Impacts of climate change on the temporal fragmentation of electricity demand in Europe

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1. CONTEXT

Daily electricity consumption in some European countries as a function of temperature

2. DATA

CMIP6 simulations

3. METHODS

3.1. HDD

\[ T_{\text{threshold,H}} = \frac{T_{\text{max}} - T_{\text{threshold,c}}}{2} \]

3.2. CDD

\[ T_{\text{threshold,c}} = \frac{T_{\text{min}} - T_{\text{threshold,c}}}{2} \]

Energy consumption in building sector (EU)

Space heating 62.0%

Eurostat 2020

Downscaled and bias corrected data using ERA5

4. RESULTS

4.1. Heating use

A. The number of episodes

B. The average duration

4.2. Air conditioning use

A. The number of episodes

B. The average duration

- In the future, the periods of heating use will become more fragmented in winter under CMIP6 and CMIP5 scenarios.
- The periods of non-use heating will become also longer in several regions of Europe.
- The periods of air conditioning use will become more frequent and longer in the future.

3 variables (\(T^\circ\), \(T_{\text{max}}\), \(T_{\text{min}}\))

4 SSP scenarios

(SSP5-8.5, SSP3-7.0, SSP2-4.5 et SSP1.26)

10 models

Selected

- Electric system flexibility
  - massive deployment of renewable energies + fragmented and variable demand -> A need for flexibility and manoeuvrability for the balance of the supply-demand
  - Economic cost of flexibility needs
  - A more fragmented and more variable demand could generate significant costs linked to the manoeuvrability of the power system.

Energy system challenges

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