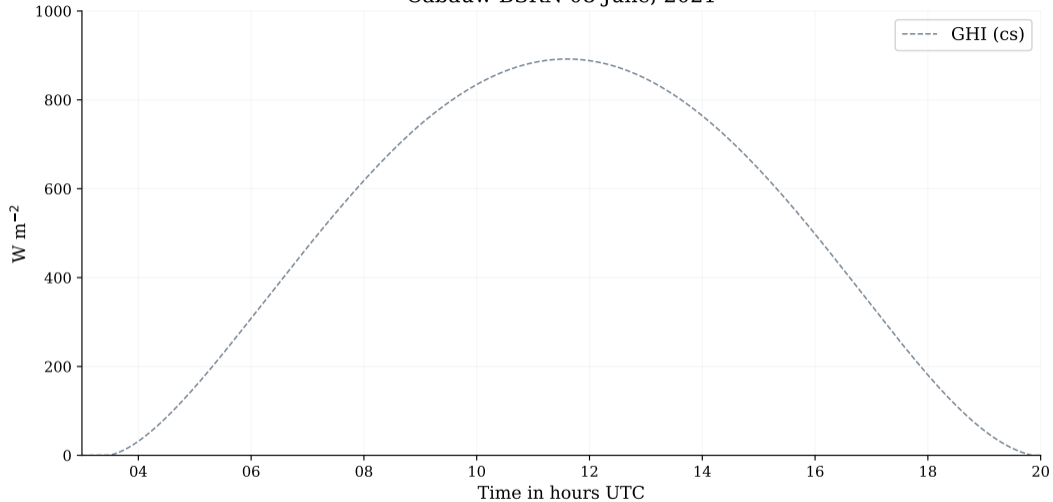
Cloud-driven patterns of surface solar irradiance as seen by a spatial network of radiometers

Wouter Mol

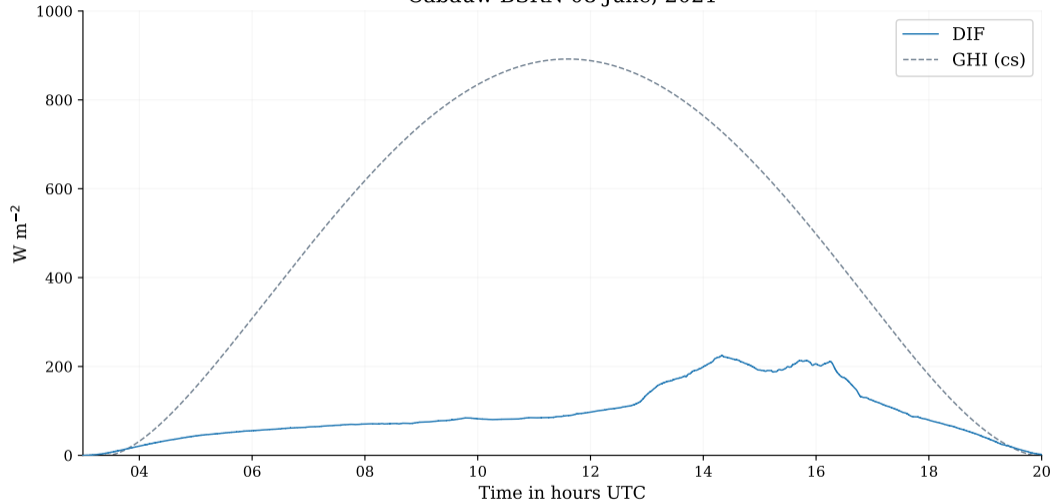
Bert Heusinkveld, Oscar Hartogensis, Chiel van Heerwaarden

28 April 2023, EGU AS2.4

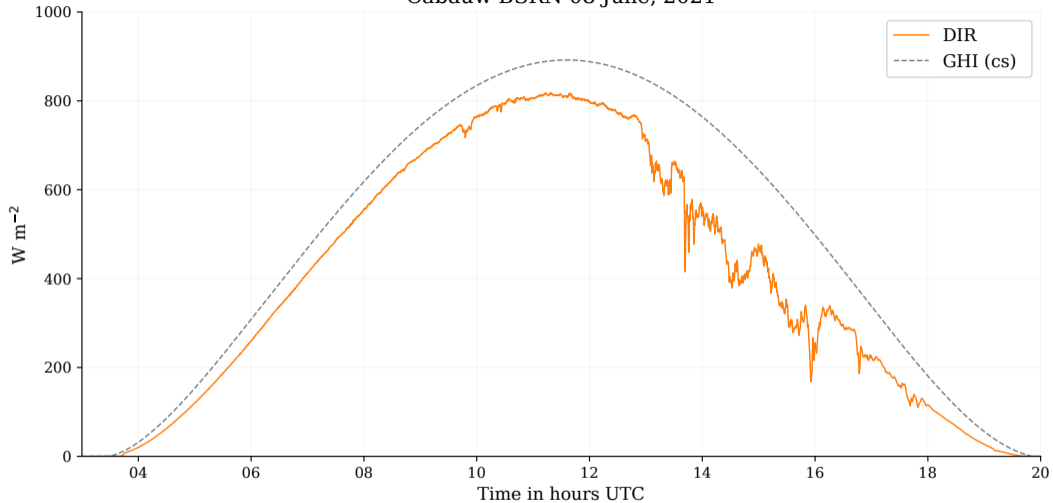
Cabauw BSRN 08 June, 2021



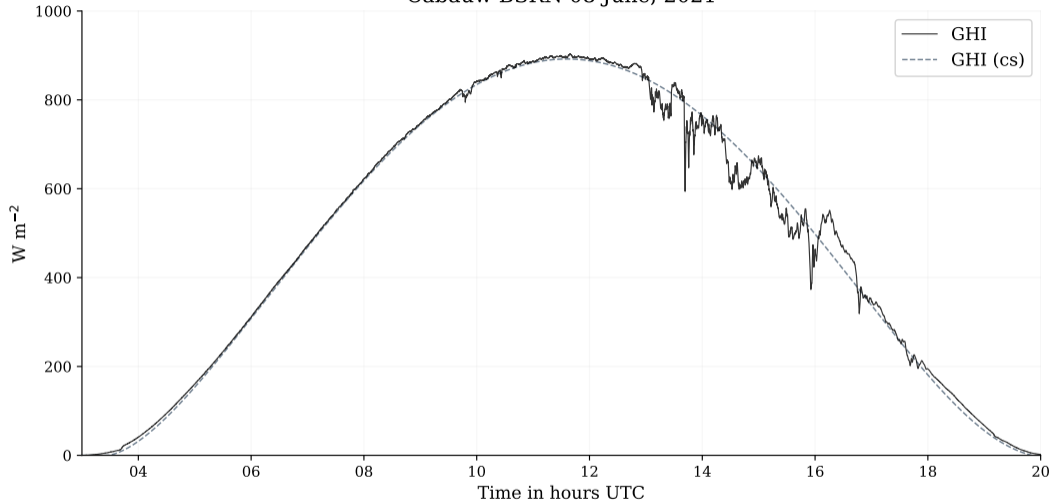
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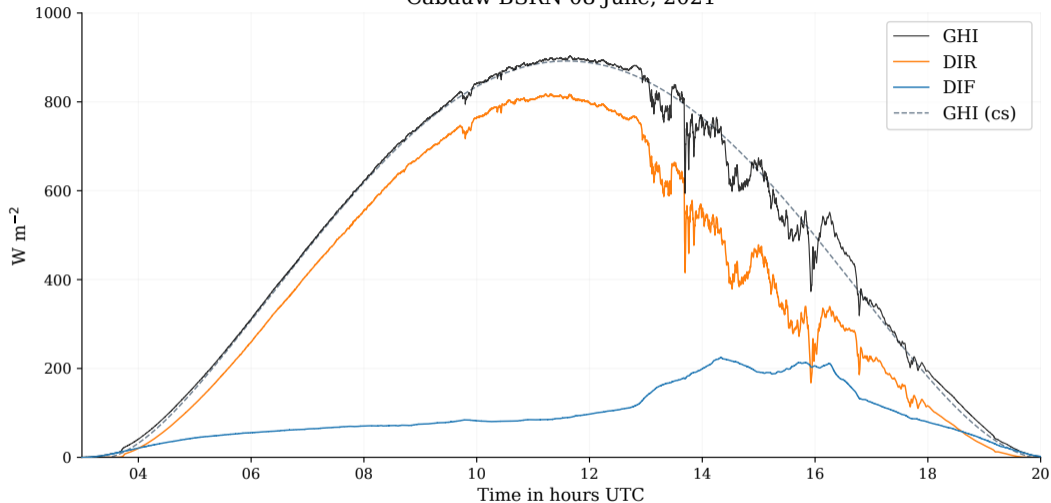
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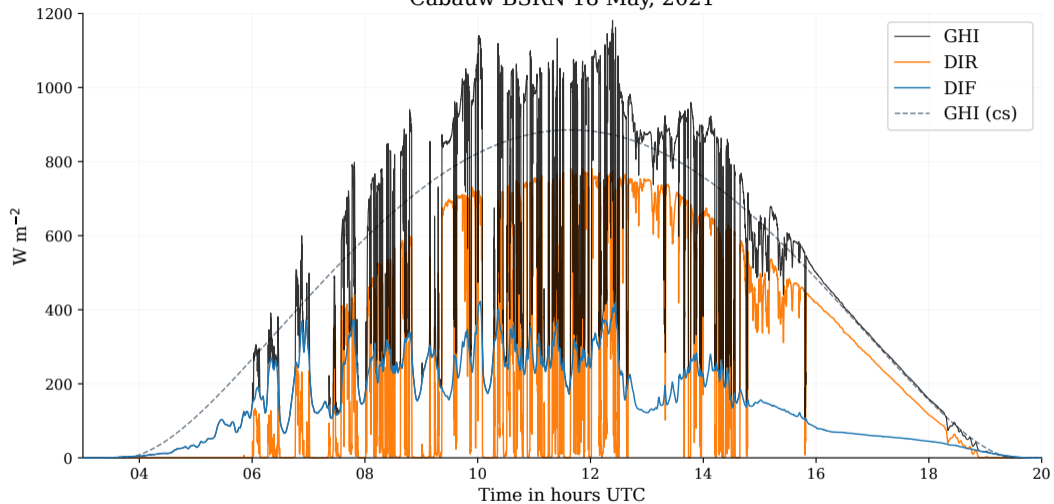
Cabauw BSRN 08 June, 2021



Cabauw BSRN 08 June, 2021



Cabauw BSRN 18 May, 2021



Before I go to spatial patterns...

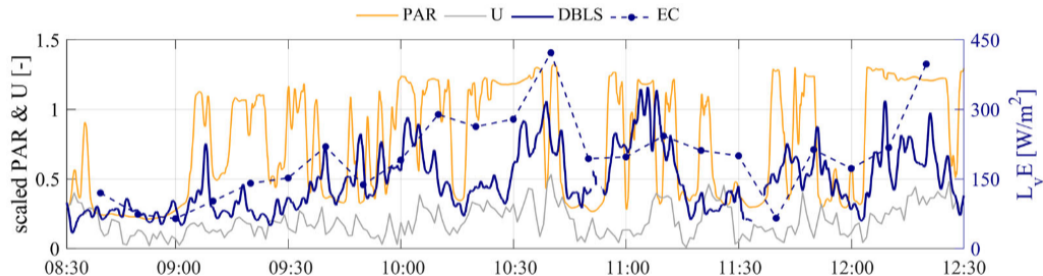



Figure: "Advancing understanding of land-atmosphere interactions by breaking discipline and scale barriers" - <https://doi.org/10.1111/nyas.14956>



Wouter Mol (wbmol@wur.nl)

A photograph of a field with a solar irradiance measurement station on a tripod in the foreground and a tall tower in the background under a cloudy sky. The station consists of a white box on a black tripod with a blue panel. The tower is a lattice structure with red and white sections. The sky is blue with large white clouds.

What does surface solar irradiance look like underneath clouds?

New radiometer instrument for spatial measurements

- ▶ Cheap and fast radiometers
- ▶ Easy to set up network
- ▶ Details in pre-print (AMT):
<https://doi.org/10.5194/egusphere-2022-726>



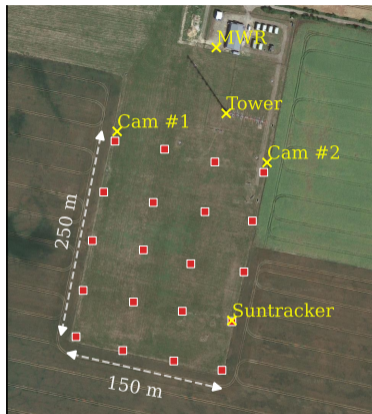


Figure: Falkenberg (DWD)

Measurement strategy at FESSTVaL

- ▶ 20 radiometers in a 4x5 grid
- ▶ Measuring solar irradiance spectrum at 10 Hz
- ▶ Two cameras for cloud imagery (5 sec)
- ▶ Calibration against high quality sun tracker

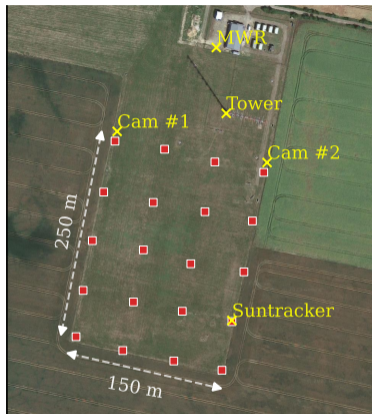
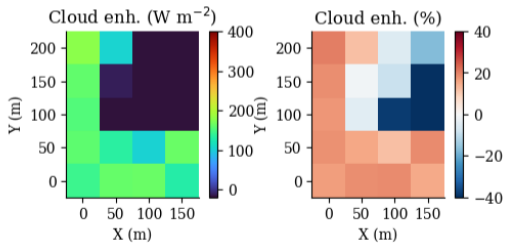
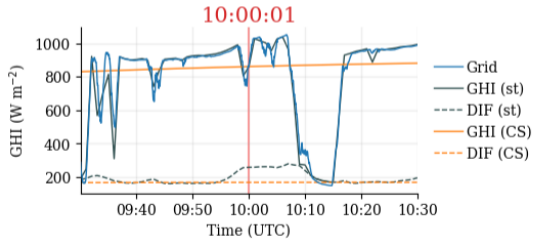


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- ▶ Compromise between grid size & spacing
- ▶ Improvements using post-processing



Post-processing to enhance grid size & spacing

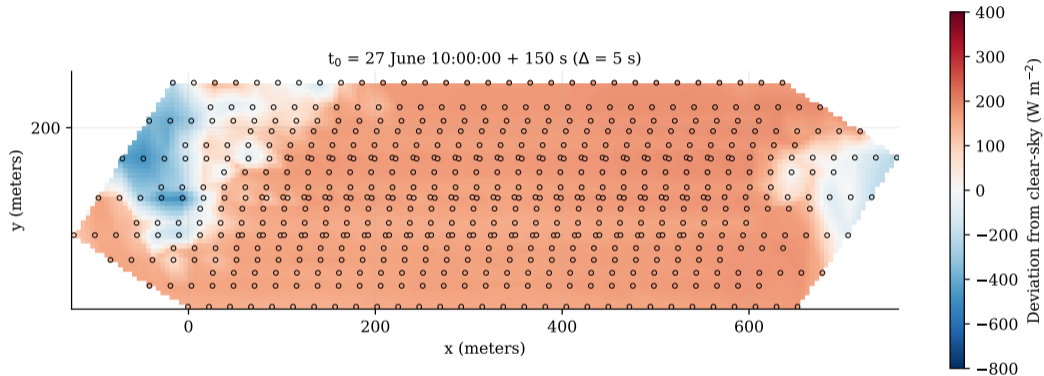
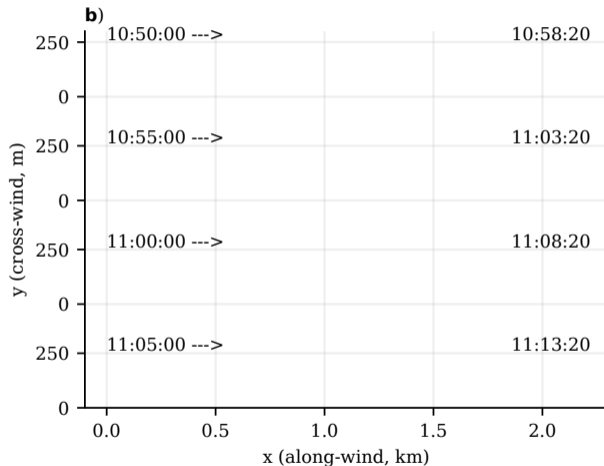
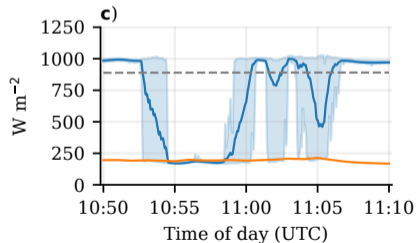


Figure: Result of 2.5 minutes of network data

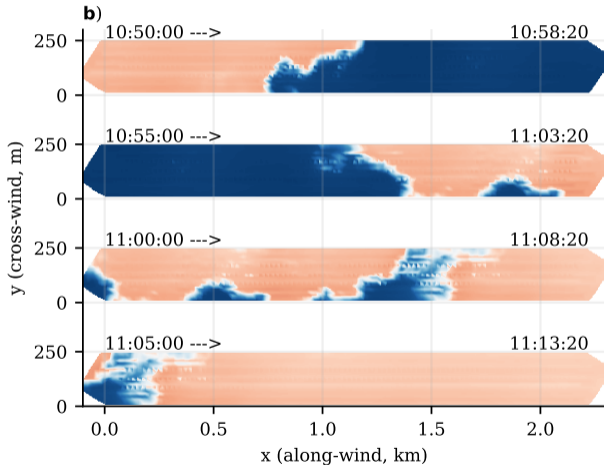
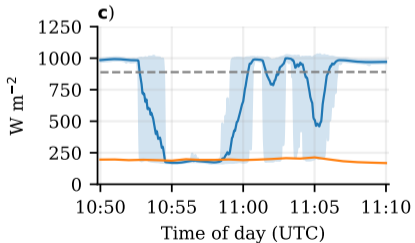
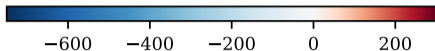


2021-06-27 10:54:25 UTC



— Grid average - - - Clear-sky GHI
█ Grid min/max — Diffuse

GHI - Clear-sky (W m^{-2})





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Summary and More Info

- ▶ Small network captures spatial irradiance patterns
- ▶ Patterns are variable, depend on cloud type

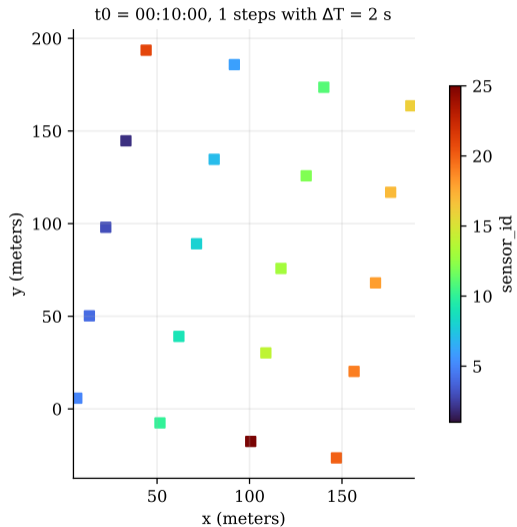
- ▶ Papers, data, pre-prints:

wbmol@wur.nl

<https://woutermol.com/research>



Post-processing to enhance grid size & spacing



Post-processing to enhance grid size & spacing

