



Climate change impacts on energy systems in the Mediterranean region

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Energy systems are very dependent on weather and climate

Predicting changes in renewable resource



Balancing grid load in an increasingly variable production mix



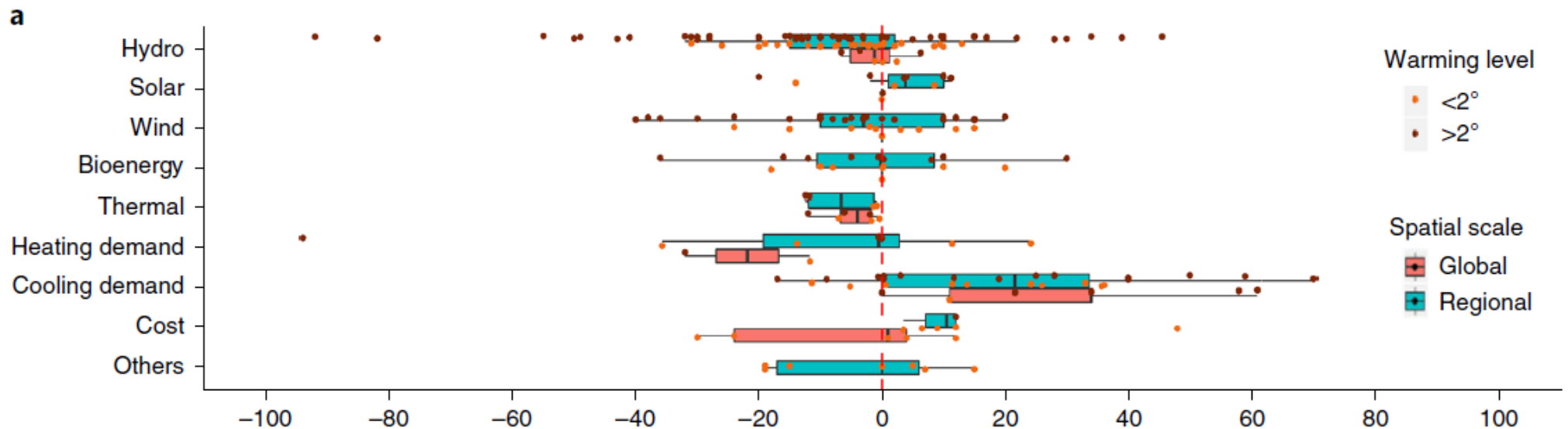
Predicting changes in conditions for operating, maintenance, commissioning and decommissioning



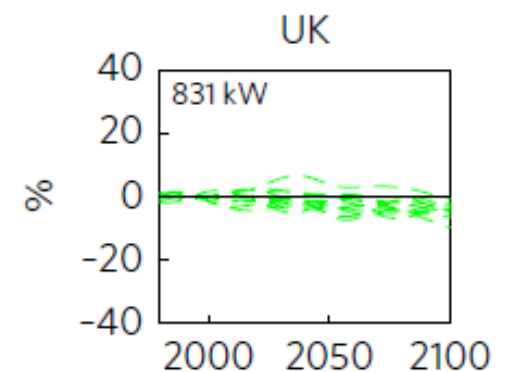
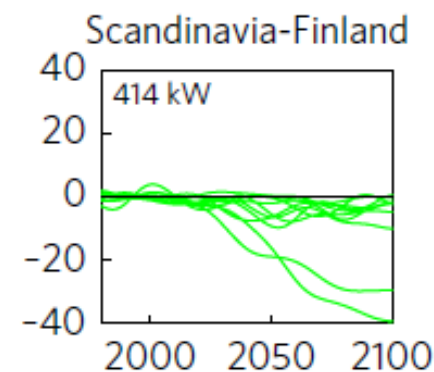
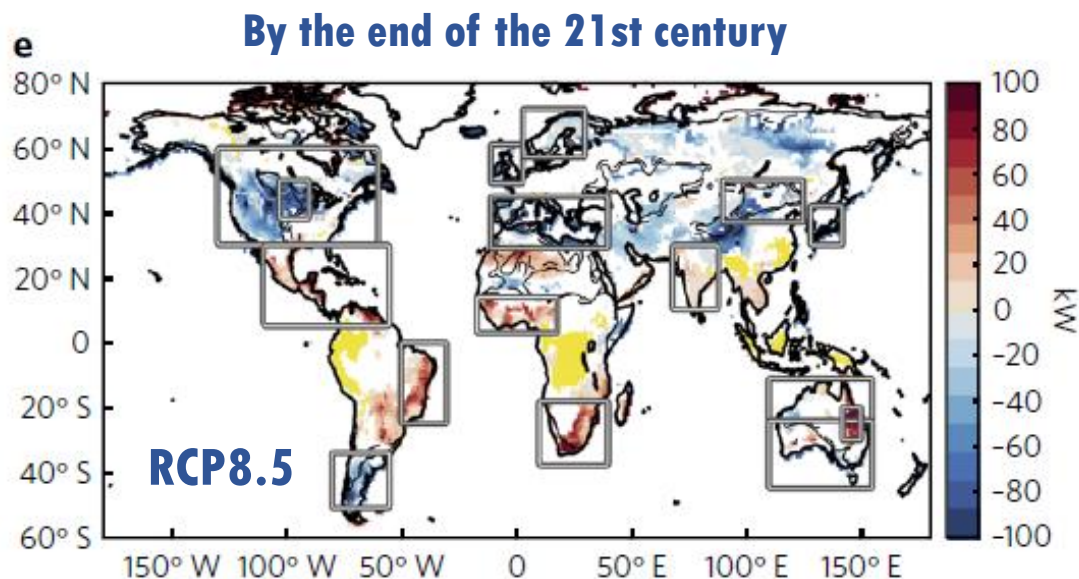
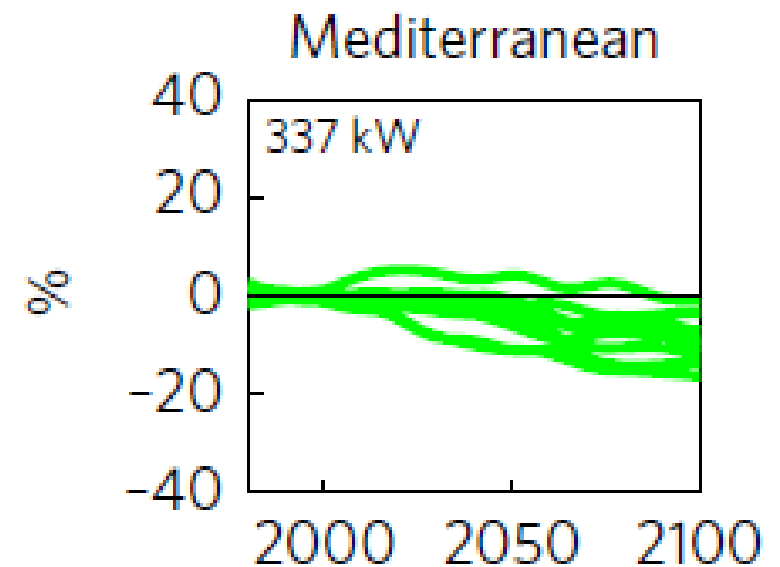
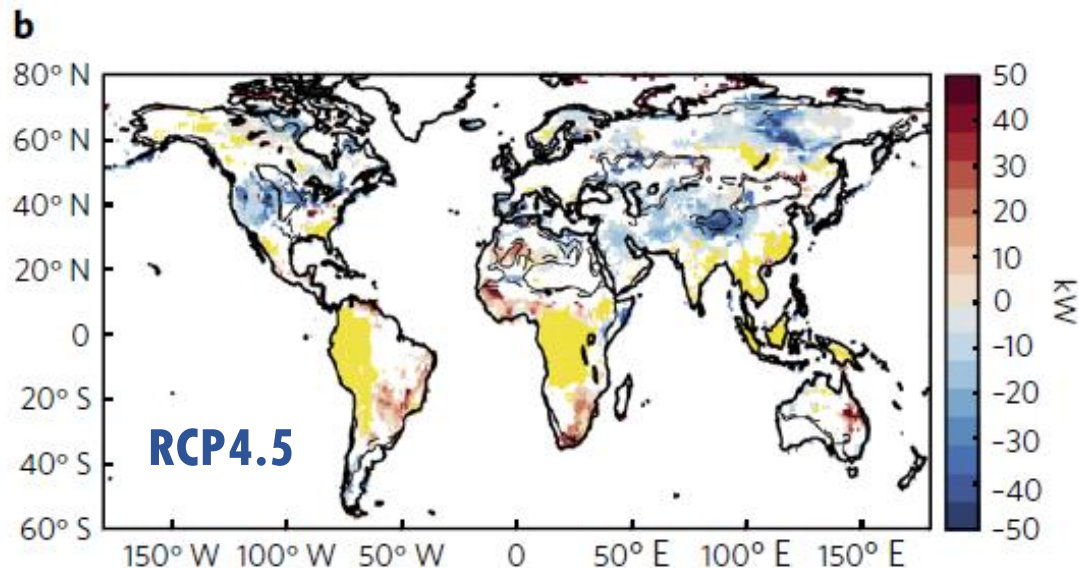
Predicting changes in disruption risks



Climate change matters a lot, with uncertainties and regional patterns



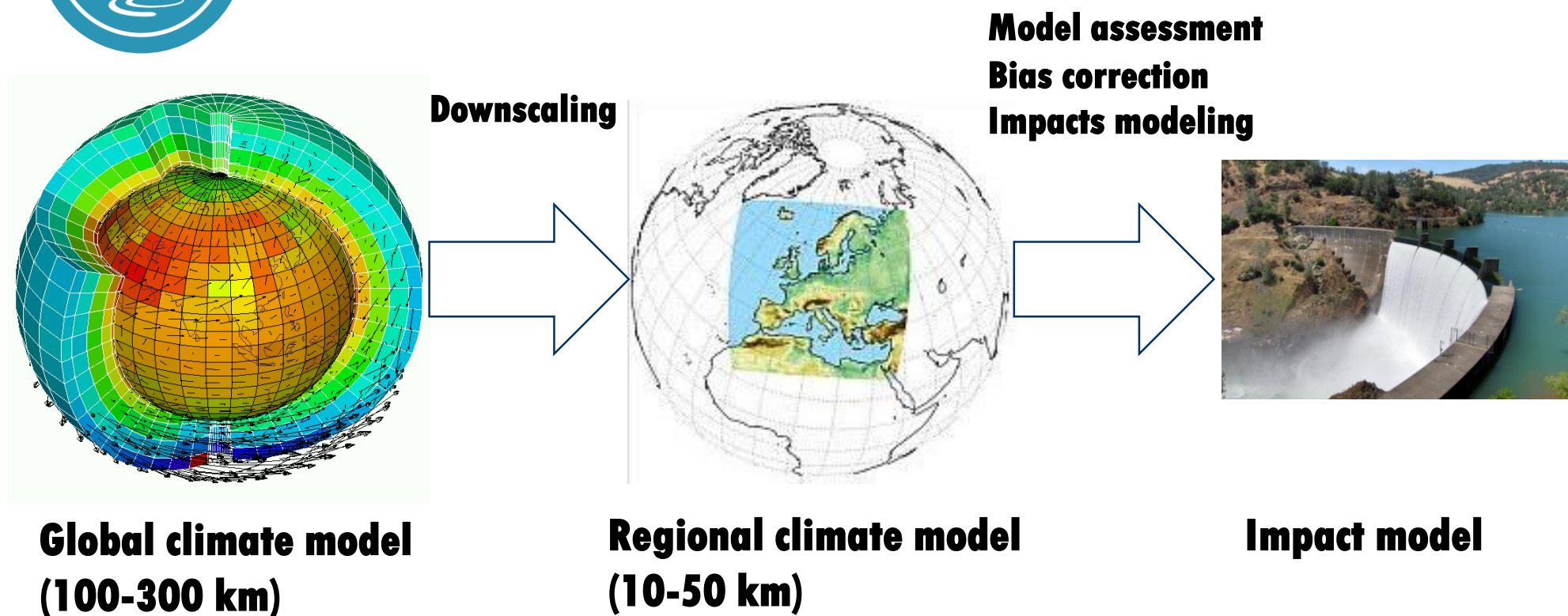
Review analysis from Yalew et al. (2020, *Nature Energy*) – ISI-MIP Energy project



Karnauskas et al., 2017, *Nature Geoscience*

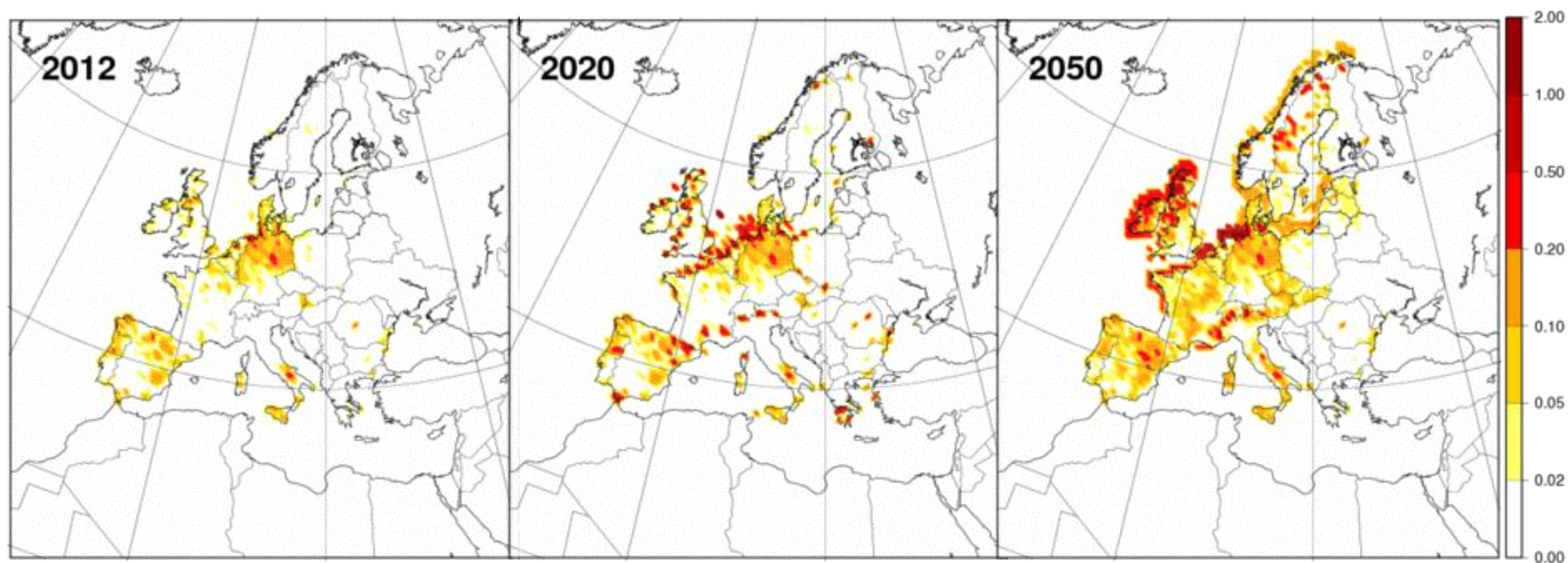


The Mediterranean region has a high potential for renewable energy resources but climate change is altering resources and creating risks on energy systems



- **MED-CORDEX: new coupled simulations, processes**
- **EURO-CORDEX : now~60 GCM-RCM projections (12 km)**
- **To come: Convection permitting simulations**

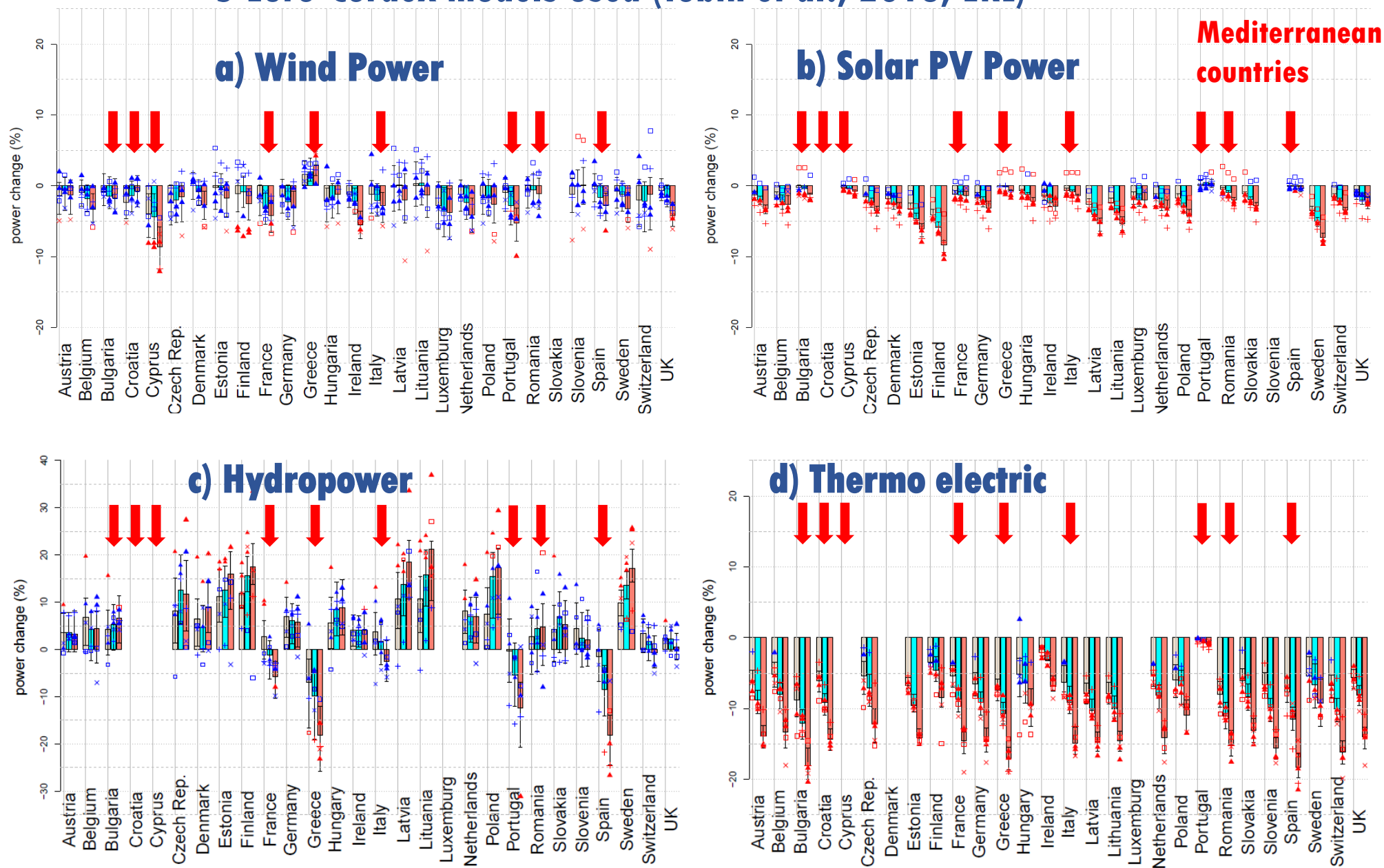
Tobin et al., 2018

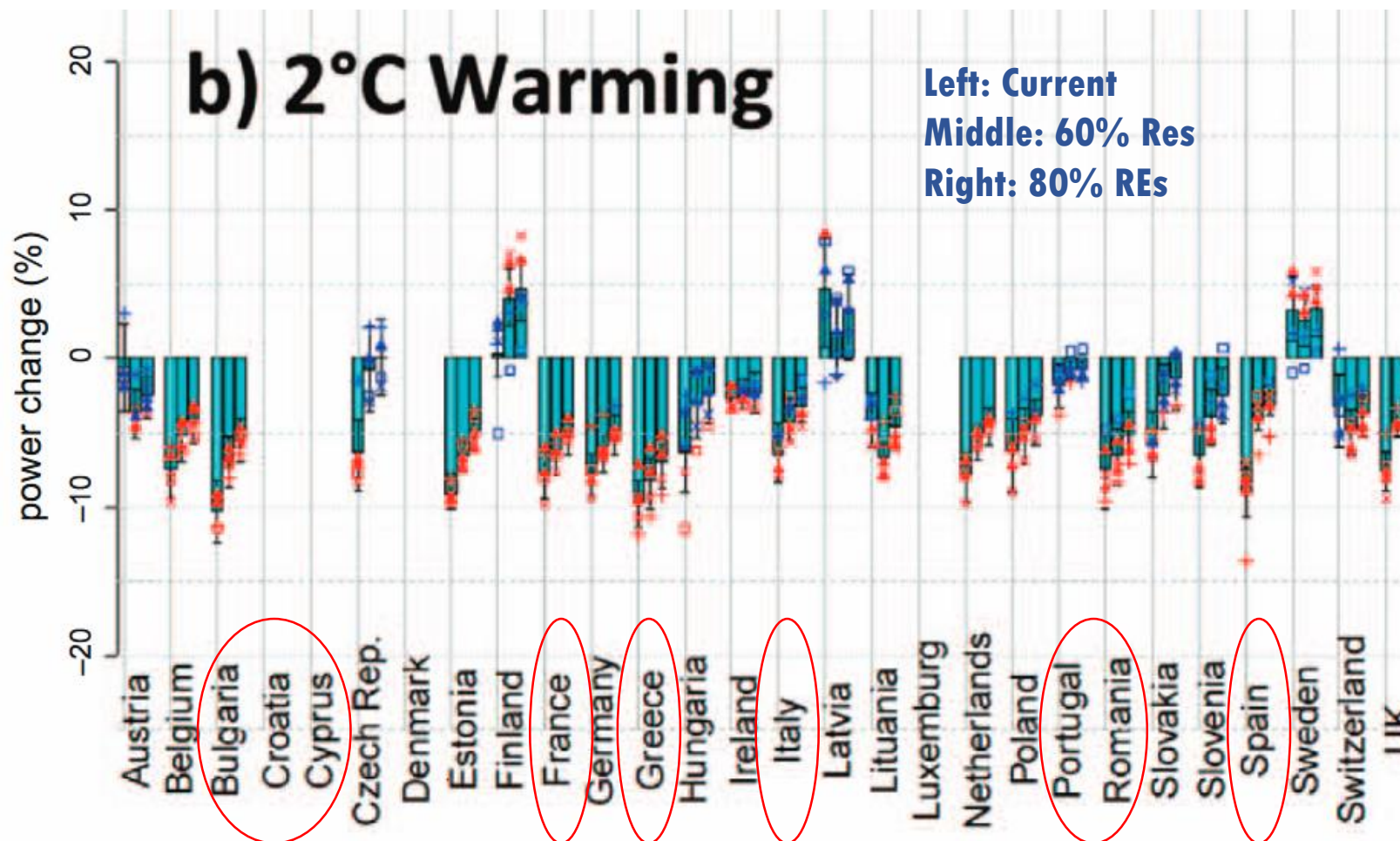


Installed wind power according to 60% or 80% REs in 2050 (here 80%), 450 GWatts

Changes for a 1.5°C, 2°C and 3°C global warming level

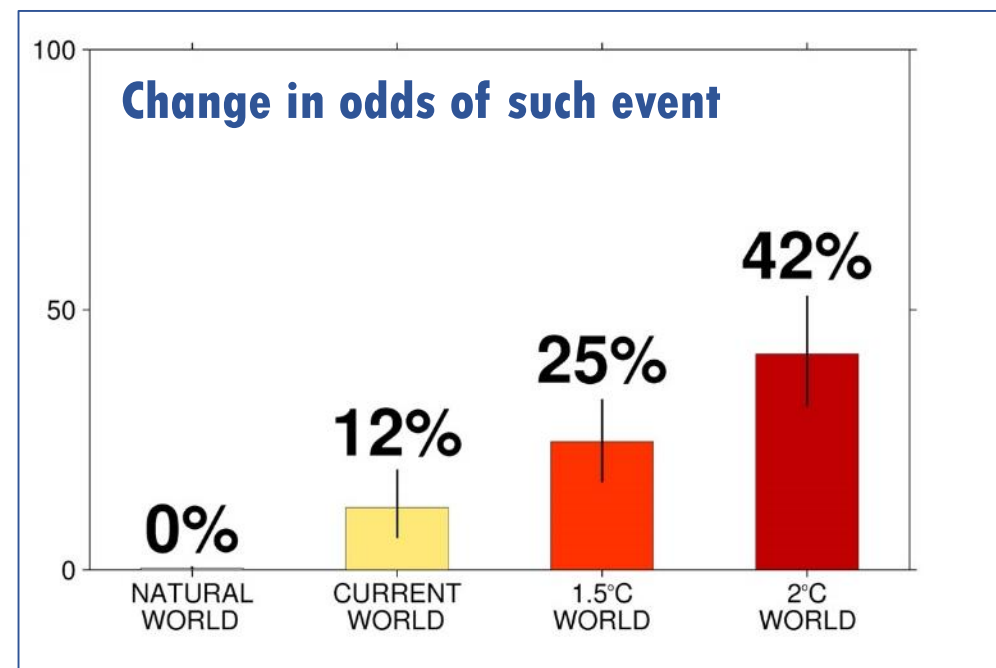
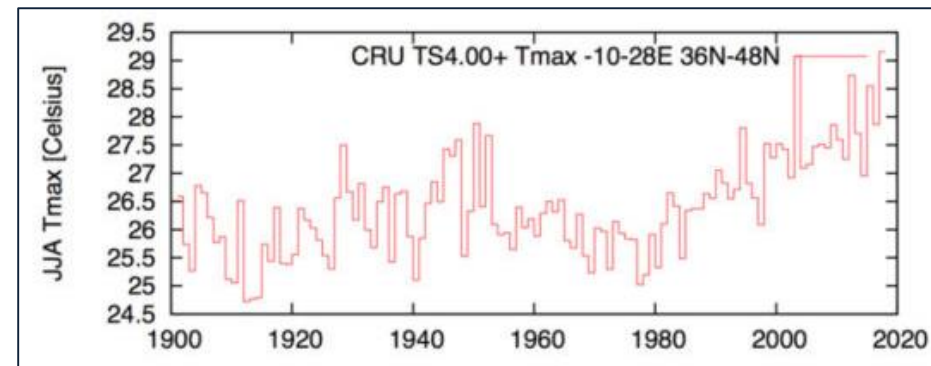
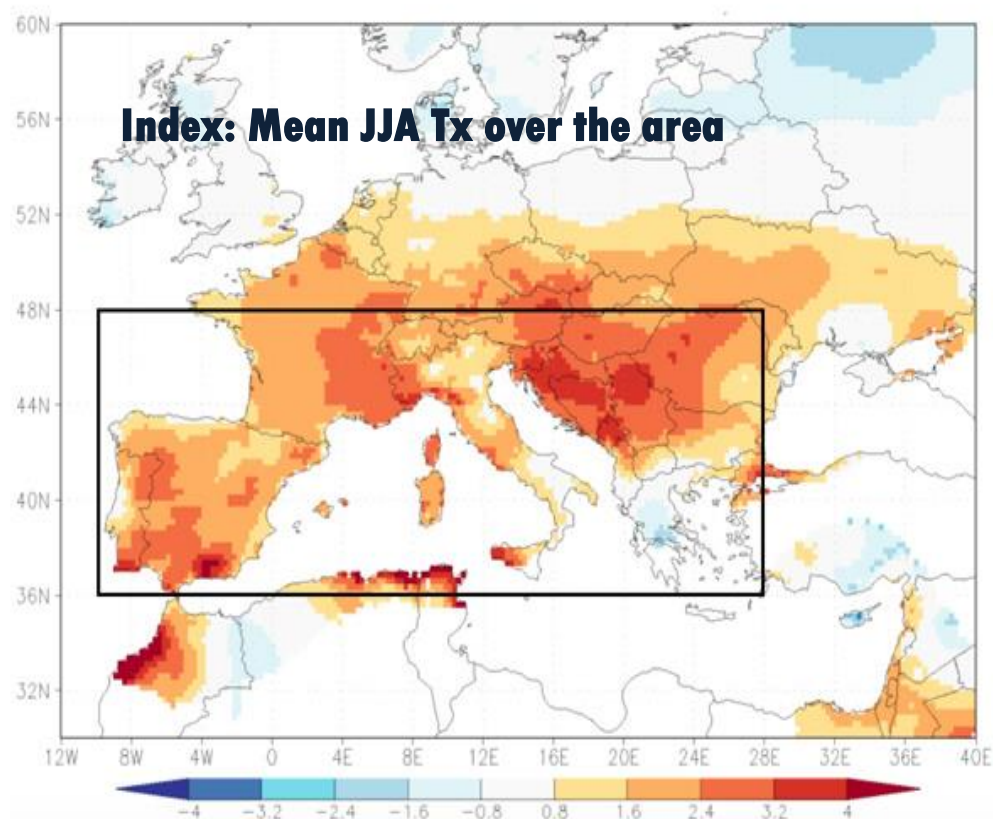
5 Euro-Cordex models used (Tobin et al., 2018, ERL)





Tobin et al. (2018), ERL

Climate change has already emerged in heat waves in the Mediterranean area: attribution of 2017 heat wave



Kew et al. (2019), BAMS

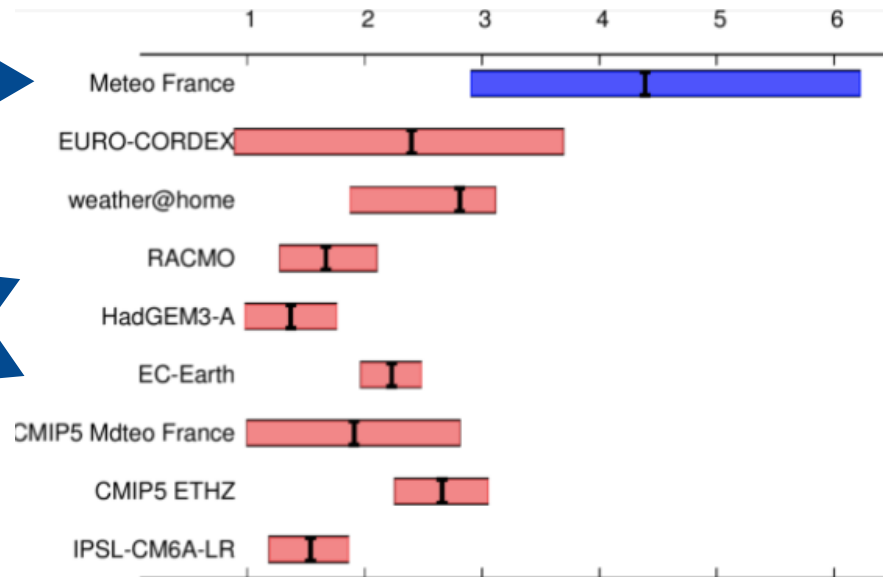
Warning: models underestimate past trends in extremes, but other limitations exist also

Estimated changes in intensities of the June maximum of TX3day (°C) for the June 2019 event (46°C in Southern France), since 1900

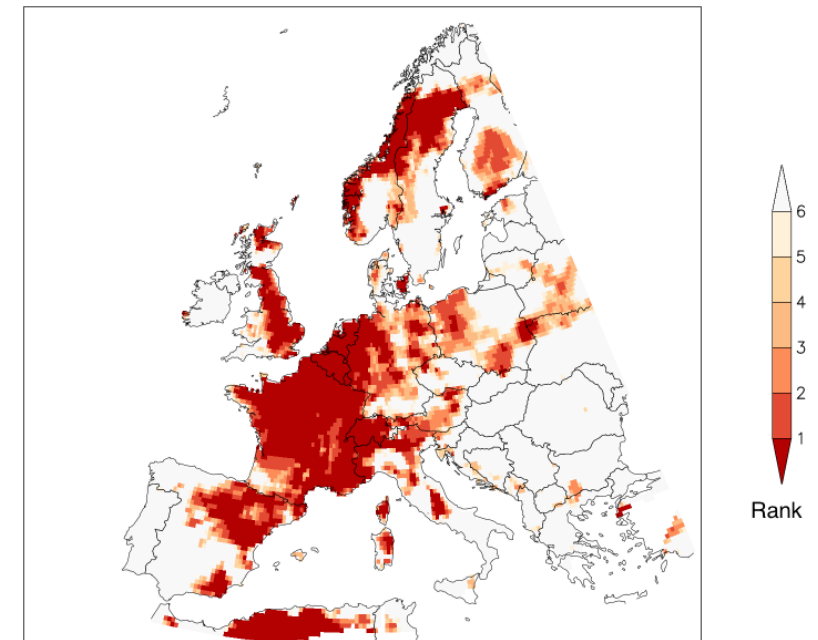
Observations



Ensembles of Climate simulations



Regions of historical record broken in Summer 2019



Vautard et al., 2020, ERL

Thanks for your attention!

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TX3day Max in IPSL-CM6 simulations

