

S1 Additional tables

Table S1: Conditional frequencies related to heatwaves in Central Germany (51°N, 10°E) in reanalyses and CMIP6 simulations during the period 1961-2010, shown for each product. Odds ratios in bold are significant at the 5% level.

	ERA5	ERA-20C	20CR	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block HW}$ [%]	42.5	37.1	39.2	37.0	36.2	25.1	32.6	33.2	30.8
$f_{HW block}$ [%]	23.9	19.9	24.7	27.6	28.3	21.3	27.2	24.4	22.8
$f_{HW no\ block}$ [%]	2.5	2.4	2.8	3.2	3.6	3.0	4.1	3.0	3.3
OR [-]	12.1	10.1	11.4	11.5	10.5	8.7	8.7	10.6	8.7

Table S2: As Table S1, but for strong heatwaves (HWMD>15).

	ERA5	ERA-20C	20CR	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block HW}$ [%]	62.5	73.3	70.2	31.1	40.0	44.9	39.3	55.1	34.9
$f_{HW block}$ [%]	3.8	3.6	5.3	2.4	6.4	5.3	6.7	7.3	2.8
$f_{HW no\ block}$ [%]	0.18	0.09	0.16	0.36	0.70	0.31	0.76	0.36	0.33
OR [-]	22.2	40.1	33.9	6.8	9.7	18.1	9.4	21.8	8.6

Table S3: Conditional frequencies related to heatwaves in Central Germany (51°N, 10°E) in the CMIP6 scenario SSP5-8.5 during the period 2051-2100. Odds ratios in bold are significant at the 5% level.

	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block HW}$ [%]	39.0	15.9	21.9	16.4	43.1	25.6
$f_{HW block}$ [%]	80.4	76.9	83.1	73.5	71.3	94.5
$f_{HW no\ block}$ [%]	29.6	27.6	34.8	22.0	19.8	44.1
OR [-]	9.8	8.7	9.2	9.8	10.1	22.0

Table S4: As Table S3, but for strong heatwaves (HWMD>15).

	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block HW}$ [%]	47.3	19.1	29.7	21.6	59.5	31.7
$f_{HW block}$ [%]	62.2	50.1	64.6	47.0	46.5	86.8
$f_{HW no\ block}$ [%]	16.3	14.4	18.0	10.1	6.7	30.1
OR [-]	8.4	6.0	8.3	7.9	12.2	15.2

Table S5: As Table S1, but for winter heatwaves (October-March).

	ERA5	ERA-20C	20CR	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block HW}$ [%]	24.6	14.8	16.3	22.0	16.0	9.6	12.7	9.7	11.5
$f_{HW block}$ [%]	29.8	17.5	24.8	22.3	21.9	28.5	14.0	12.5	12.6
$f_{HW no\ block}$ [%]	3.1	3.0	3.4	2.6	3.4	5.2	3.4	2.7	2.9
OR [-]	13.5	6.9	9.3	10.9	8.0	7.3	4.7	5.1	4.8

Table S6: As Table S5, but for strong heatwaves (HWMD>15).

	ERA5	ERA-20C	20CR	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block HW}$ [%]	16.2	20.0	11.5	19.0	15.9	20.6	7.5	0.0	4.5
$f_{HW block}$ [%]	2.0	2.3	2.5	1.4	2.7	12.2	1.0	0.0	0.4
$f_{HW no\ block}$ [%]	0.35	0.27	0.51	0.19	0.42	0.91	0.42	0.12	0.24
OR [-]	5.9	8.6	5.0	7.3	6.6	15.2	2.3	0.0	1.6

Table S7: As Table S3, but for winter heatwaves (October-March).

	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block HW}$ [%]	9.3	7.0	10.9	8.3	7.0	13.4
$f_{HW block}$ [%]	43.2	55.4	76.0	50.5	37.6	85.9
$f_{HW no\ block}$ [%]	19.7	23.0	31.4	18.2	14.9	46.5
OR [-]	3.1	4.2	6.9	4.6	3.4	7.0

Table S8: As Table S7, but for strong heatwaves (HWMD>15).

	CESM2	CNRM-CM6- 1	MIROC- ES2L	MPI-ESM1-2- HR	NorESM2- MM	UKESM1-0- LL
$f_{block HW}$ [%]	12.8	9.5	12.7	11.3	11.6	15.7
$f_{HW block}$ [%]	19.7	28.4	55.4	19.7	16.7	72.4
$f_{HW no\ block}$ [%]	6.3	8.5	19.2	5.1	3.8	32.6
OR [-]	3.7	4.3	5.2	4.6	5.1	5.4

Table S9: Conditional frequencies related to heavy precipitation in Western (51°N, 8°E) and Eastern Germany (51°N, 14°E) in reanalyses and CMIP6 simulations during the period 1961-2010, shown for each product. The abbreviation “EE” denotes blocking over Eastern Europe and “Scan” blocking over Scandinavia. The abbreviation “Pr” in the index of the conditional frequencies denotes Heavy precipitation. Odds ratios in bold are significant at the 5% level.

ERA5		ERA-20C		20CR		CESM2		CNRM-CM6-1		MIROC-ES2L		MPI-ESM1-2-HR		NorESM2-MM		UKESM1-0-LL	
Western Germany																	
	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE
$f_{block Pr}$ [%]	11.3	16.1	8.2	16.5	9.8	19.6	6.8	10.2	2.8	16.1	4.8	8.9	6.1	5.1	6.2	12.3	14.0
$f_{Pr block}$ [%]	1.5	1.0	1.5	1.4	1.2	1.0	0.8	0.6	0.9	2.7	3.2	2.1	1.8	0.6	1.1	0.9	1.4
$f_{Pr no\ block}$ [%]	0.6	0.6	0.9	0.9	0.5	0.5	0.6	0.6	1.6	1.4	1.6	1.6	1.0	1.1	0.7	0.7	1.0
OR [-]	2.3	1.5	1.7	1.6	2.3	1.9	1.2	0.9	0.6	1.9	2.1	1.3	1.7	0.5	1.5	1.3	1.4
Eastern Germany																	
	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE
$f_{block Pr}$ [%]	9.1	17.5	10.3	18.6	9.5	17.2	10.9	16.4	7.4	13.6	4.4	10.1	3.0	11.2	5.2	12.5	15.3
$f_{Pr block}$ [%]	2.7	2.5	3.2	2.7	2.7	1.9	2.3	1.8	2.8	2.6	3.2	2.5	1.2	1.7	1.3	1.3	1.8
$f_{Pr no\ block}$ [%]	1.5	1.5	1.5	1.4	1.2	1.2	1.1	1.1	1.7	1.7	1.7	1.7	1.5	1.4	1.0	1.0	1.2
OR [-]	1.8	1.7	2.2	1.9	2.2	1.7	2.1	1.7	1.7	1.6	1.9	1.5	0.8	1.1	1.3	1.3	2.5

Table S10: As Table S9, but for the winter half-year.

ERA5	ERA-20C	20CR	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL									
Western Germany																	
EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE									
$f_{block Pr}$ [%]	0.0	1.1	0.0	0.0	2.1	0.0	2.0	2.0	4.4	0.0	5.8	1.4	4.2	4.3	3.2	0.0	2.0
$f_{Pr block}$ [%]	0.0	0.1	0.0	0.0	0.5	0.0	0.5	0.2	0.2	0.0	0.1	0.2	0.3	1.0	0.29	0.0	0.2
$f_{Pr no\ block}$ [%]	1.1	1.1	0.8	0.8	1.1	1.2	1.1	1.2	0.5	0.5	0.2	0.1	0.8	1.0	1.1	1.1	1.2
OR [-]	0.0	0.1	0.0	0.0	0.5	0.0	0.4	0.1	0.4	0.4	0.0	0.6	0.4	0.9	0.3	0.0	0.2
Eastern Germany																	
EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE									
$f_{block Pr}$ [%]	5.0	7.5	3.6	0.0	3.6	5.4	8.9	3.6	16.7	16.7	0.0	0.0	11.1	6.7	4.4	5.9	3.8
$f_{Pr block}$ [%]	0.4	0.3	0.2	0.0	0.5	0.3	1.1	0.2	0.6	0.3	0.0	0.0	1.0	0.3	0.7	0.4	0.5
$f_{Pr no\ block}$ [%]	0.4	0.5	0.3	0.3	0.6	0.7	0.6	0.7	0.2	0.2	0.1	0.2	0.5	0.5	0.7	0.8	0.6
OR [-]	1.0	0.6	0.7	0.0	0.9	0.5	2.0	0.3	3.7	1.6	0.0	0.0	2.1	0.6	0.3	0.2	0.3

Table S11: Conditional frequencies related to heavy precipitation in the summer half-year (April-September) in Western (51°N, 8°E) and Eastern Germany (51°N, 14°E) in CMIP6 simulations during the period 2051-2100 assuming the CMIP6 scenario SSP5-8.5. The abbreviation “EE” denotes blocking over Eastern Europe and “Scan” blocking over Scandinavia. The abbreviation “Pr” in the index of the conditional frequencies denotes Heavy precipitation. Odds ratios in bold are significant at the 5% level.

	CESM2		CNRM-CM6-1		MIROC-ES2L		MPI-ESM1-2-HR		NorESM2-MM		UKESM1-0-LL	
Western Germany												
	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan
$f_{block Pr}$ [%]	22.8	19.0	5.8	15.0	12.0	17.1	6.0	19.0	21.4	27.1	16.0	14.9
$f_{Pr block}$ [%]	1.0	0.8	2.6	3.3	3.3	2.8	2.0	2.4	1.0	1.1	1.2	0.9
$f_{Pr no\ block}$ [%]	0.8	0.9	2.2	2.1	2.3	2.3	1.2	1.1	0.7	0.7	1.0	1.1
OR [-]	1.2	0.9	1.2	1.5	1.5	1.2	1.6	2.2	1.4	1.6	1.2	0.9
Eastern Germany												
	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan
$f_{block Pr}$ [%]	21.4	22.1	4.1	11.7	10.2	18.0	2.5	12.6	18.5	27.4	14.0	17.2
$f_{Pr block}$ [%]	1.6	1.6	1.7	2.4	3.3	3.5	1.1	2.2	1.7	2.1	1.0	1.1
$f_{Pr no\ block}$ [%]	1.4	1.4	2.2	2.1	2.8	2.7	1.8	1.7	1.4	1.3	1.0	1.0
OR [-]	1.1	1.1	0.8	1.2	1.2	1.3	0.6	1.3	1.2	1.6	1.0	1.0

Table S12: As Table S11, but for the winter half-year (October-March).

	CESM2		CNRM-CM6-1		MIROC-ES2L		MPI-ESM1-2-HR		NorESM2-MM		UKESM1-0-LL	
Western Germany												
	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan
$f_{block Pr}$ [%]	3.6	3.0	5.0	6.0	2.8	4.2	0.8	2.4	1.9	2.5	5.5	2.5
$f_{Pr block}$ [%]	0.9	0.6	0.8	0.6	0.5	0.3	0.2	0.3	0.5	0.4	1.0	0.3
$f_{Pr no\ block}$ [%]	2.3	2.3	1.1	1.2	0.8	0.8	1.4	1.5	1.9	2.0	1.9	2.1
OR [-]	0.4	0.3	0.7	0.5	0.6	0.3	0.1	0.2	0.3	0.2	0.5	0.1
Eastern Germany												
	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan	EE	Scan
$f_{block Pr}$ [%]	13.4	10.7	7.2	10.1	9.1	6.1	8.2	10.6	3.4	4.5	8.0	14.0
$f_{Pr block}$ [%]	2.0	1.2	0.8	0.7	0.7	0.2	1.5	1.0	0.5	0.4	0.4	0.5
$f_{Pr no\ block}$ [%]	1.2	1.2	0.8	0.8	0.3	0.4	0.9	0.9	1.0	1.1	0.6	0.6
OR [-]	1.7	1.0	1.1	0.9	2.1	0.5	1.7	1.1	0.5	0.4	0.8	0.9

Table S13: Conditional frequencies related to calms in the summer half-year (April-September) in Central Germany (51°N, 10°E) in reanalyses and CMIP6 simulations during the period 1961-2010, shown for each product. Odds ratios in bold are significant at the 5% level.

	ERA5	ERA-20C	20CR	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block calm}$ [%]	10.5	9.7	11.0	15.2	10.3	6.8	16.8	11.9	9.0
$f_{calm block}$ [%]	6.0	7.1	6.8	11.2	8.7	8.7	15.7	10.3	5.5
$f_{calm no\ block}$ [%]	5.5	6.5	5.8	5.9	6.5	7.5	7.2	6.7	5.2
OR [-]	1.1	1.1	1.2	2.0	1.4	1.2	2.4	1.6	1.1

Table S14: As Table S13, but for the winter half-year (October-March).

	ERA5	ERA-20C	20CR	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block calm}$ [%]	25.5	16.8	19.2	33.1	31.6	12.5	25.9	26.3	22.0
$f_{calm block}$ [%]	10.1	6.5	8.0	10.6	9.5	2.1	4.4	7.0	9.5
$f_{calm no\ block}$ [%]	3.4	3.6	3.9	2.5	2.4	1.4	1.5	2.2	4.2
OR [-]	3.2	1.9	2.2	4.6	4.2	1.5	3.1	3.4	2.4

Table S15: Conditional frequencies related to calms in the summer half-year (April-September) in Central Germany (51°N, 10°E) in the CMIP6 scenario SSP5-8.5 during the period 2051-2100. Odds ratios in bold are significant at the 5% level.

	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block calm}$ [%]	23.6	12.3	18.3	11.6	20.4	12.7
$f_{calm block}$ [%]	9.4	8.8	17.2	11.9	8.7	6.3
$f_{calm no\ block}$ [%]	6.8	6.1	10.8	8.0	7.1	7.4
OR [-]	1.4	1.5	1.7	1.5	1.2	0.8

Table S16: As Table S15, but for the winter half-year (October-March).

	CESM2	CNRM-CM6-1	MIROC-ES2L	MPI-ESM1-2-HR	NorESM2-MM	UKESM1-0-LL
$f_{block calm}$ [%]	33.6	35.9	21.2	31.6	23.6	32.8
$f_{calm block}$ [%]	8.5	9.7	7.3	6.6	9.2	16.3
$f_{calm no\ block}$ [%]	1.9	2.2	3.8	1.6	2.7	6.1
OR [-]	4.9	4.7	2.0	4.3	3.7	3.0