

Patterns and Climatology of Solar Irradiance Variability

EGU22 - Energy Meteorology (ERE2.1)

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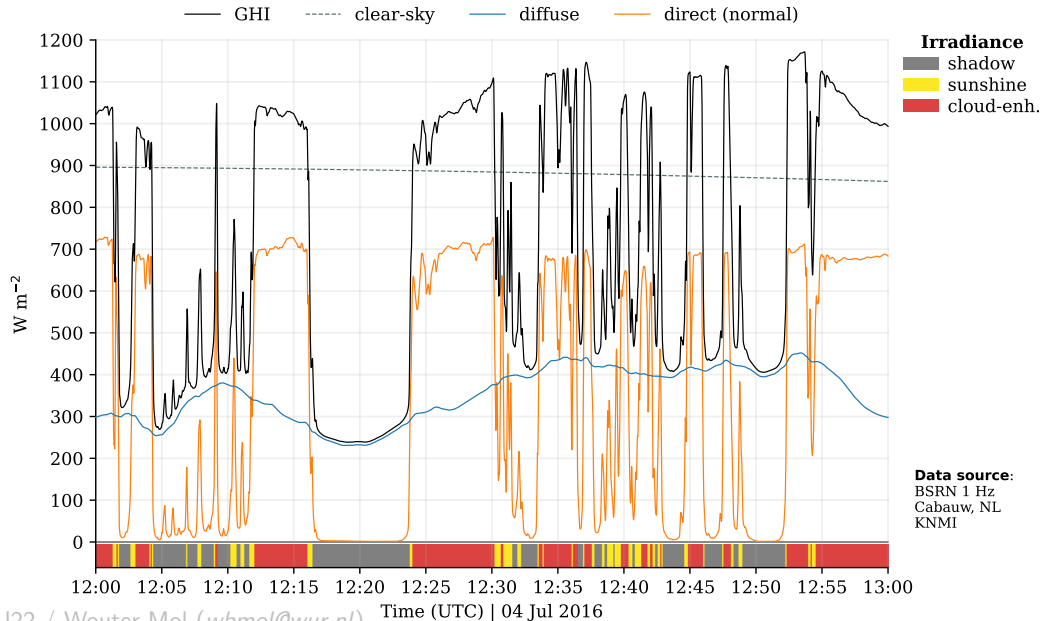
- ▶ How does a cloud (field) make surface patterns?
- ▶ Apply knowledge to simplify models, allowing forecasting (e.g. solar energy)



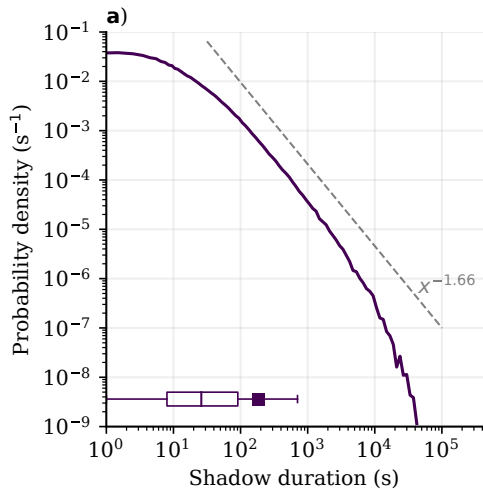
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Making and analysing observations:

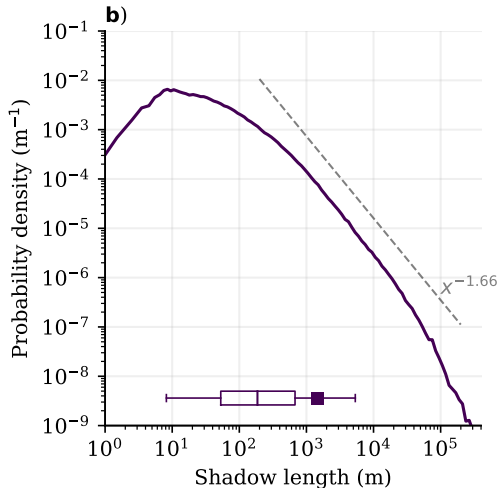
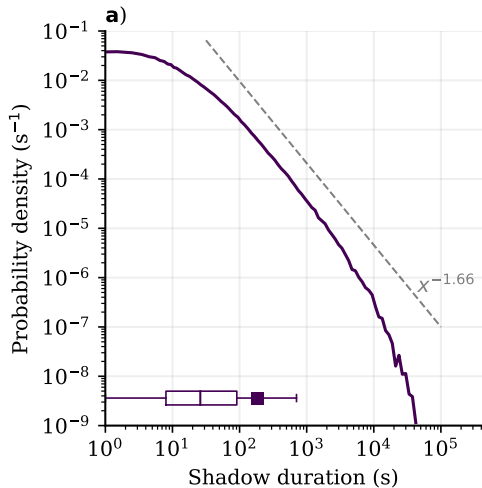
1. **Climatology of intra-day irradiance variability**
2. Short term spatial observations of irradiance



Cloud Shadows

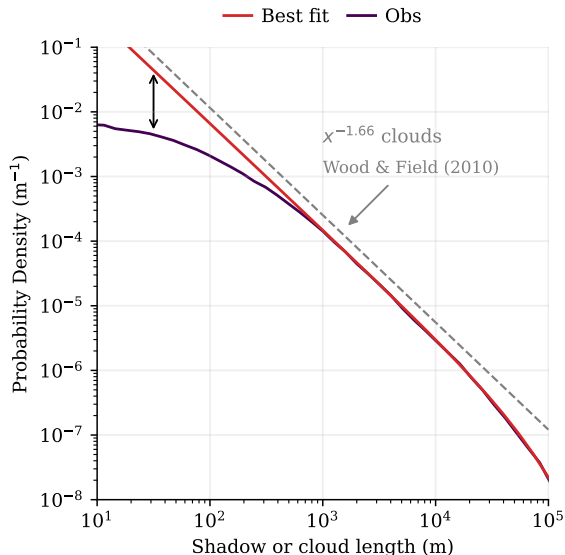


Cloud Shadows



From Cloud to Shadow

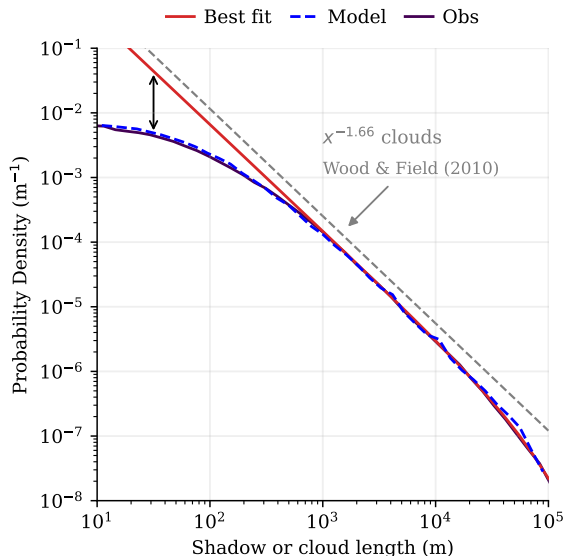
- ▶ Shadow size distribution best fit nearly identical as cloud size distribution
- ▶ Exponential drop off at large scale due to day length limit
- ▶ Deviation at small scale due to transparent cloud edge?



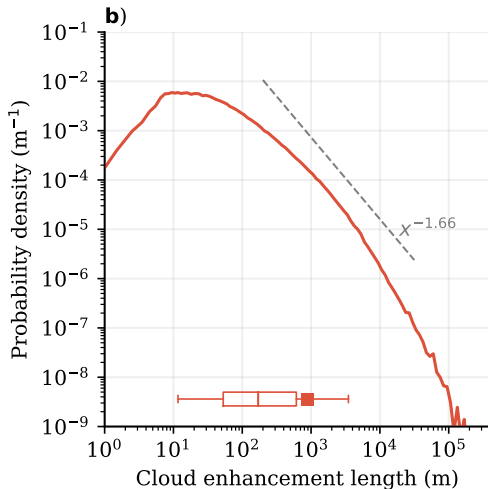
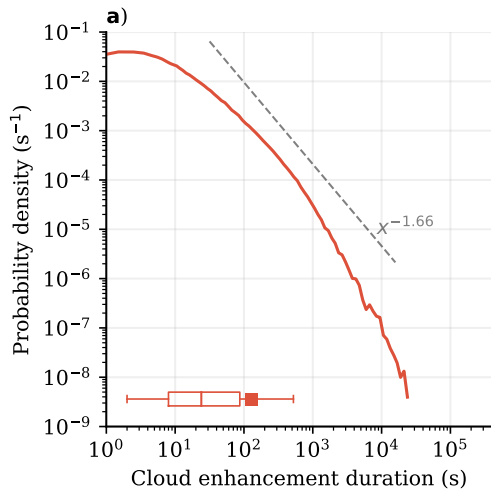


From Cloud to Shadow

1. Randomly generate clouds from cloud size distribution
 2. Subtract a fixed length for transparent cloud edge
- Resulting shadows match observations



Cloud Enhancements



Conclusions

- ▶ Cloud shadows and enhancements occur over a wide range of scales, with power law scaling
- ▶ Irradiance variability is characterised by cloud size distribution
- ▶ Relationship to cloud types, spatial observations: see upcoming work

