

# Validating regional PV models has so many nuances it made me think of doing a 2<sup>nd</sup> PhD

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## Challenges in validating regional PV methods: a discussion on geometry assumptions and other elements

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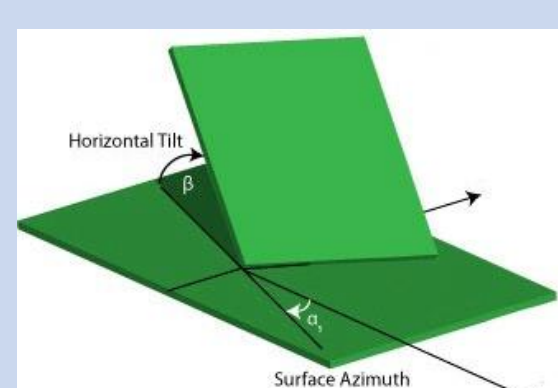
### INTRO

- Regional PV estimates relevant for operation & prospective planning of energy systems

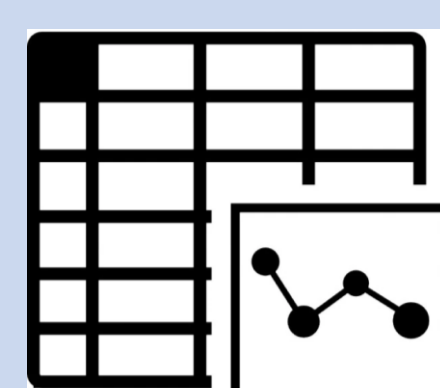
- Various sources of uncertainty, such as:



Weather



PV fleet tilt & azimuth



Reference data

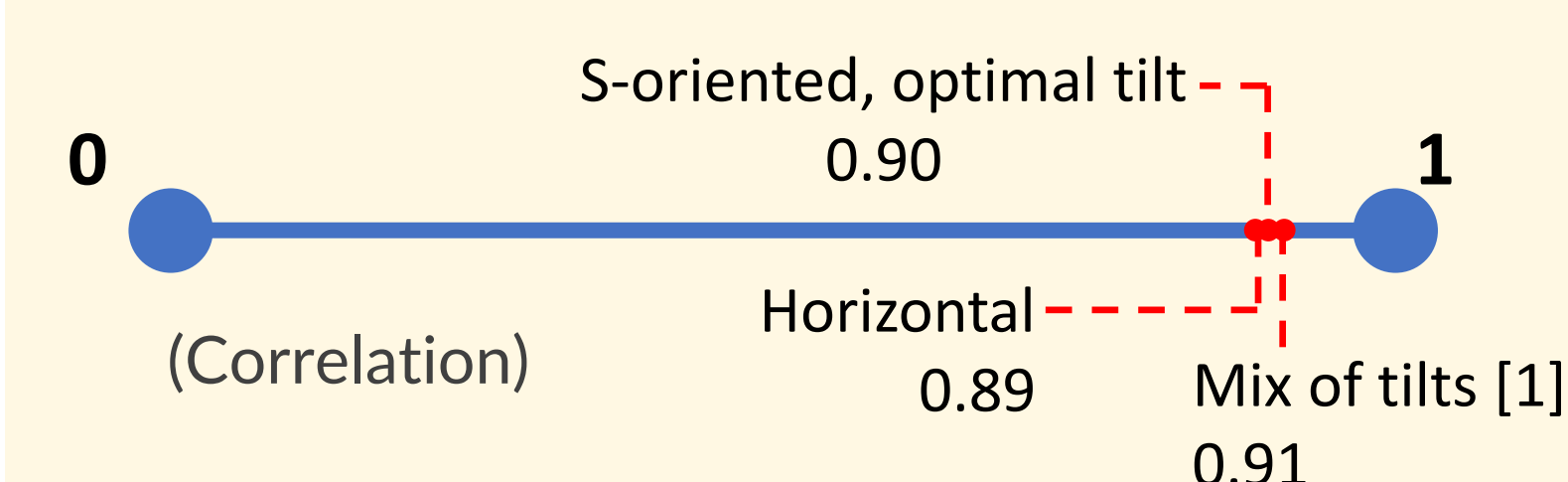
### BASE MODEL

Physically-based approach [1]:

- ERA5 weather data
- GHI decomposition+transposition
- Optical, thermal, and electric losses
- Returns hourly PV capacity factor (CF)

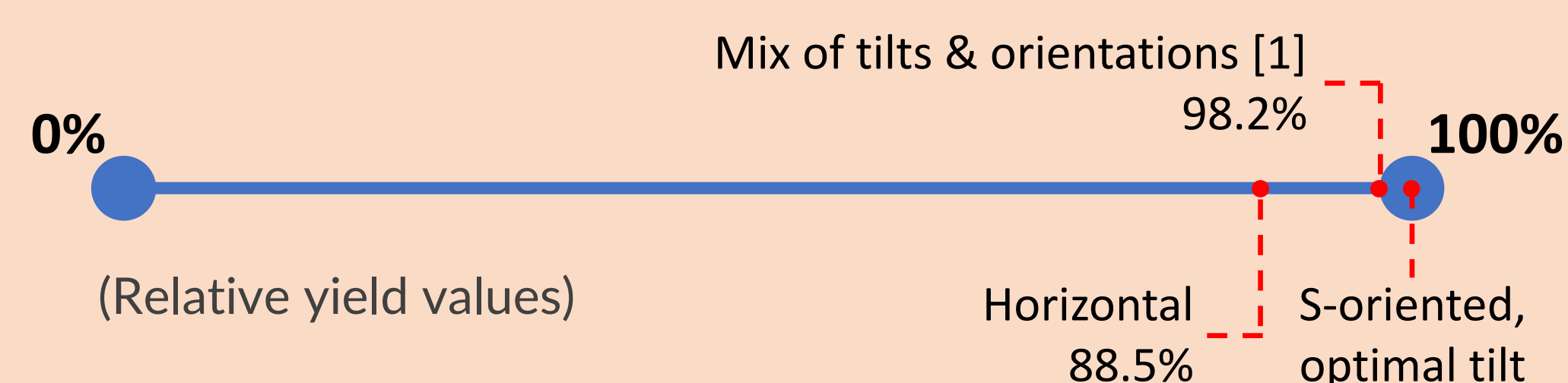
### BASE VALIDATION

- Correlation  $CF_{model} - PV_{real}$  (dismisses capacity data)
- Varies less than 2%, despite the impact in the timeseries

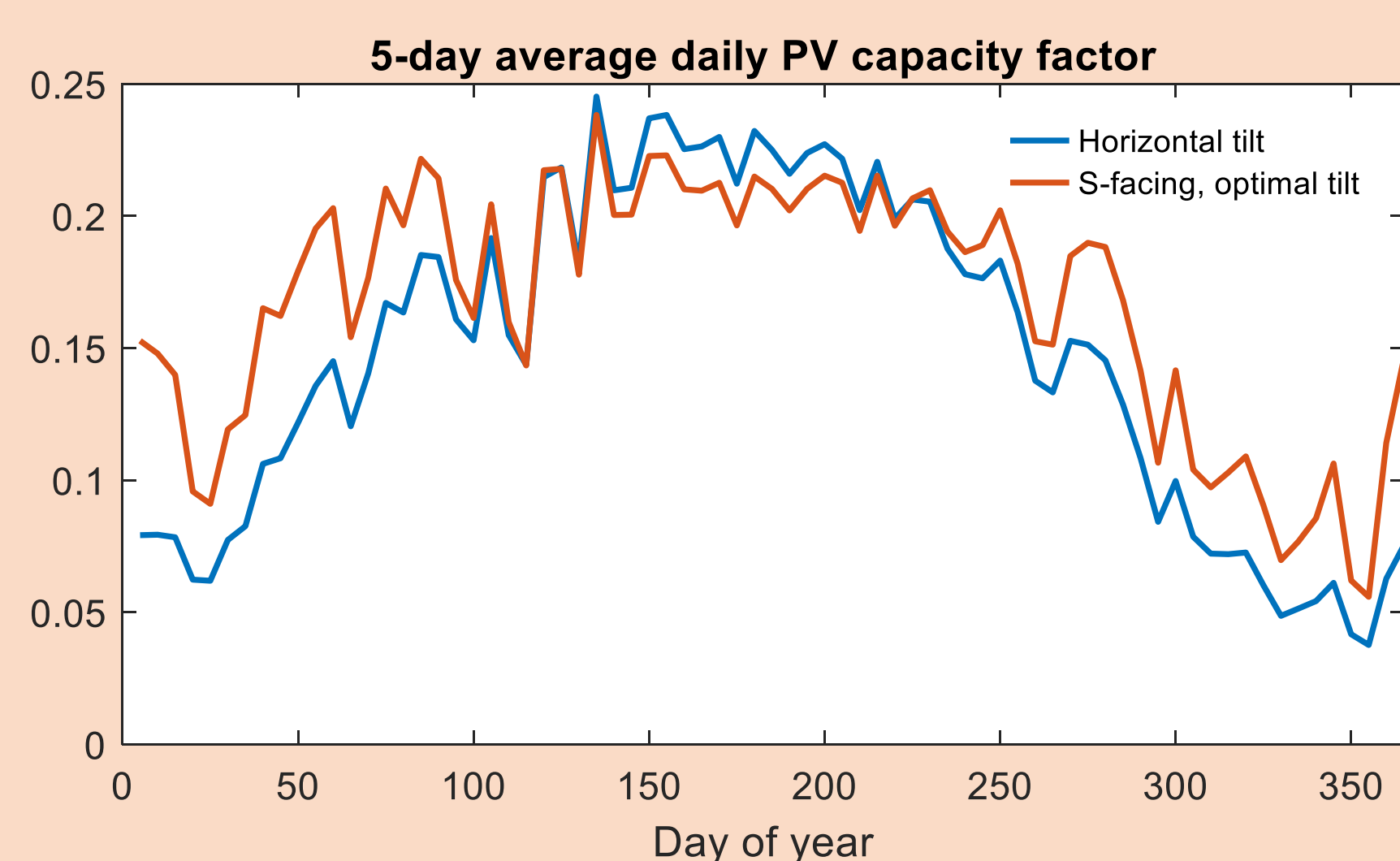


### TILT & ORIENTATION ASSUMPTION

- Annual yield: moderate to small impact (all examples from Spain 2019)

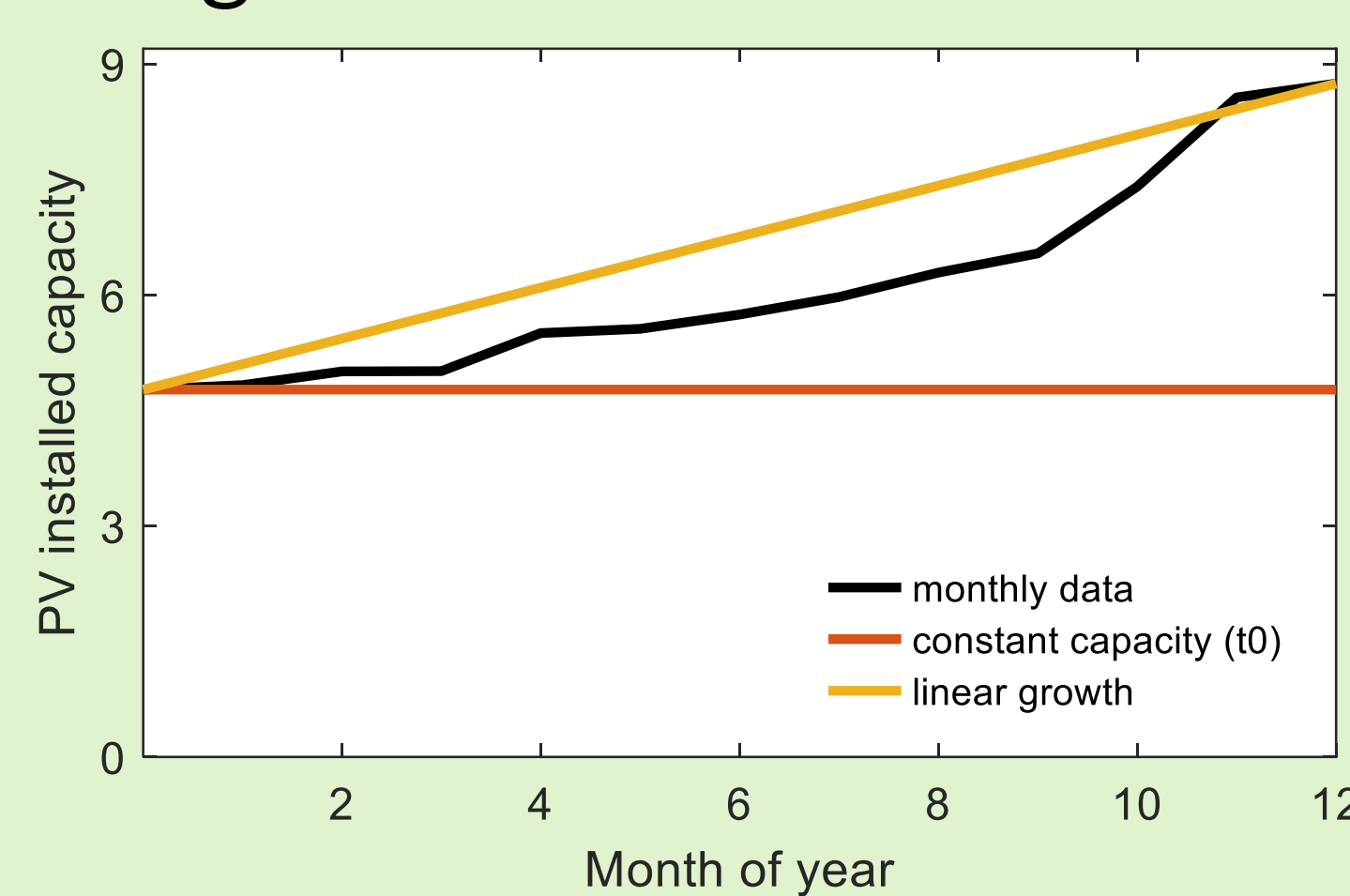


- Impact in seasonality

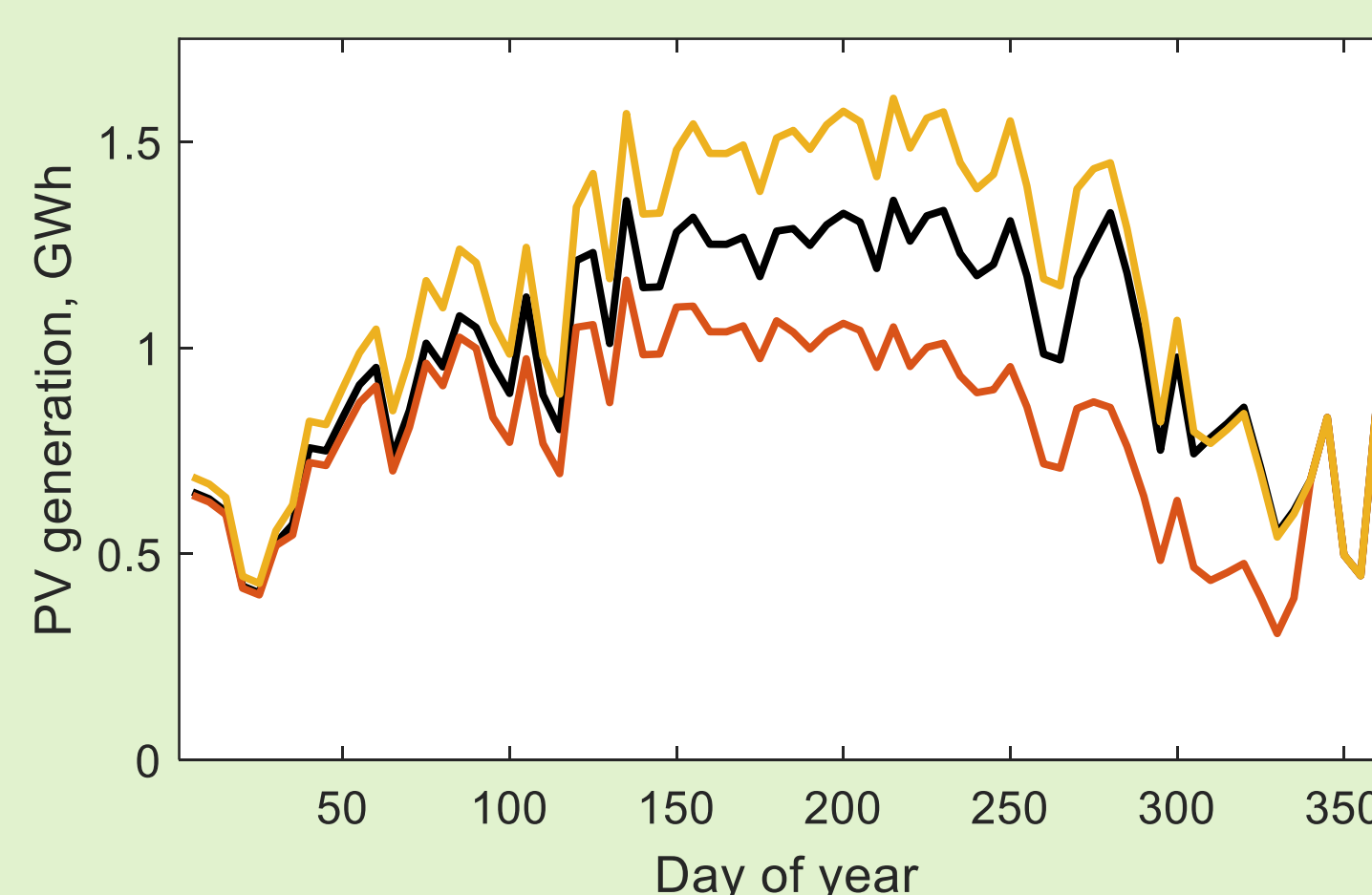


### INSTALLED CAPACITY ASSUMPTION

- For capacity factor → PV generation, often available as annual data
- Strategies to downscale to monthly

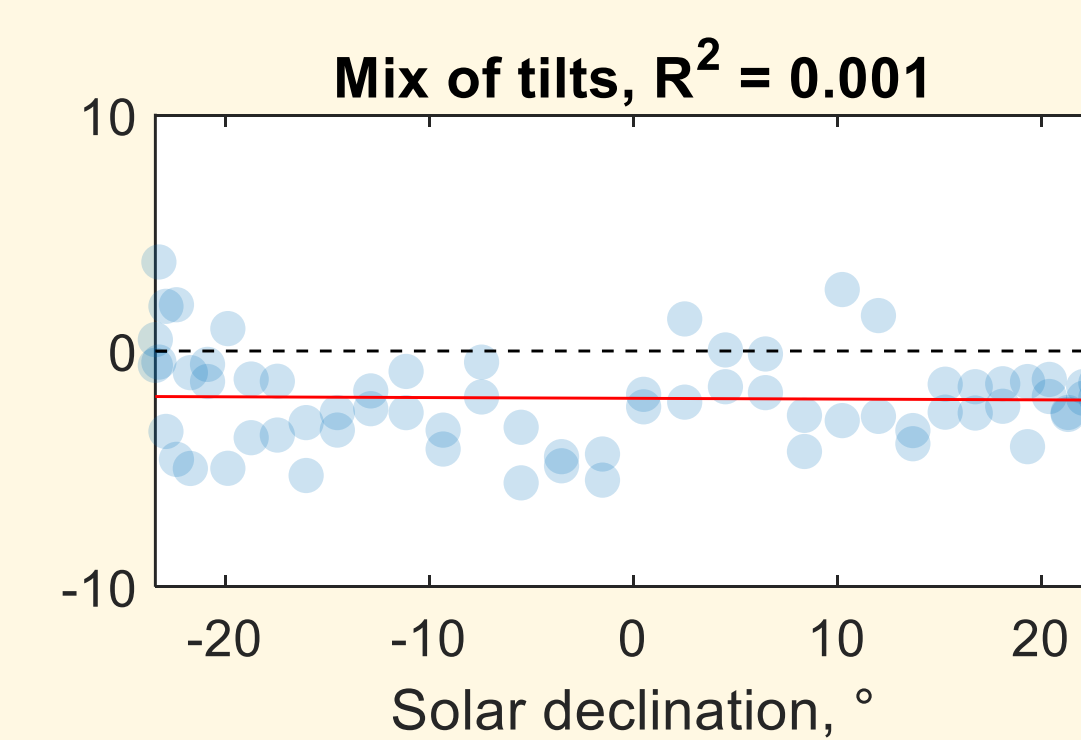
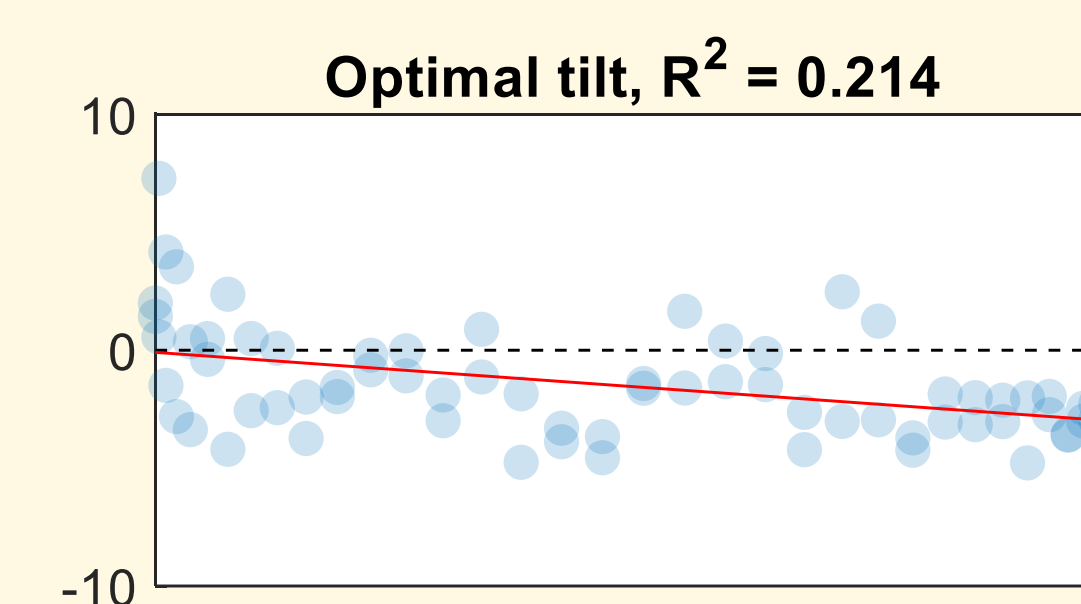
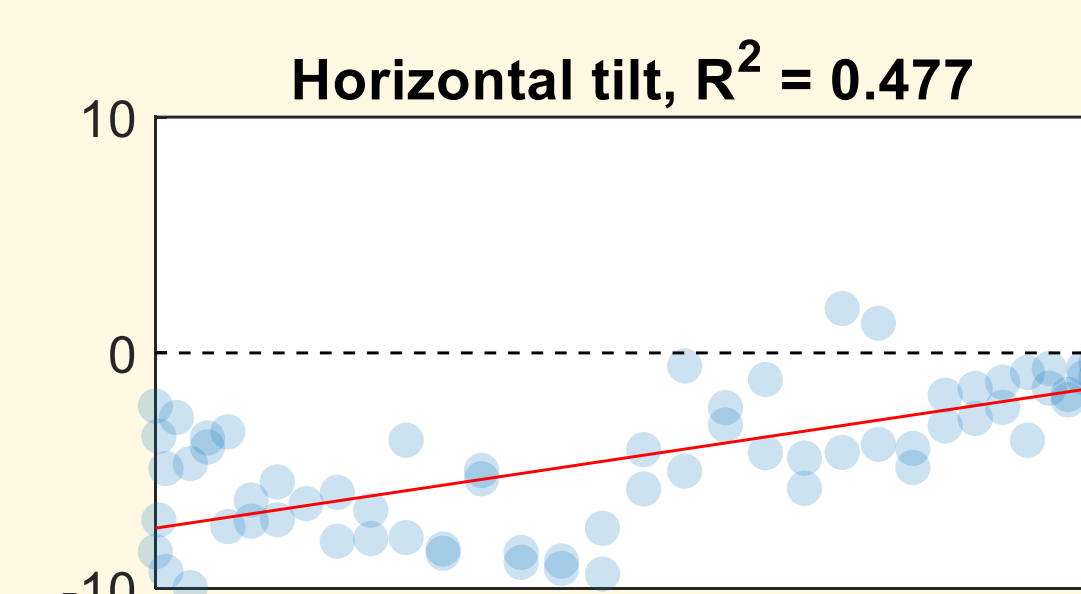


- Impact in modelled PV generation



### PROPOSED APPROACH

- Convert CF to generation
- Quantify how much sun declination explains deviations



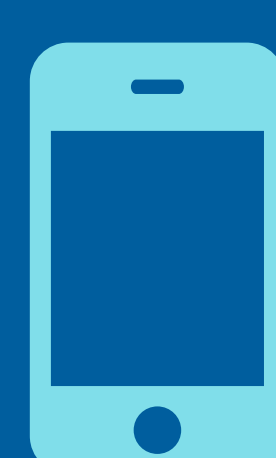
### MAIN TAKEAWAYS

- Coarse capacity data can distort the conversion of capacity factor → generation
- Look at deviations as a function of declination to assess PV geometry

This research was done under the framework of the Copernicus Climate Change Service (C3S)



Reference: [1] Saint-Drenan et al. (2018) doi: 10.5194/asr-15-51-2018



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