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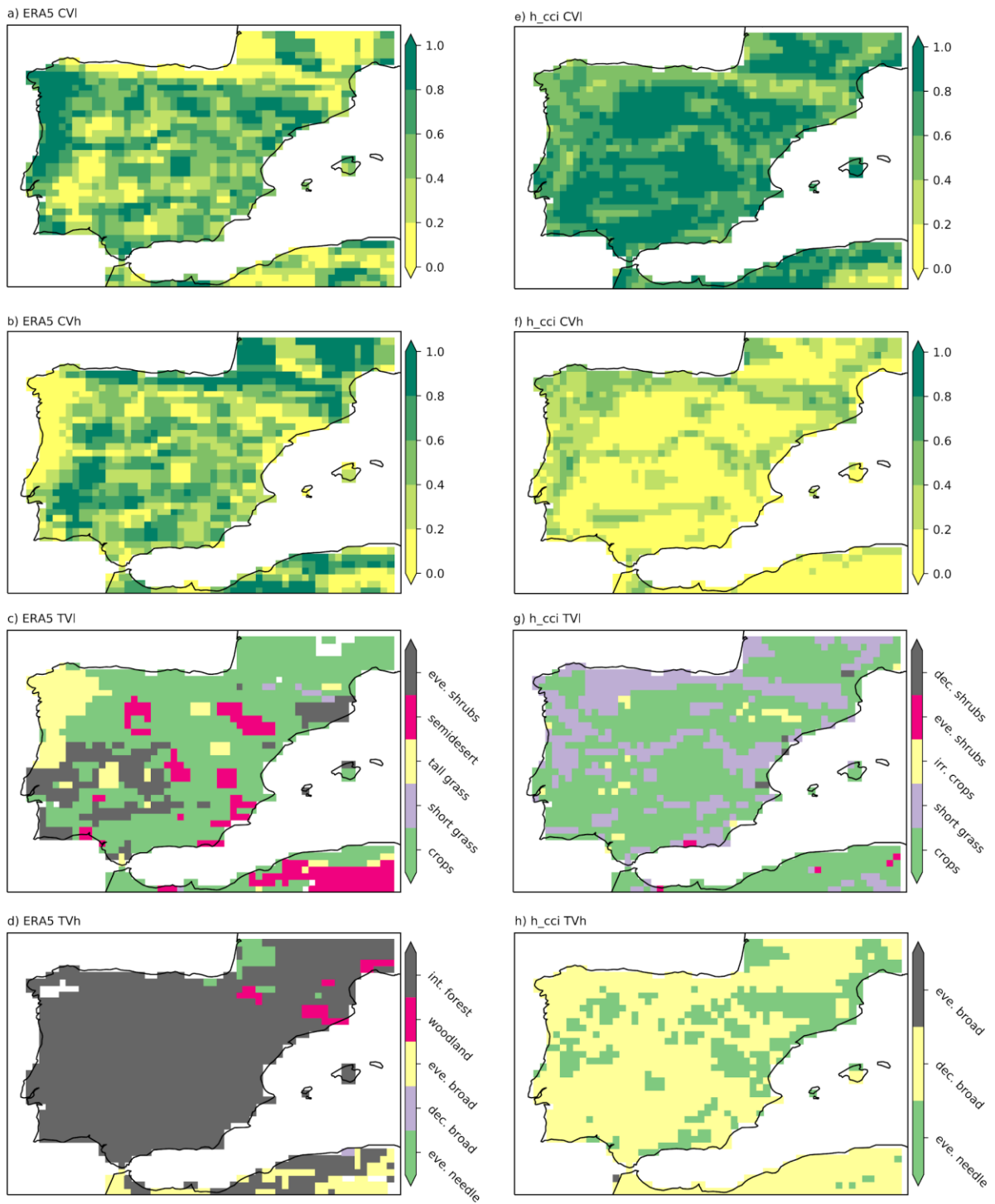
Supplement of

**Role of vegetation in representing land surface temperature in the
CHTESSEL (CY45R1) and SURFEX-ISBA (v8.1) land surface models:
a case study over Iberia**

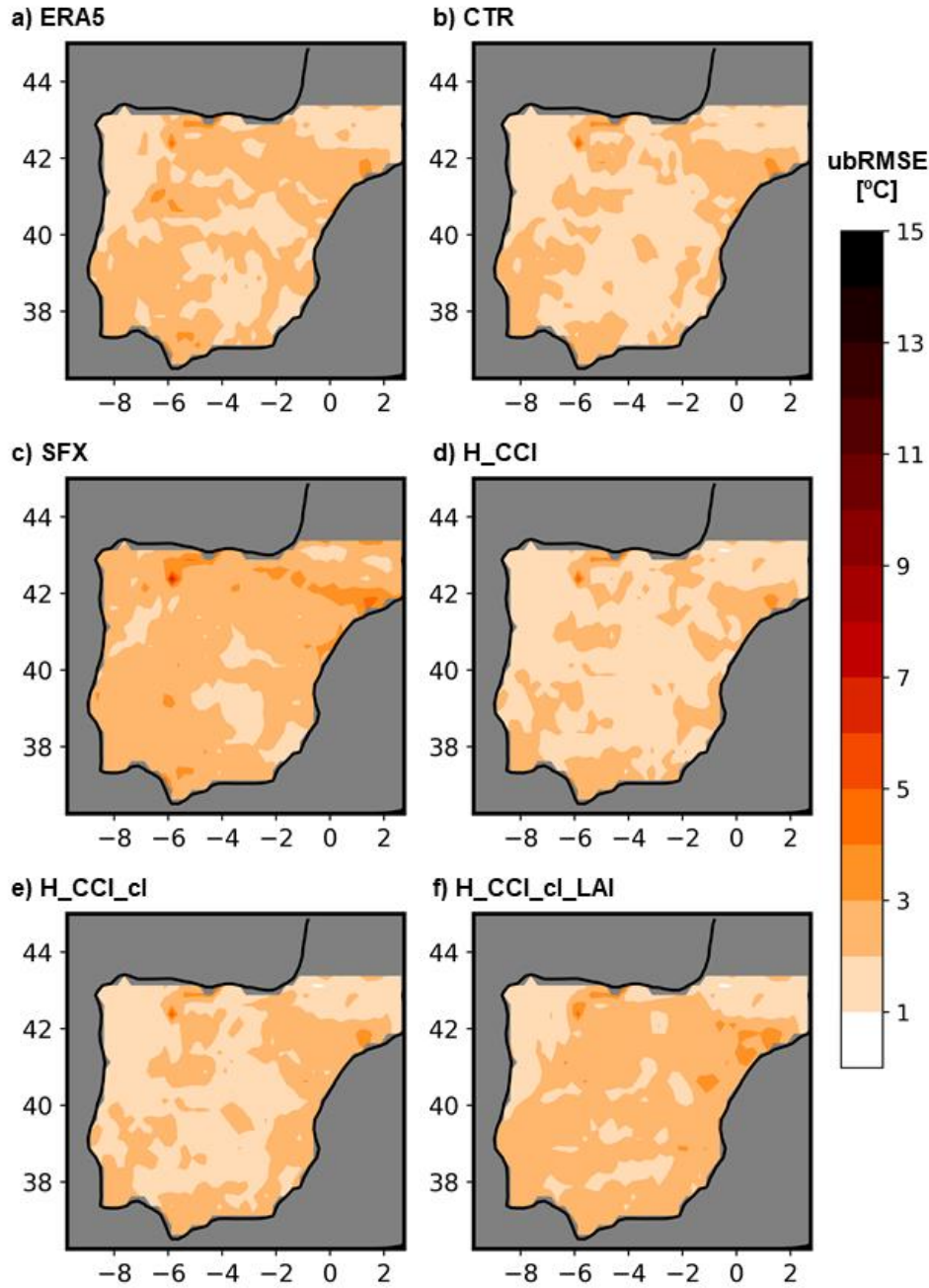
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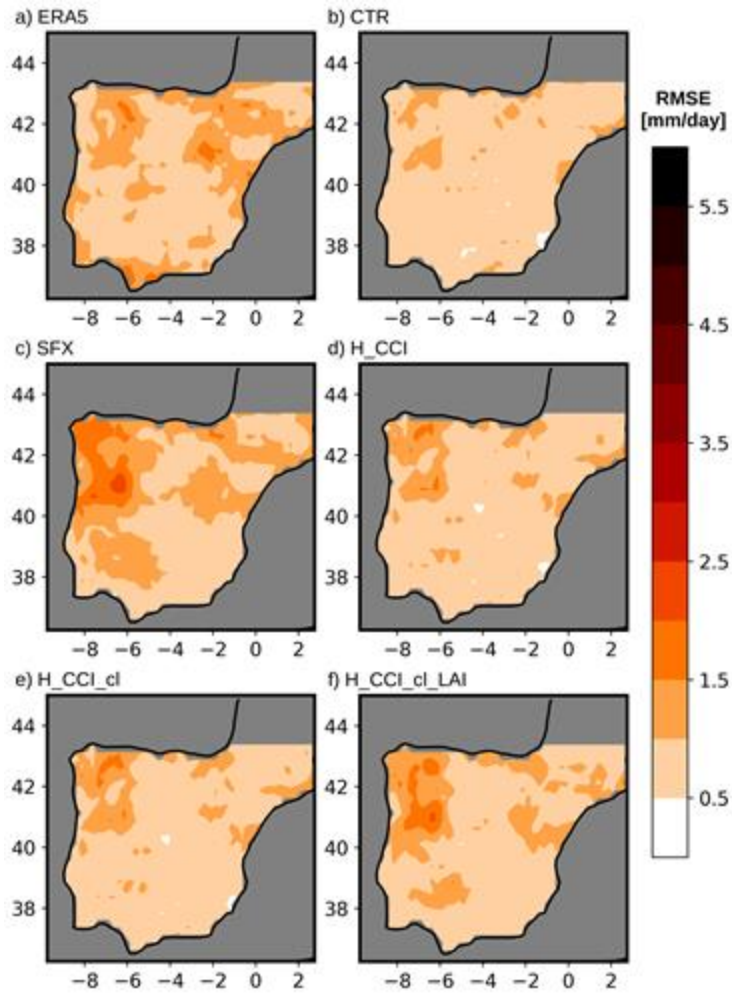
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Supplementary Figure S1. Comparison of ERA5 (a-d and CTR) with H_CCI (e-h) vegetation cover and dominant vegetation types: CVI (a,e), CVh (b,f), TVI (c,g), TVh (d,h). Note the different color and associated dominant vegetation types in panels c, g, d, h.



Supplementary Figure S2. Maps of JJA daily maximum unbiased RMSE bias over Iberia under clear-sky conditions, computed for different simulations a) ERA5; b) CHTESSEL offline (CTR); c) SURFEX offline (SFX); d) H_CCI; e) H_CCI_cl; and f) H_CCI_cl_LAI. LSA-SAF LST was considered as reference for computing the simulation errors.



Supplementary Figure S3. JJA surface evaporation RMSE computed from a) ERA5; b) CTR; c) SFX; d) H_CCI; e) H_CCI_cl; and g) H_CCI_cl_LAI. Here GLEAMv3b dataset was considered as reference

Supplementary Table S1. CHTESSEL land cover types and associated parameters. H/L differentiates low (L) from high (H) vegetation; cveg is the vegetation density (0–1) used in the tile fraction definition; and z0m and z0h are the roughness lengths for momentum and heat, respectively used in the calculations of the turbulent exchange coefficients for momentum, heat and water (adapted from JO19).

Index	Land Cover Type	H/L	Cveg	z0m	z0h
1	Crops, mixed farming	L	0.90	0.25	0.25×10^{-2}
2	Short grass	L	0.85	0.20	0.20×10^{-2}
3	Evergreen needleleaf trees	H	0.90	2.00	2.00
4	Deciduous needleleaf trees	H	0.90	2.00	2.00
5	Deciduous broadleaf trees	H	0.90	2.00	2.00
6	Evergreen broadleaf trees	H	0.99	2.00	2.00
7	Tall grass	L	0.70	0.47	0.47×10^{-2}
8	Desert	-	0	0.013	0.013×10^{-2}
9	Tundra	L	0.50	0.034	0.034×10^{-2}
10	Irrigated crops	L	0.90	0.50	0.50×10^{-2}
11	Semidesert	L	0.1	0.17	0.17×10^{-2}
12	Ice caps and glaciers	-	-	1.3×10^{-3}	1.3×10^{-4}
13	Bogs and marshes	L	0.6	0.83	0.83×10^{-2}
14	Inland water	-	-	-	-
15	Ocean	-	-	-	-
16	Evergreen shrubs	L	0.50	0.10	0.10×10^{-2}
17	Deciduous shrubs	L	0.50	0.25	0.25×10^{-2}
18	Mixed forest	H	0.90	2.00	2.00
19	Interrupted forest	H	0.90	1.1	1.1
20	Water and land mixtures	L	0.60	-	-