Analysis of wind power under heat wave conditions in southern Europe

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1. Introduction

Energy system:

+ Renewables -> + weather dependence

+ Heat waves -> + Demand Southern European countries

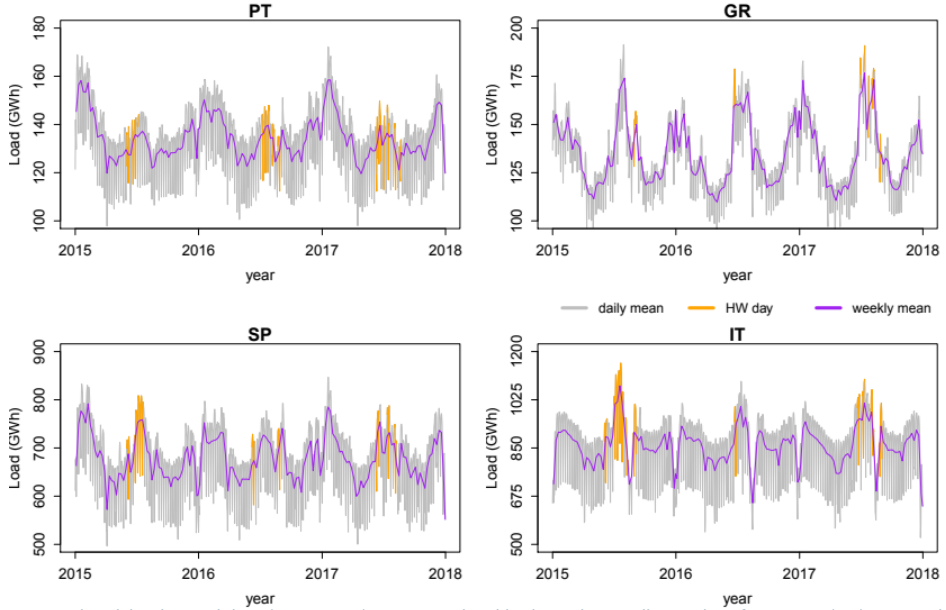


Fig. 1. C3S Electricity demand data (2015-2018) at country level is shown in gray lines colour for Greece (GR), Portugal (PT), Spain (SP) and Italy (IT) in gigawatts per hour (GWh). Purple colour indicates the weekly load mean and orange colour indicates the heat wave days.

Increase of energy demand in heat wave days

2. Objective

Study wind power production in present climate in episodes of heat waves and their associated atmospheric patterns in summer

3. Method

3.1. **Heat wave** days from EOB-S tasmax (1971-2019)
3 consecutive days above p90 of tasmax (1971-2000)
>30% territory of each country
3.2. **Wind power** modeled from u and v ERA5 reanalysis at 100m (1989-2019)
3.3. Composites of daily Z500 anomalies (ERA5) in summer (JJA, 1989-2019)
EOF analysis + k-means clustering → weather regime (WR)

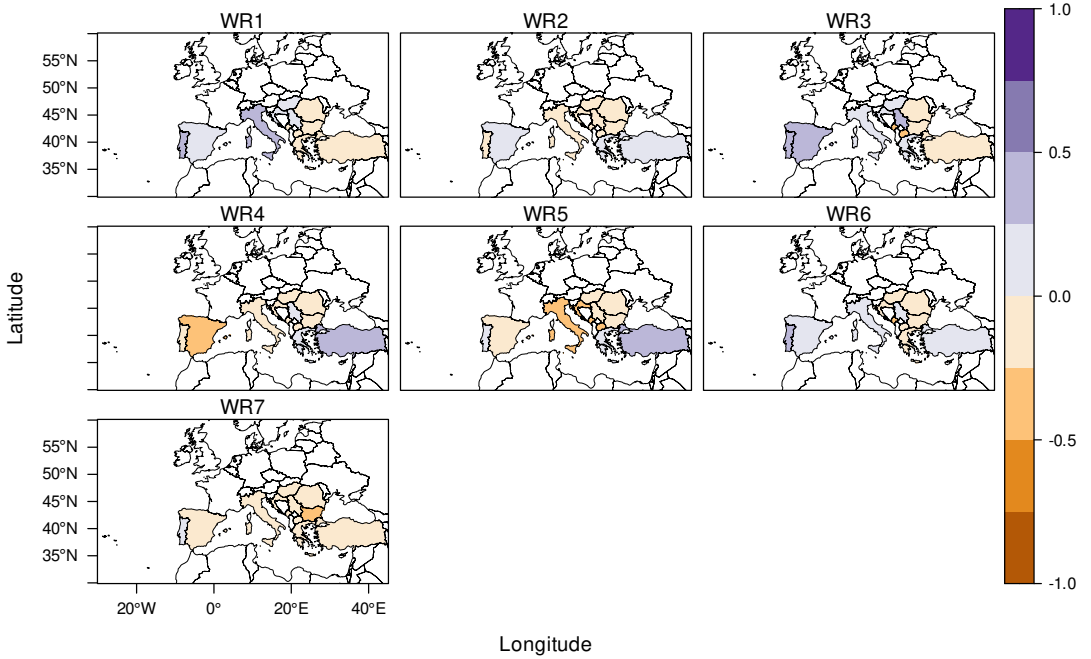


Fig. 2. Country wind energy production anomalies in heat wave days from ERA5 reanalysis data for the different summer WRs. Colors show normalized wind production anomaly in SD units (i.e. +1 indicates a +1 standard deviation above the summer average).

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