tecnalia
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

EMS-2023-251

EXPERIENCE OF THE LIFE URBANKLIMA2050 PROYECT: CLIMATE CHANGE SCENARIOS FOR THE BASQUE COUNTRY

M. Martija-Díez[1,2], R. Hernández[1,2], M. Iza[1,2], J.D. Gómez de Segura[1,2], S. Gaztelumendi[1,2]

1 - Basque Meteorology Agency (EUSKALMET), Basque Country.

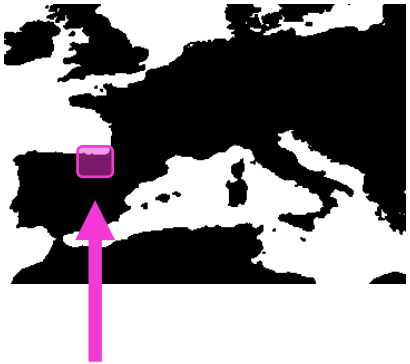
2 - BRTA, Tecnalia, Weather & Climate Area, Energy, Climate Change and Urban Transition Unit, Basque Country

EMS Annual Meeting 2023
07/09/2023

INTRODUCTION & OBJECTIVE

- UrbanKlima2050 is a large-scale Integrated Life Project and the most ambitious initiative led by the Basque Country that aims to ensure the resilience of the territory through multi-level governance and climate action on the ground.
- The main objective of the UrbanKlima2050 project is to contribute to the full implementation of the Basque Climate Change Strategy 2050, developing a low-carbon and climate-resilient region by 2050.
- More details about Tecnalia participation in URBANKLIMA2050 in Gaztelumendi et al 2022)

OBJECTIVE: to implement a bias-correction to EURO-CORDEX climate projections of **wind**, **humidity** and **radiation**.

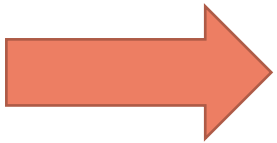


DATA & METHODOLOGY

1980-2009

EURO-CORDEX (historical)
vs.
E-OBS (v26)

WIND (28), HUMIDITY (26)
RADIATION (7)



Quantille Delta Mapping

Jacob et al. (2014)
Costoya et al. (2020)
Ballarin et al. (2023)

EURO-CORDEX
(projections)

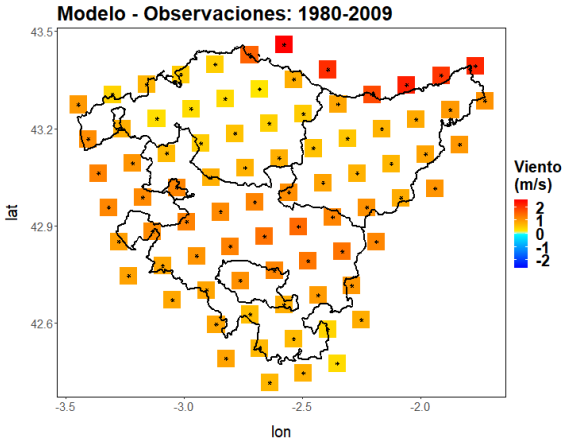
2011 → 2100

rcp4.5 **rcp8.5**

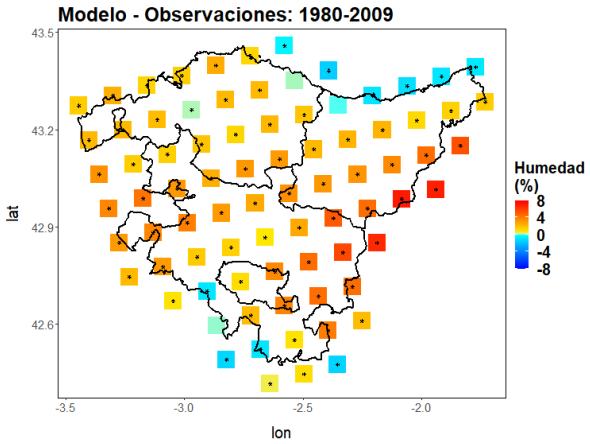
WIND (15)
HUMIDITY (11)
RADIATION (5)

RESULTS Model - Observations (1980-2009)

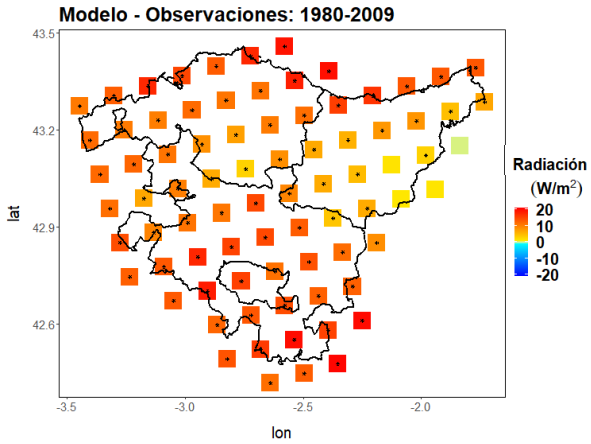
WIND



HUMIDITY



RADIATION



The **model** tends to **overestimate** the observations

BIAS-CORRECTION

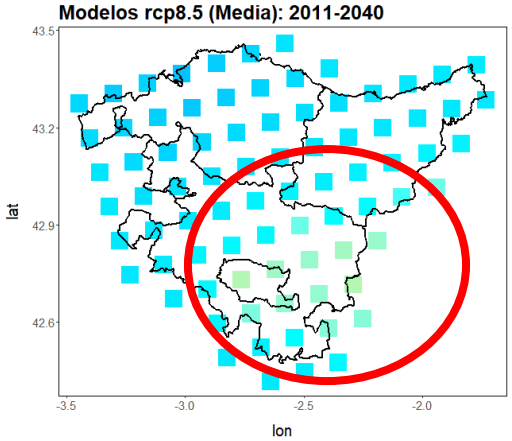
RESULTS

WIND

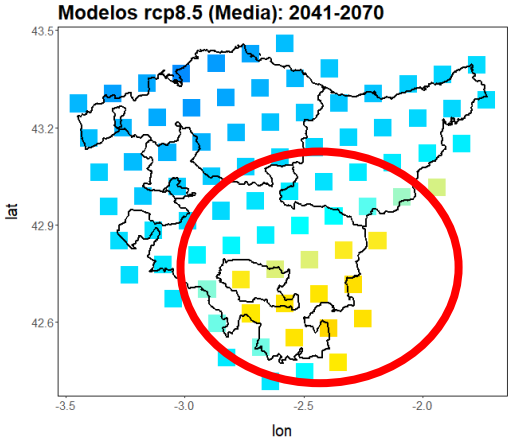
Bias-ajusted climate projections with respect to 1980-2009

RCP8.5

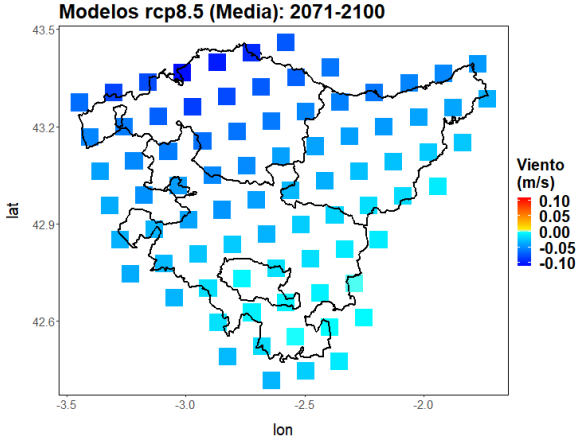
2011-2040



2041-2070



2071-2100



A **downward** trend of wind intensity in the future is showed (4%)

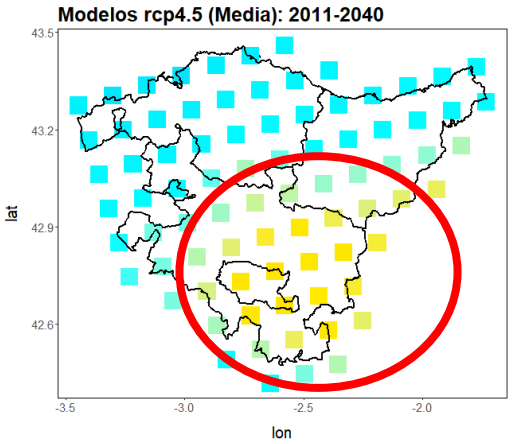
RESULTS

WIND

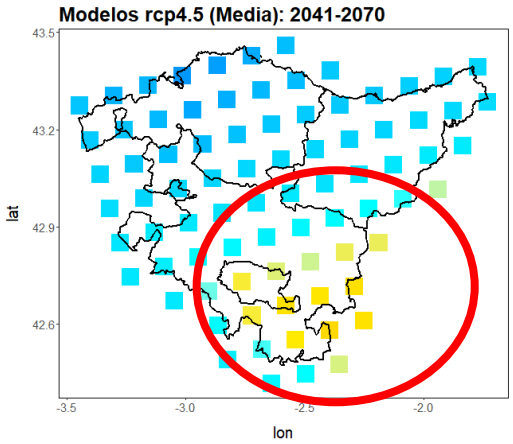
Bias-ajusted climate projections with respect to 1980-2009

RCP4.5

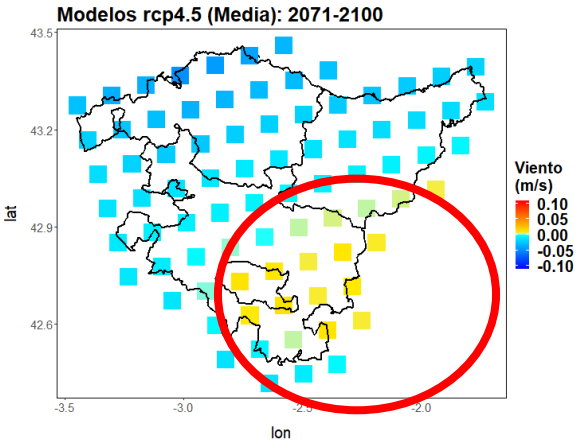
2011-2040



2041-2070



2071-2100



The **increase** in the south-east **persist**

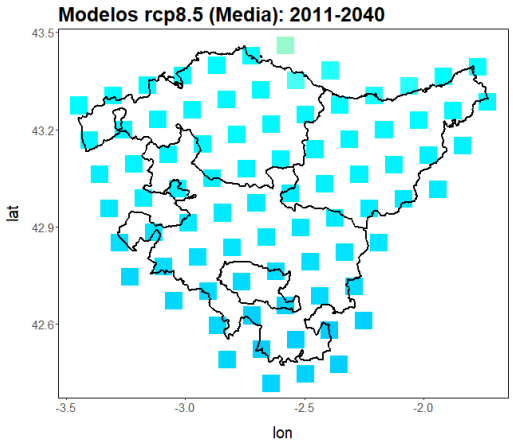
RESULTS

HUMIDITY

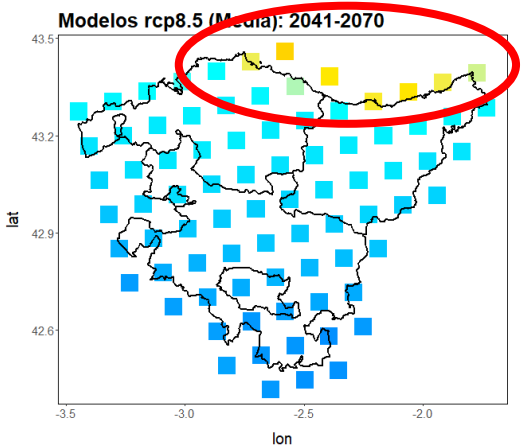
Bias-ajusted climate projections with respect to 1980-2009

RCP8.5

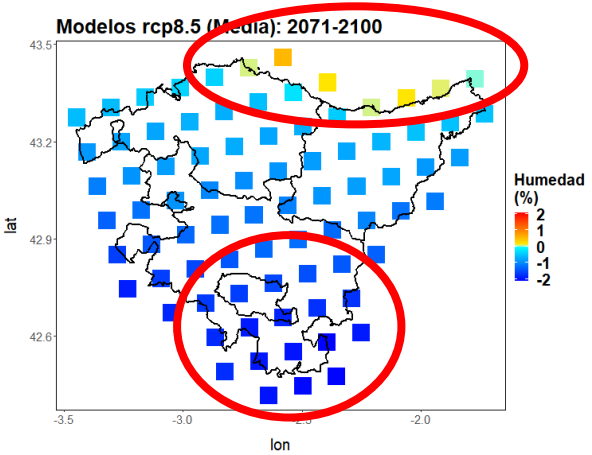
2011-2040



2041-2070



2071-2100



Humidity tends to **decrease** in future projections (2%)

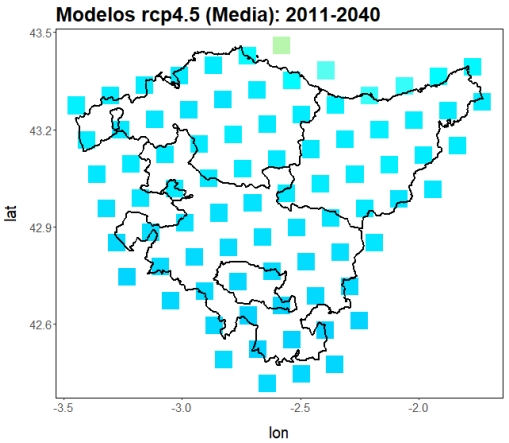
RESULTS

HUMIDITY

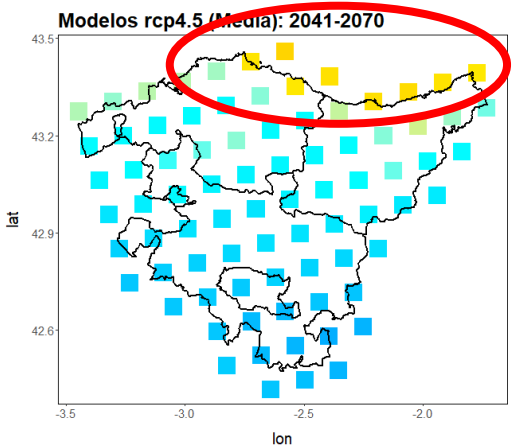
Bias-ajusted climate projections with respect to 1980-2009

RCP4.5

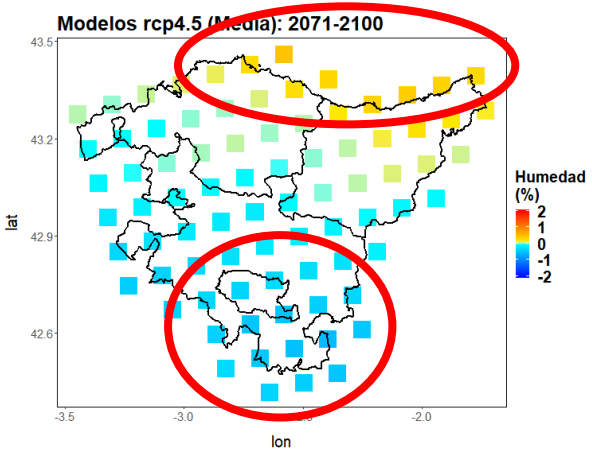
2011-2040



2041-2070



2071-2100



The **same** tendency is found

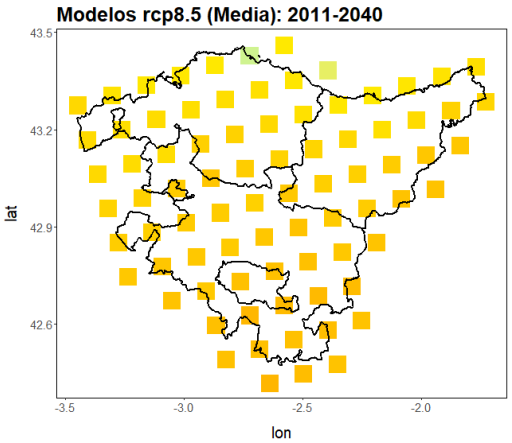
RESULTS

RADIATION

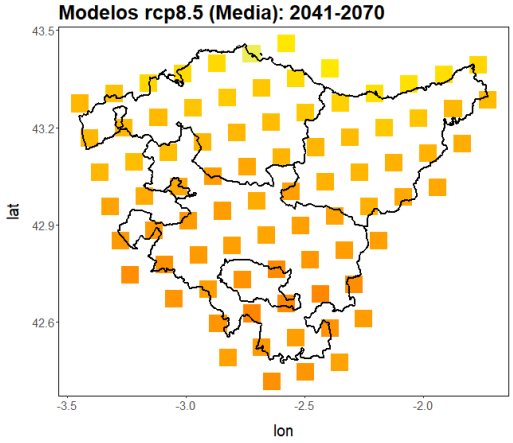
Bias-ajusted climate projections with respect to 1980-2009

RCP8.5

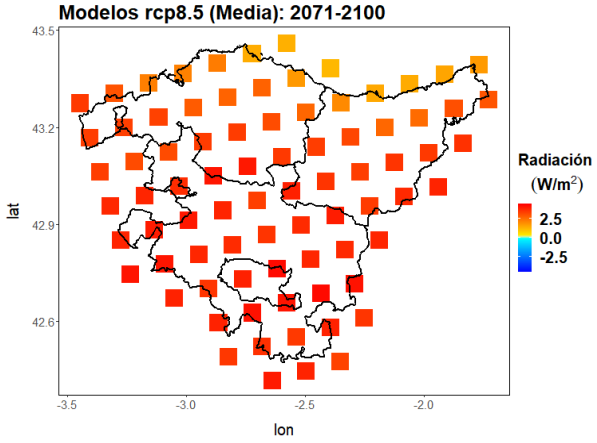
2011-2040



2041-2070



2071-2100



Radiation shows a generalized **increase** in the coming decades (3%)

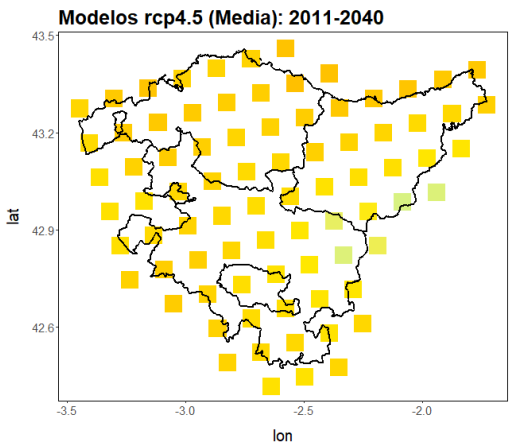
RESULTS

RADIATION

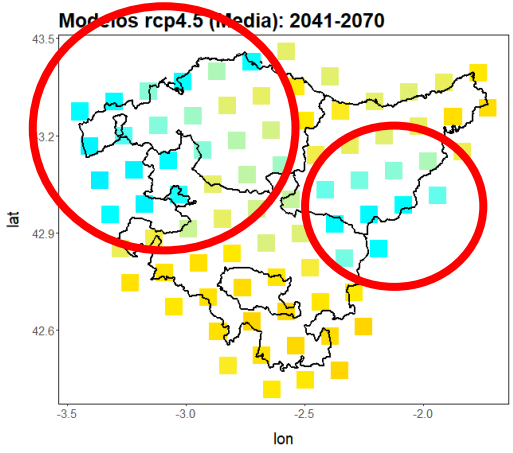
Bias-ajusted climate projections with respect to 1980-2009

RCP4.5

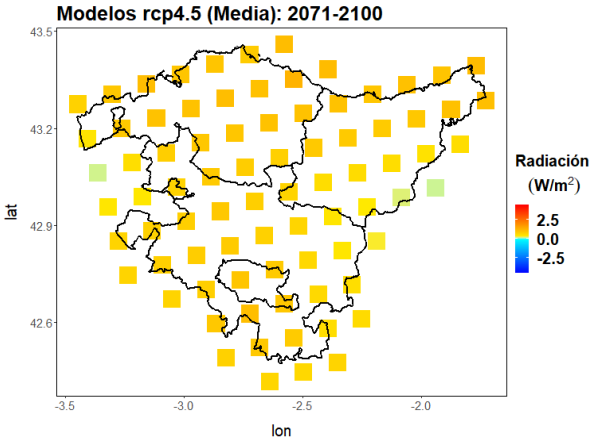
2011-2040



2041-2070



2071-2100

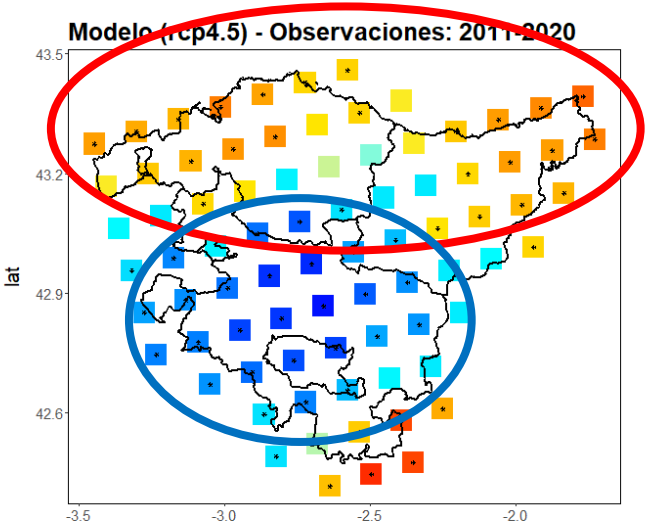


Radiation shows a slight **decrease** in the middle future (0.2%)

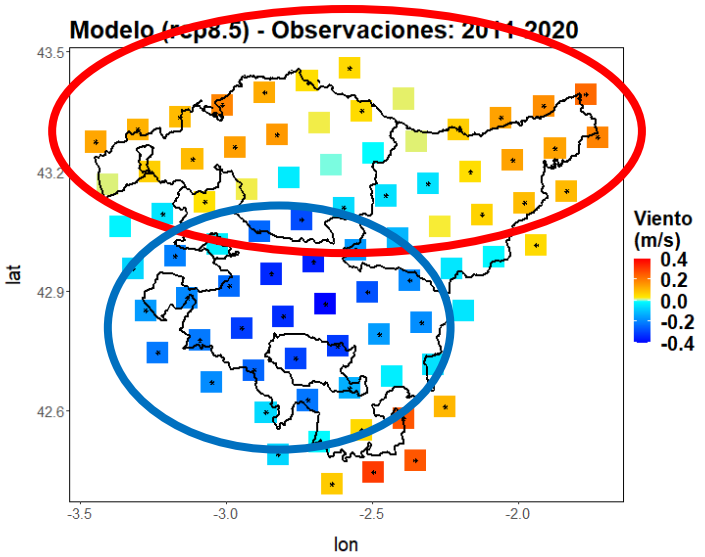
VALIDATION (2011-2020)

WIND

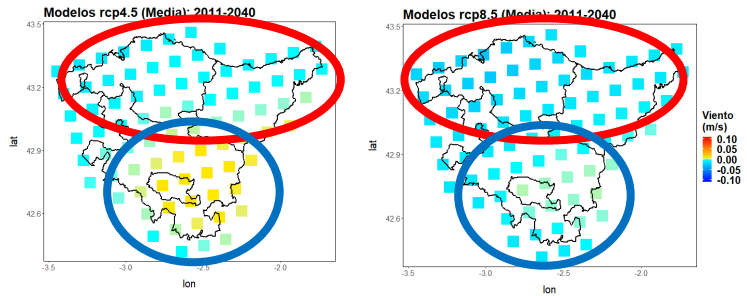
RCP4.5



RCP8.5



2011-2040

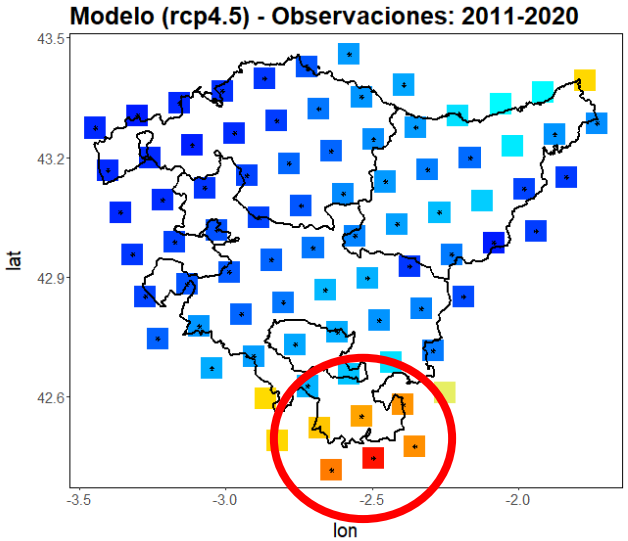


Models **smooth** the trend

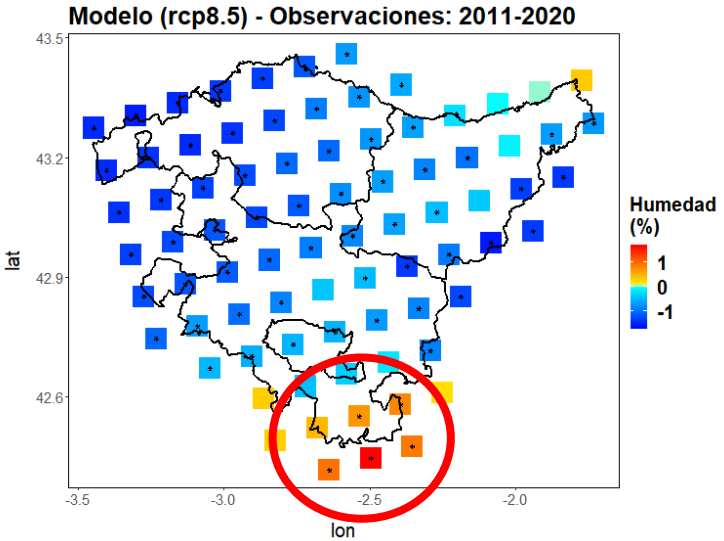
VALIDATION (2011-2020)

HUMIDITY

RCP4.5



RCP8.5

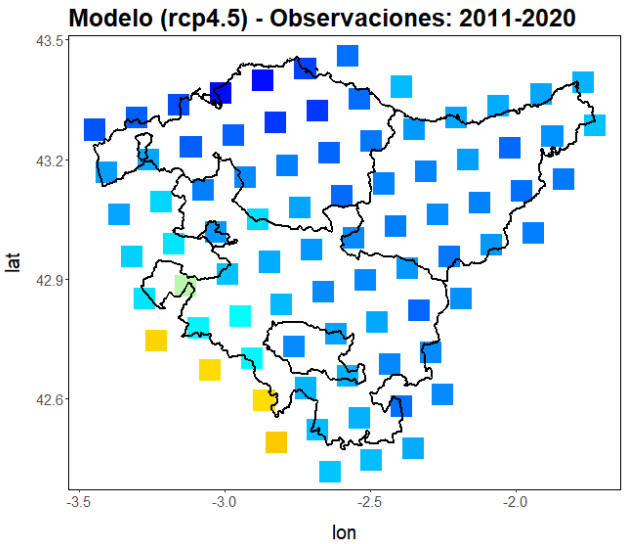


Models **underestimate** the observations in most of the region

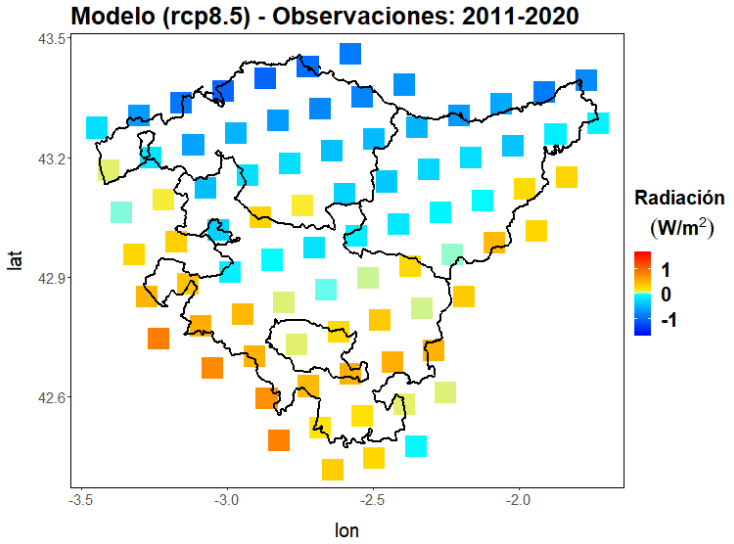
VALIDATION (2011-2020)

RADIATION

RCP4.5



RCP8.5



Models **adequately** reproduce the observations

CONCLUSIONS

- **WIND**: A **downward trend** is detected over the decades. The decrease is around 4% in the distant future in the rcp8.5 scenario. In near and middle future, **in the south** a slight **increase** is showed that persists until the end of the century in the rcp4.5 scenario.

- **HUMIDITY**: A **decreased** tendency appears, specially in the south, where exceed the 2%. In the coast seems to increase around a 1% in the distant future.

- **RADIATION**: A generalized **increase** in showed. In the distant future this increase reaches the 4% in the rcp8.5 scenario. In the rcp4.5, in the **middle future**, a slight **decrease** is showed in **some areas**.

FUTURE WORK will be focused on the creation of high-resolution grid (1 km).

REFERENCES

- Ballarin, A.S., Sone, J.S., Gesualdo, G.C. *et al.*: CLIMBra - Climate Change Dataset for Brazil, *Sci Data* **10**, 47 (2023). https://doi.org/10.1038/s41597-023-01956-z, 2023.
- Costoya, X., A. Rocha, and D. Carvalho: Using bias-correction to improve future projections of offshore wind energy resource: A case study on the Iberian Peninsula. Appl. Energy, https://doi.org/10,1016/j.apenergy.2020.114562, 2020.
- Gaztelumendi, S., Gomez de Segura, J. D., Hernandez, R., Martija-DIez, M., and Aranda, J. A.: Climate change monitoring and atmospheric indices in Basque Country: experiences from URBANKLIMA2050 LIFE project., EMS Annual Meeting 2022, Bonn, Germany, 5–9 Sep 2022, EMS2022-596, https://doi.org/10.5194/ems2022-596, 2022.
- Jacob, D., and Coauthors: EURO-CORDEX: New high-resolution Climate change projections for European impact research. Reg. Environ. Chang., https://doi.org/10.1007/s10113-013-0499-2, 2014.
- URBANKLIMA2050, 2023: https://www.urbanklima2050.eu/es/

ACKNOWLEDGEMENTS

✓ Our thanks to Basque Government for maintain and supports research and operational services in the hydro-ocean-meteo-climatic field essential for the Basque community, and particularly to the Department of Security for Euskalmet funding.

✓ This work has been supported by Directorate of Emergencies and Meteorology (DAEM) and Basque Environmental Agency (IHOBE) in the context of the LIFE-URBANKLIMA2050 project

✓ Likewise, our recognition to our colleagues from DAEM, EUSKALMET, IHOBE and Basque Research and Technology Alliance (BRTA) for promoting valuable research and services for the Basque Society.

euskalmet
agencia vasca de meteorología
euskal meteorologia agentzia

EUSKO JAURLARITZA
SEGURTASUN SAILA
Larrialdiei Aurre Egiteko eta Meteorologiako Zuzendaritza

GOBIERNO VASCO
DEPARTAMENTO DE SEGURIDAD
Dirección de Atención de Emergencias y Meteorología

Herri-baltzua
Sociedad Pública del

ihobe
ingurumen hobekuntza
mejora ambiental

EUSKO JAURLARITZA
GOBIERNO VASCO
EKONOMIAREN GARAPEN, JASANGARRITASUN ETA INGURUMEN SAILA
DEPARTAMENTO DE DESARROLLO ECONÓMICO, SOSTENIBILIDAD Y MEDIO AMBIENTE

URBAN KLIMA 2050

Life