

# Interaction between atmospheric model resolution and energy system model topology

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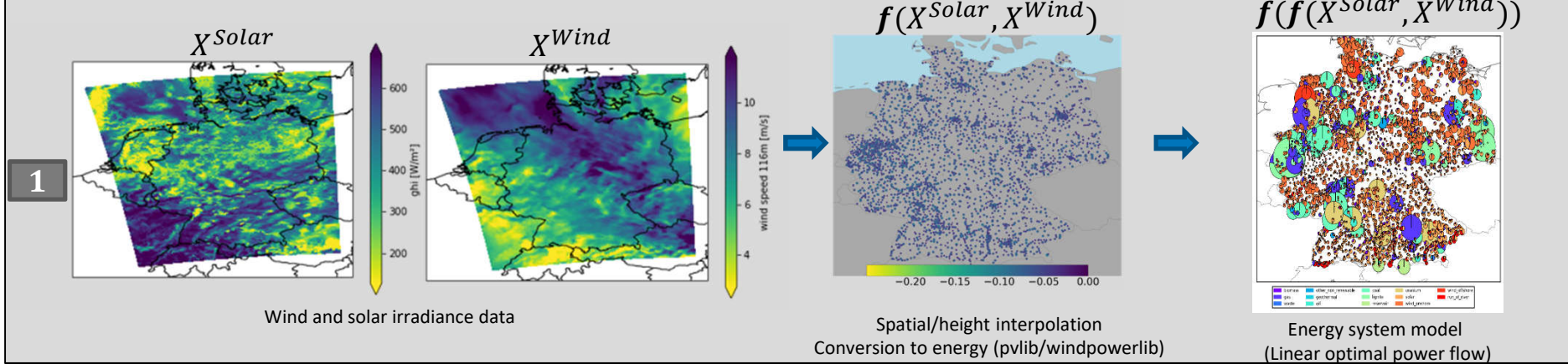
EMS Annual Meeting 2021

Virtual conference

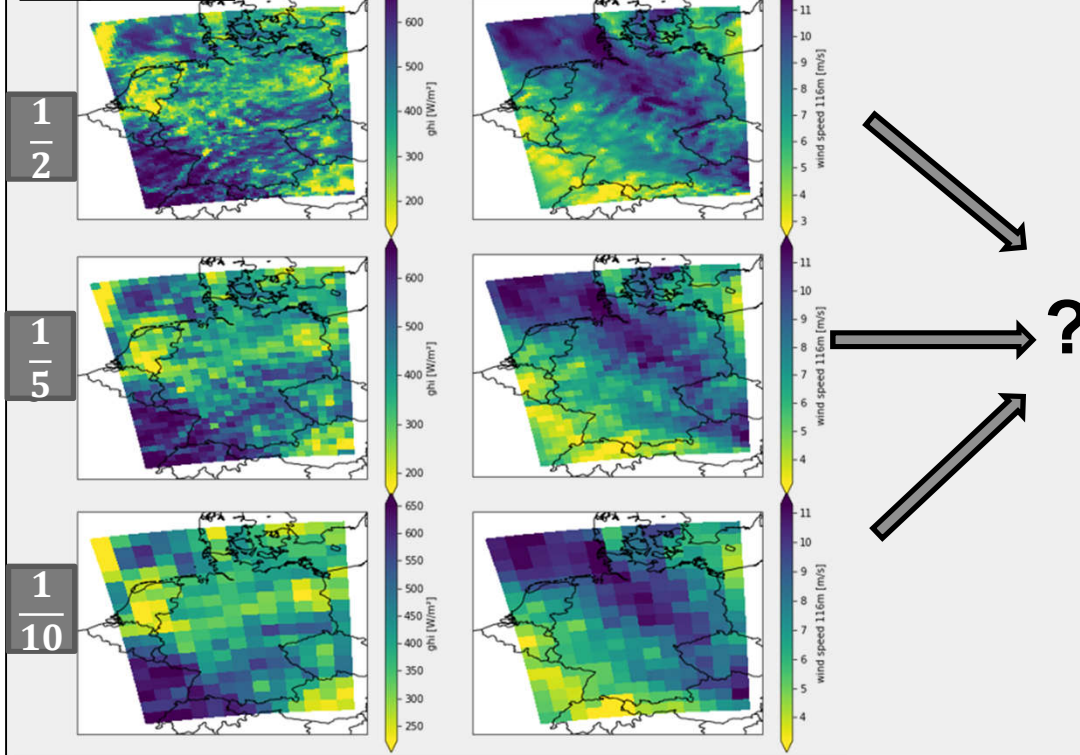
DLR- Institute of Networked Energy Systems



## Energy system modeling pipeline



## Study overview



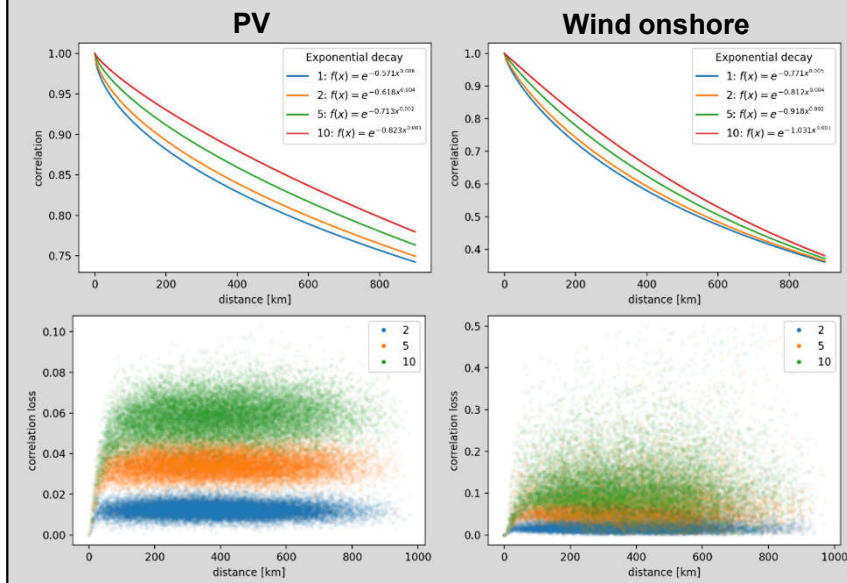
## Study design

- Impact of atmospheric model resolution on nodal, internodal and energy system effects by artificially decreasing atmospheric model resolution
- Models:**
  - Atmospheric model: **Cosmo REA-6**
  - Energy system model: **open\_eGo** (capacities of 2015: wind onshore 14%, solar 10%)
- Metrics:**
  - Information loss in **mean** [%]
  - Information loss in **variability**  $\sigma_n(\Delta x_t)$  [%]
- Subject of interest:**
  - Nodal**
  - Internodal**
  - Energy system model**
- Temporal dimension:** critical week with highest spatio-temporal variability of electricity prices  $\sigma_n(\sigma_t(e_{t,n}))$  within 2009-2019

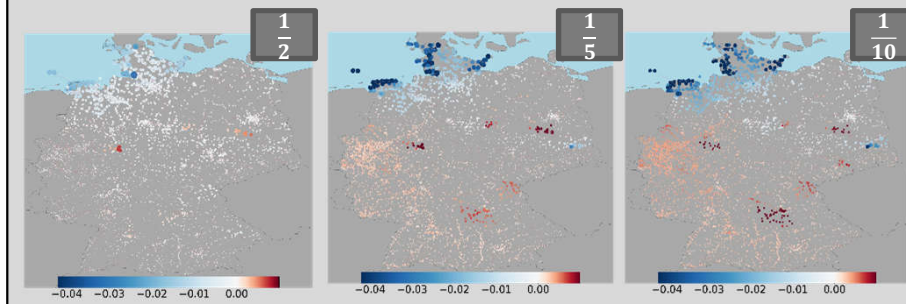




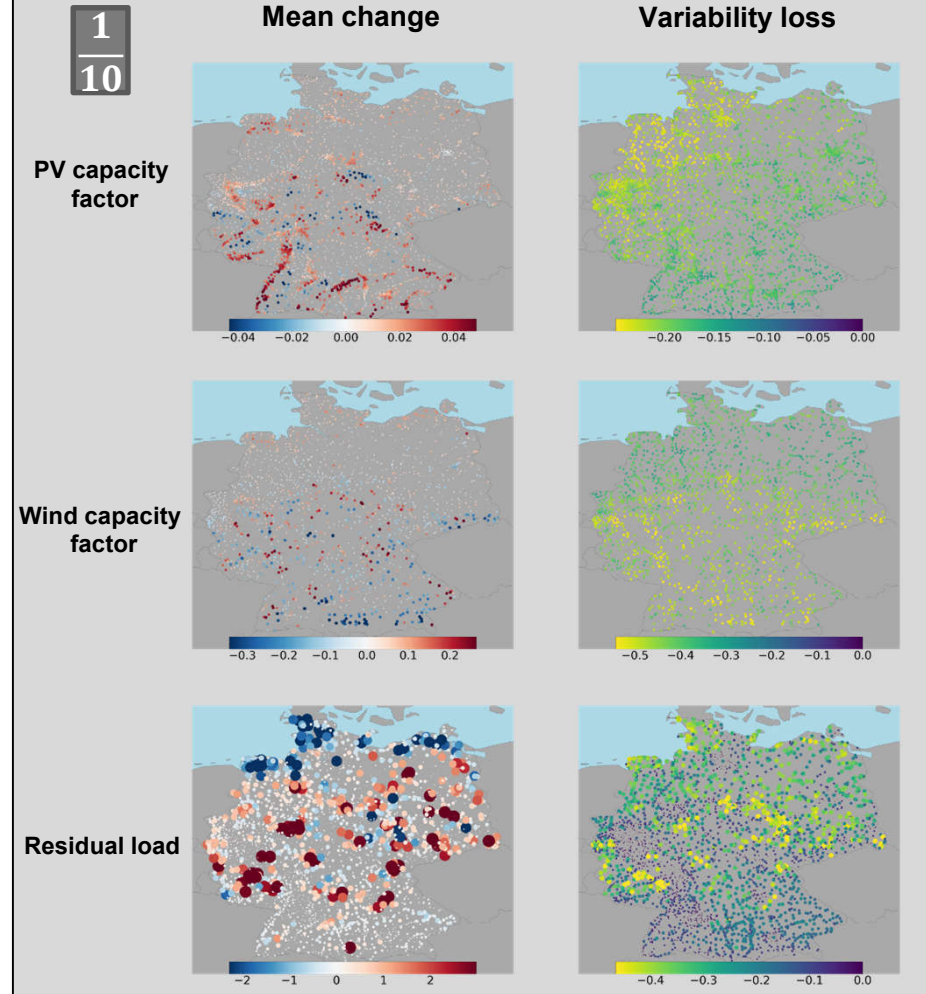
### Internodal: Correlation lengths



### Energy system model: Electricity prices



### Nodal effects



### Conclusions

1. Information losses in variability are higher than in mean (wind power losses are greater than PV)
2. Loss in variability has different orientations (North-South vs. East-West)
3. System costs are similar (<0.7%) whereas nodal electricity prices change remarkably (4%)
4. Lower weather model resolution amplifies already existing spatial electricity price spreads (North-South)

