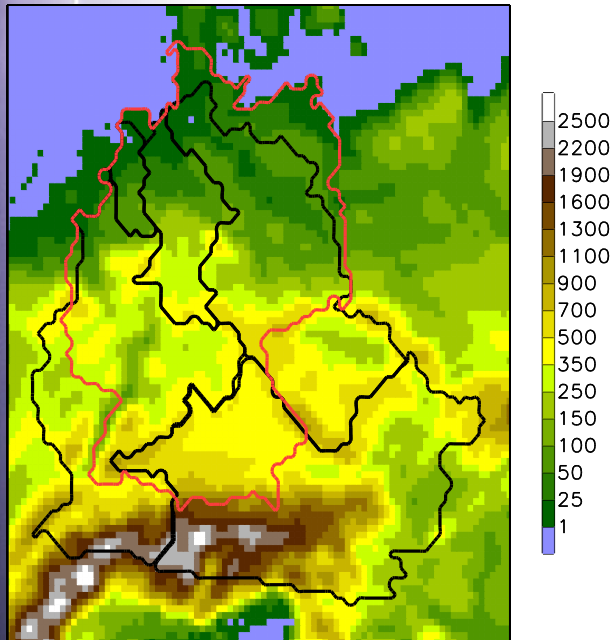


# Das Klima der Zukunft: Niederschlagskennzahlen

Katharina Bülow Climate Service Center Germany (GERICS)

# Niederschlagsänderung

- Anzahl der trockenen Tage  $< 1$  mm/Tag
- Perioden aufeinanderfolgender trockener Tage



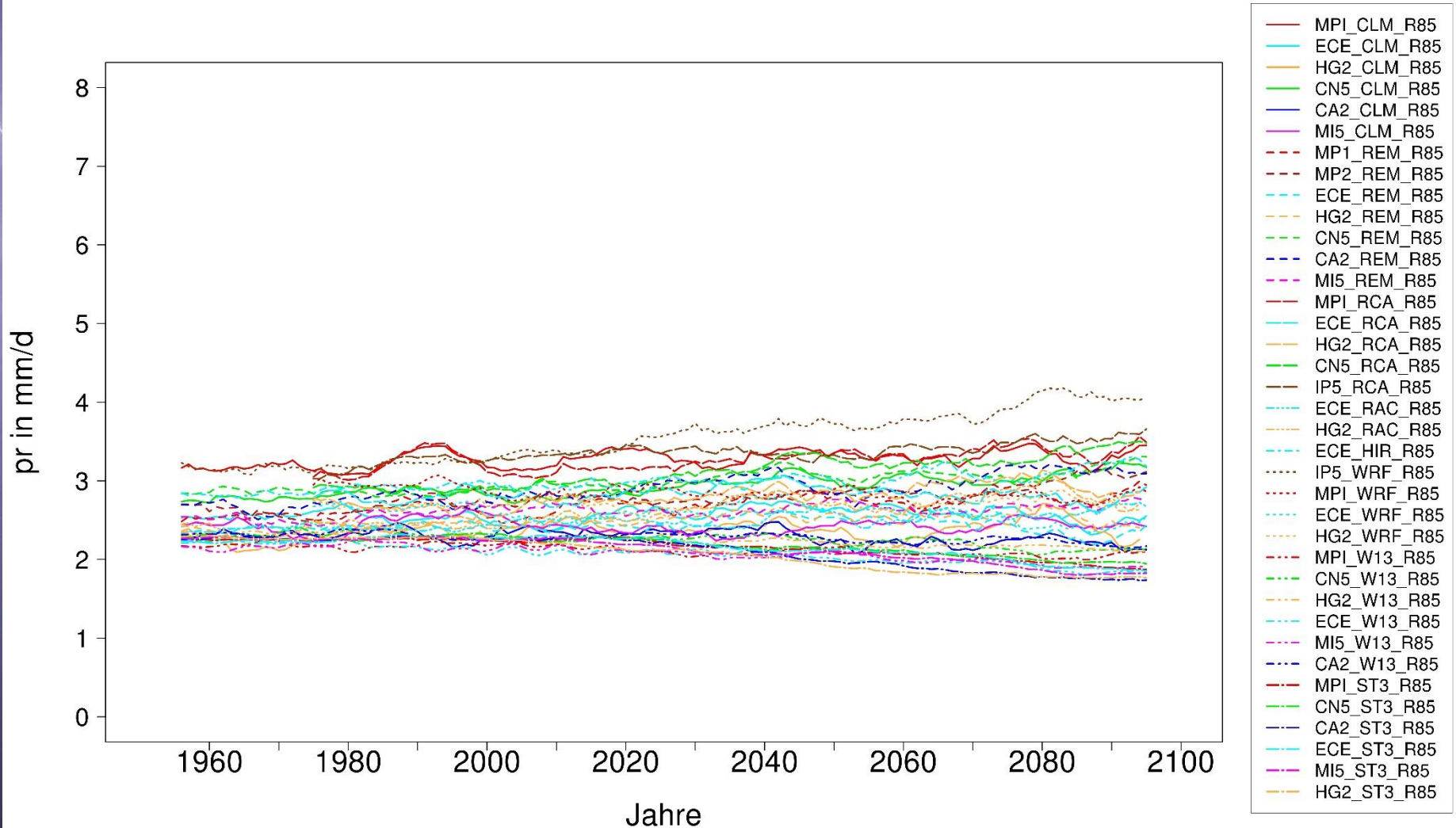
- Niederschlagstage  $\geq 10$  mm/Tag
- Niederschlagstage  $\geq 20$  mm/Tag
- Niederschlagssumme oberhalb des 95. und 99. Perzentils

# Die Simulationen

GCM + RCP/RCM	CCLM	REMO	WRF	WR'13	STARS	RCA4	RACMO	HIRHAM5
EC-EARTH RCP2.6	EURO CORDEX					EURO CORDEX	EURO CORDEX	EURO CORDEX
HADGEM2-ES RCP2.6						EURO CORDEX	EURO CORDEX	
MPI-ESM-LR RCP2.6		EURO CORDEX				EURO CORDEX		
MPI-ESM-LR RCP8.5	EURO CORDEX	EURO CORDEX	EURO CORDEX			EURO CORDEX		
CNRM-CM5 RCP8.5	EURO CORDEX					EURO CORDEX		
HADGEM2-ES RCP8.5	EURO CORDEX					EURO CORDEX	EURO CORDEX	
EC-EARTH RCP8.5	EURO CORDEX					EURO CORDEX	EURO CORDEX	EURO CORDEX
Can-ESM RCP8.5								
MIROC5 RCP8.5								
IPSL-INERIS RCP8.5			EURO CORDEX			EURO CORDEX		

# Jährlicher Niederschlag

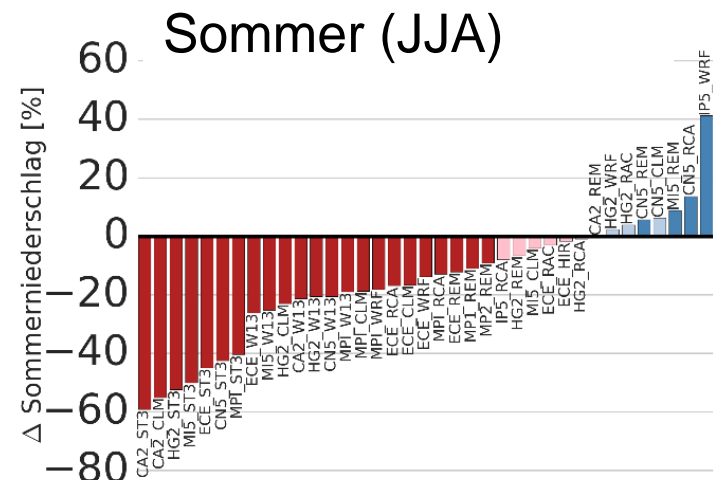
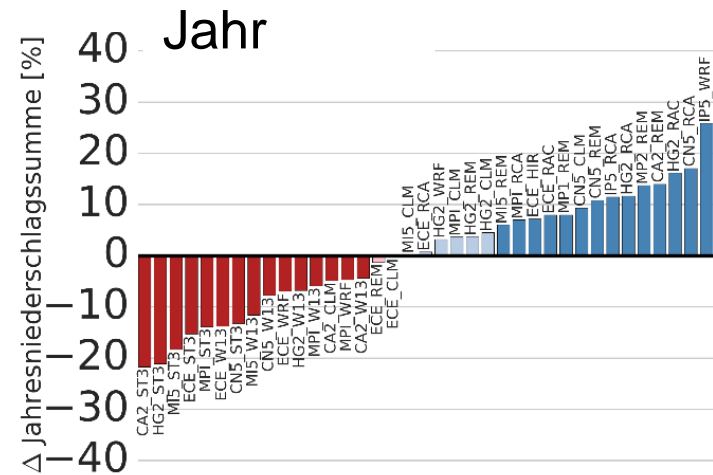
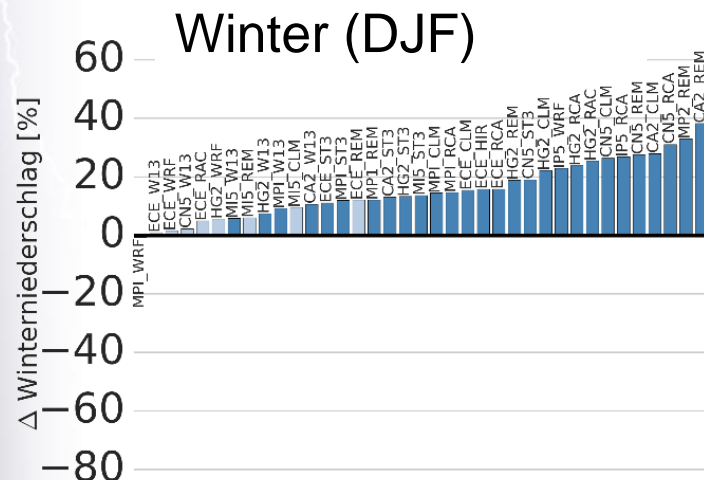
ReKliEs-De Gebiet, RCP8.5, 11-jähriges gleitendes Mittel





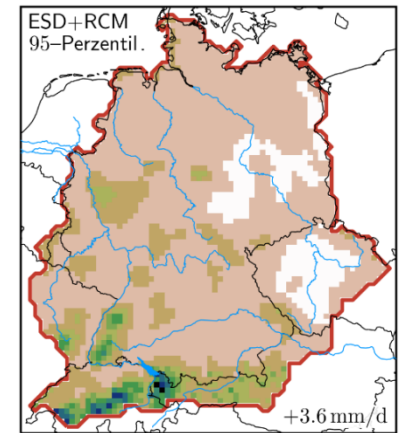
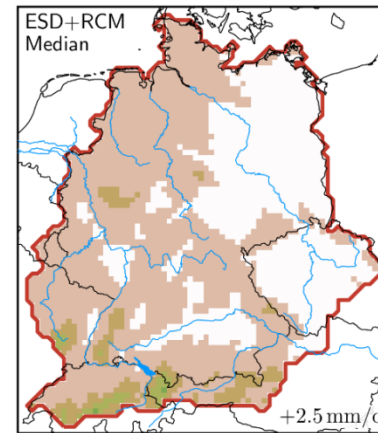
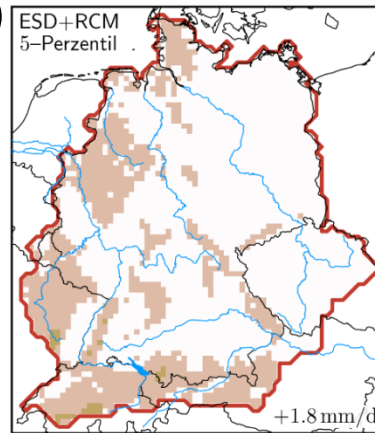
# Änderung des Niederschlags

ReKliEs-De Gebiet, RCP8.5,  
(2070-2099) minus (1971-2000)

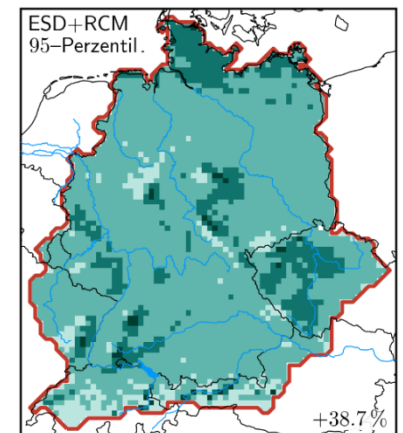
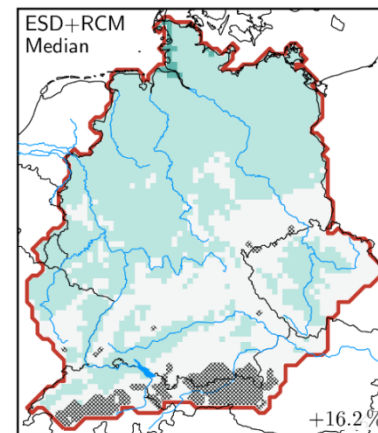
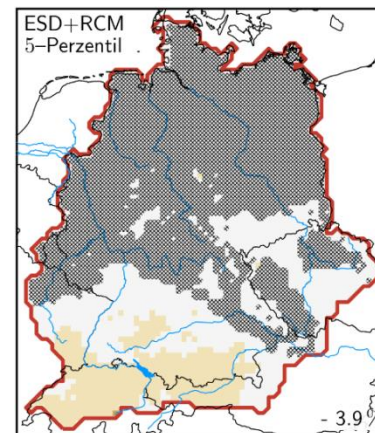
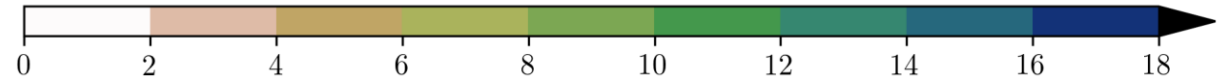


# Änderung des Winterniederschlags

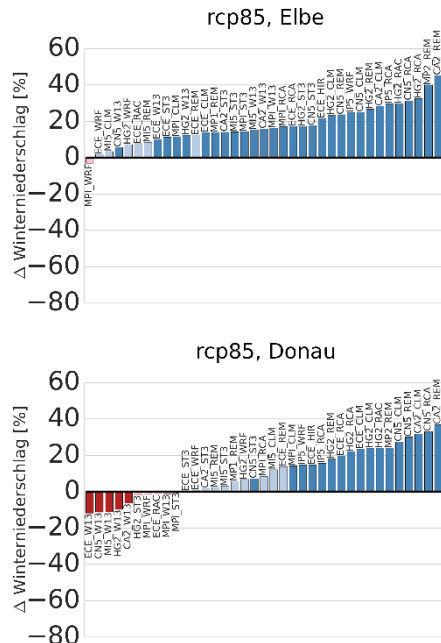
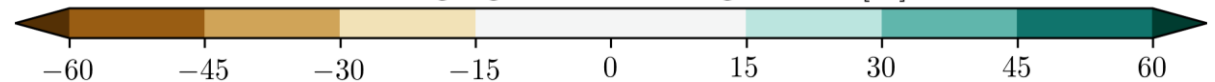
(2071-2100) – (1971-00)



Niederschlagssumme [mm/d]

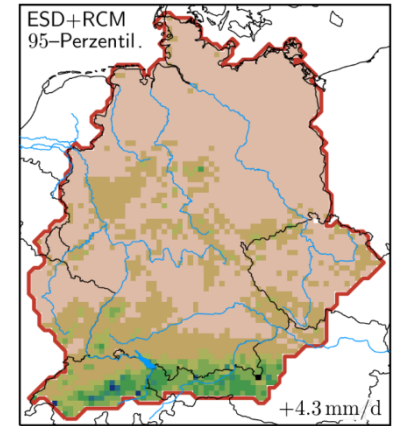
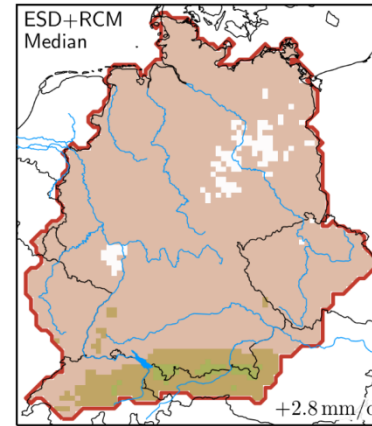
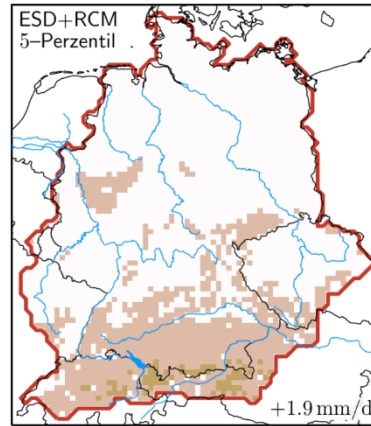


Änderungssignal Niederschlagssumme [%]

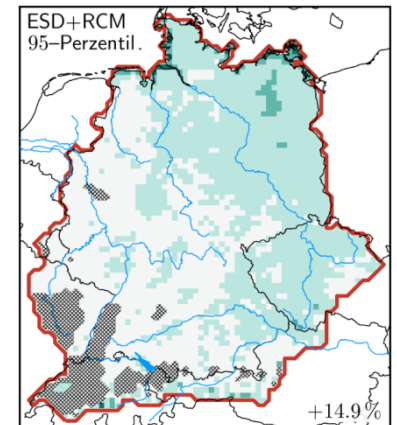
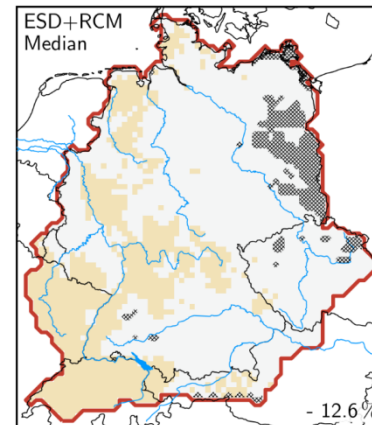
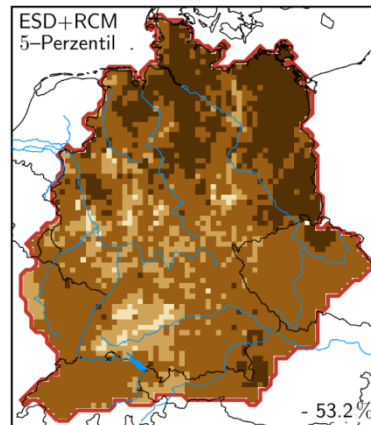
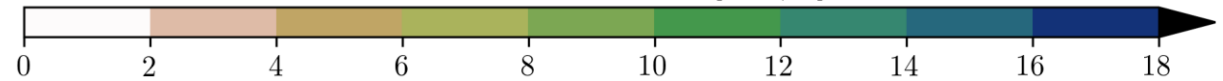


# Änderung des Sommerniederschlags

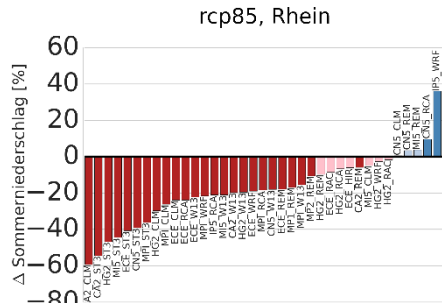
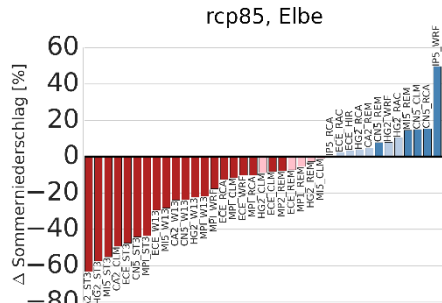
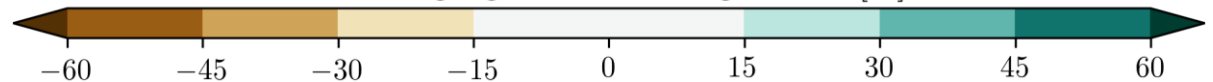
(2071-2100) – (1971-00)



Niederschlagssumme [mm/d]



Änderungssignal Niederschlagssumme [%]





# Änderung der Anzahl der trockenen Tage

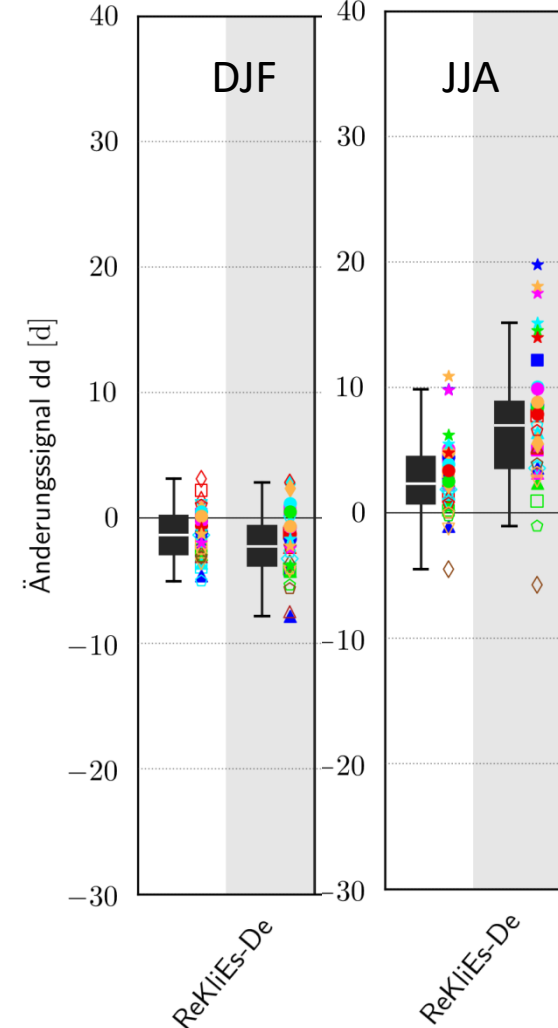
1971-2000 ReKliEs-De Gebiet Ensemble Median:

Anzahl der trockenen Tage < 1mm = 236 pro Jahr

Anzahl der nassen Tage  $\geq$  1mm = 128 pro Jahr

Anzahl der trockenen Tage/Saison= 56 (DJF), 58 (JJA)

$\Delta$  2021-2050 und  $\Delta$  2071-2100

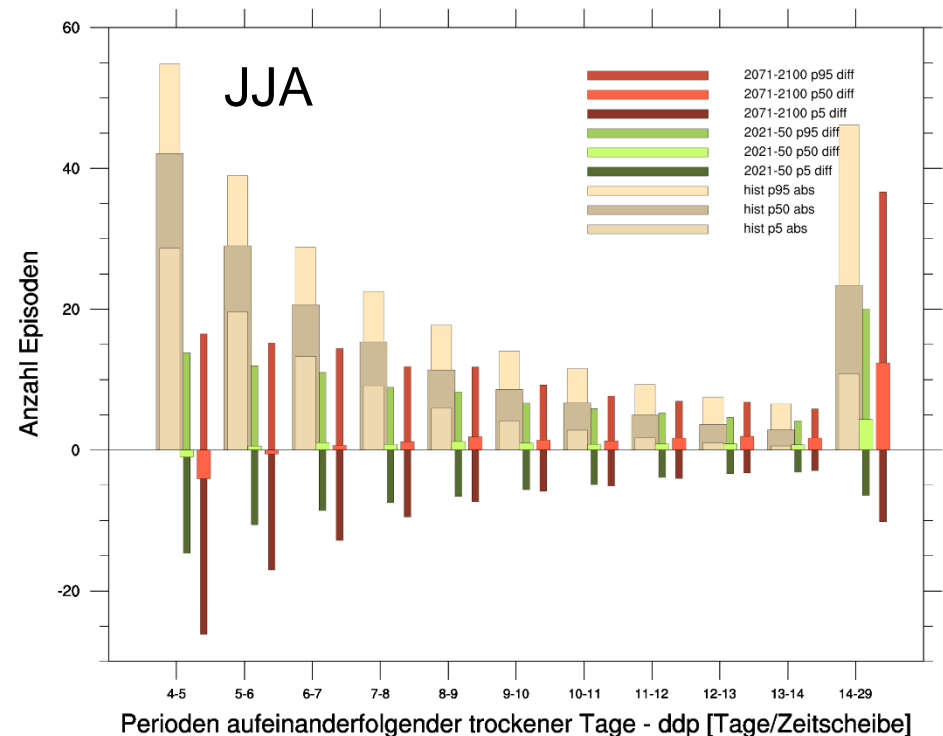
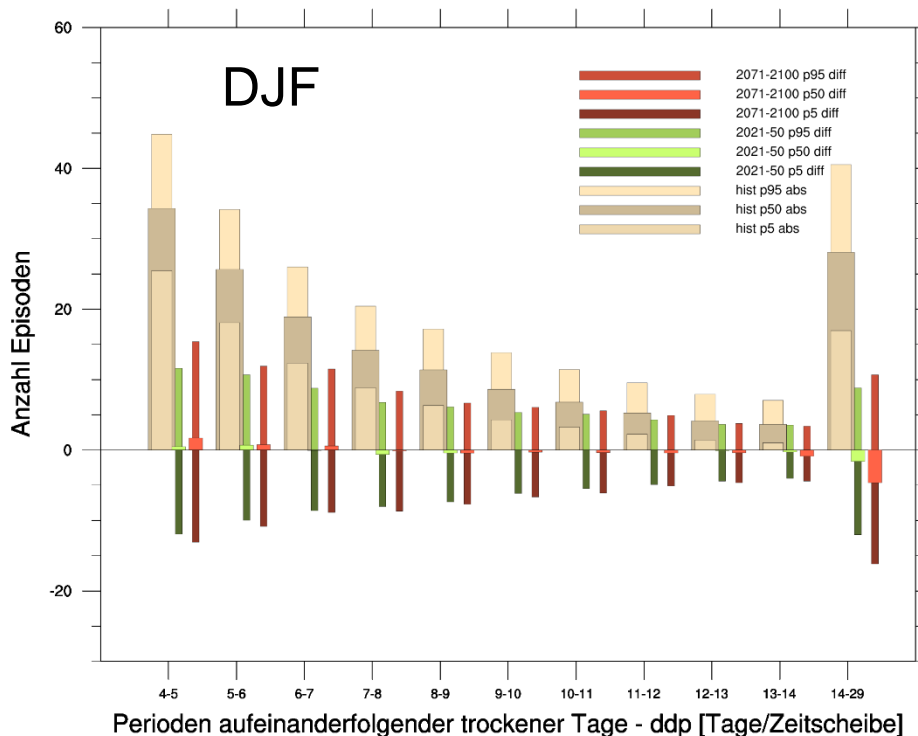


- |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|
| CA2   | CN5   | ECE   | HG2   | IP5   | MI5   | MPI   |
| ■ CLM | □ CLM | □ CLM | □ CLM |       | ■ CLM | □ CLM |
|       |       | ◇ HIR |       |       |       |       |
|       |       | ▽ RAC | ▽ RAC |       |       |       |
|       | ◇ RCA | ◇ RCA | ◇ RCA | ◇ RCA |       | ◇ RCA |
| ▲ REM | ▲ REM | ▲ REM | ▲ REM |       | ▲ REM | ▲ REM |
| ★ ST3 | ★ ST3 | ★ ST3 | ★ ST3 |       | ★ ST3 | ★ ST3 |
| ● W13 | ● W13 | ● W13 | ● W13 |       | ● W13 | ● W13 |
|       | ◇ WRF | ◇ WRF | ◇ WRF | ◇ WRF | ◇ WRF | ◇ WRF |

# Anzahl der Perioden aufeinanderfolgender trockener Tage

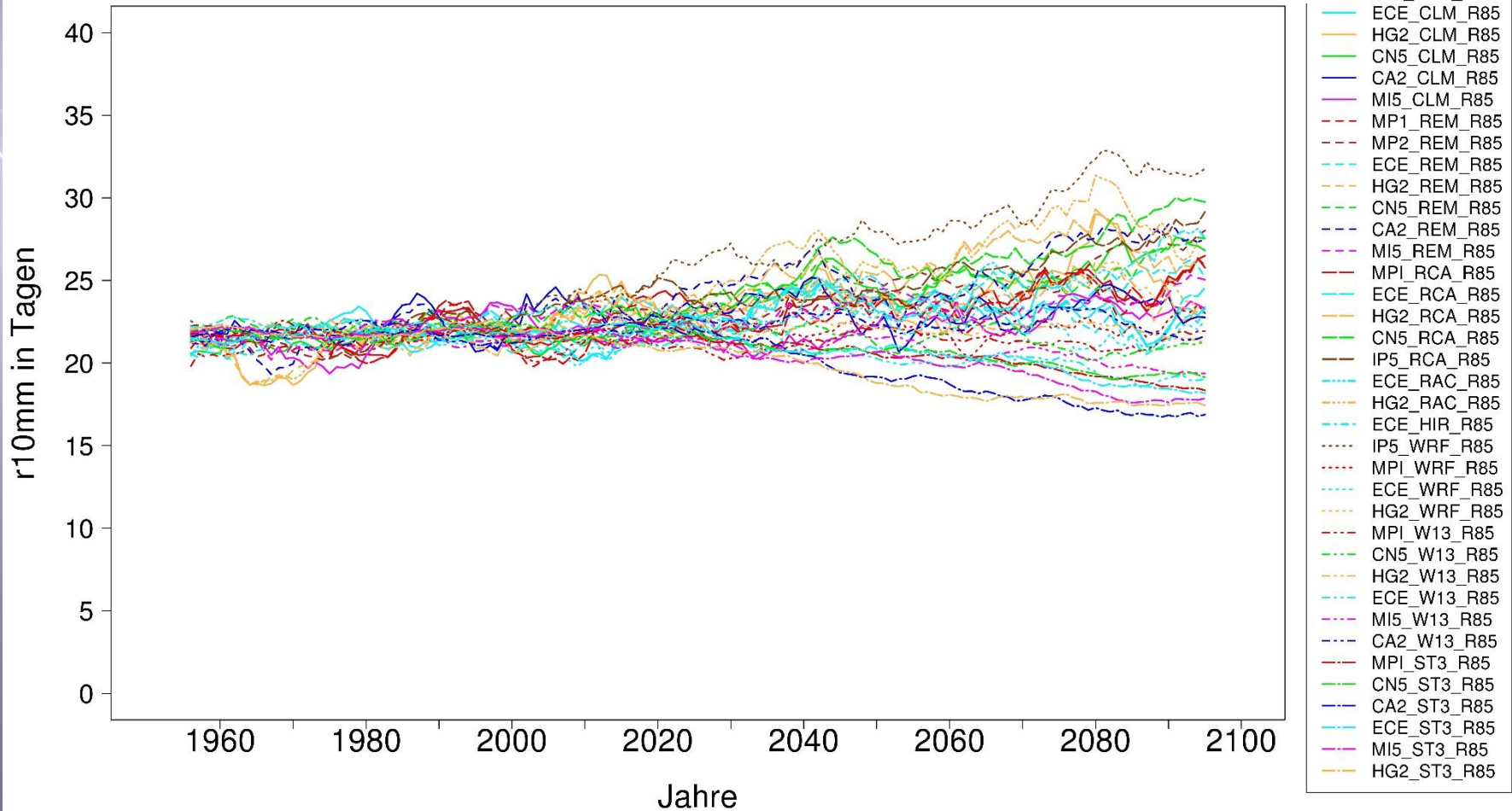
ReKliEs-De Gebiet

trockener Tag < 1mm /Tag



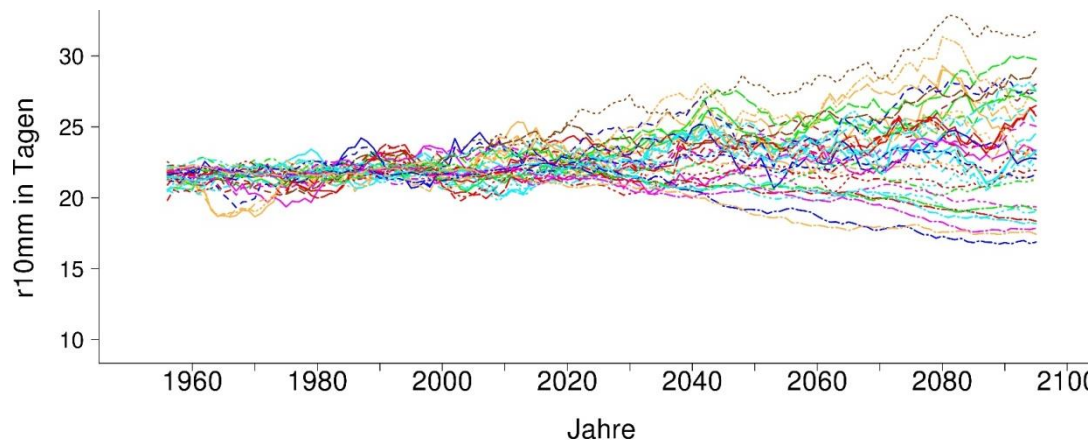
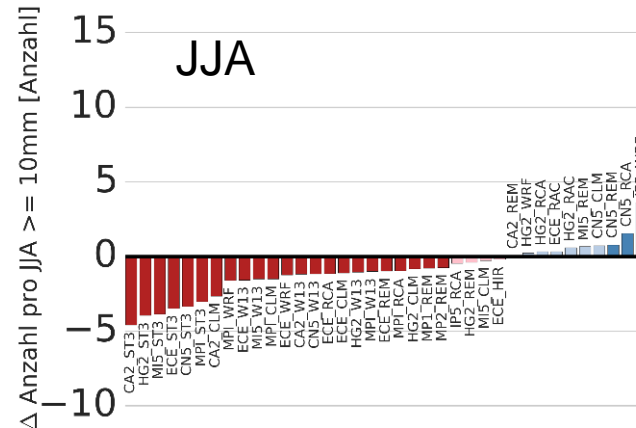
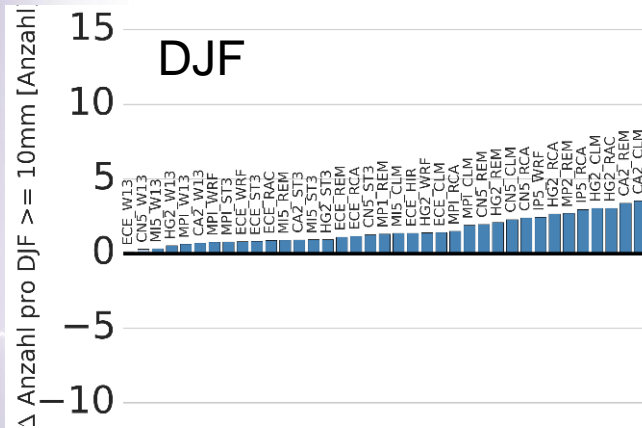
# Jährliche Anzahl der Niederschlagstage $\geq 10\text{mm}/\text{Tag}$

ReKliEs-De Gebiet, RCP8.5, 11-jähriges gleitendes Mittel



# Änderung der Anzahl von Niederschlagstagen $\geq 10\text{mm}/\text{Tag}$

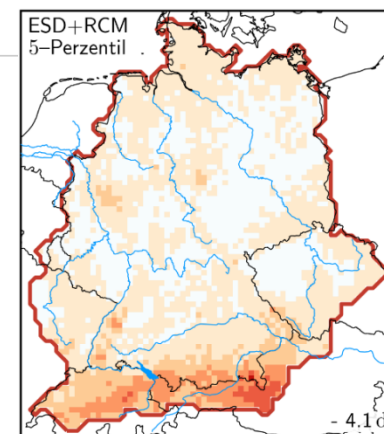
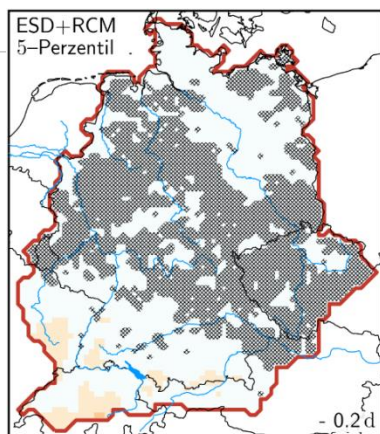
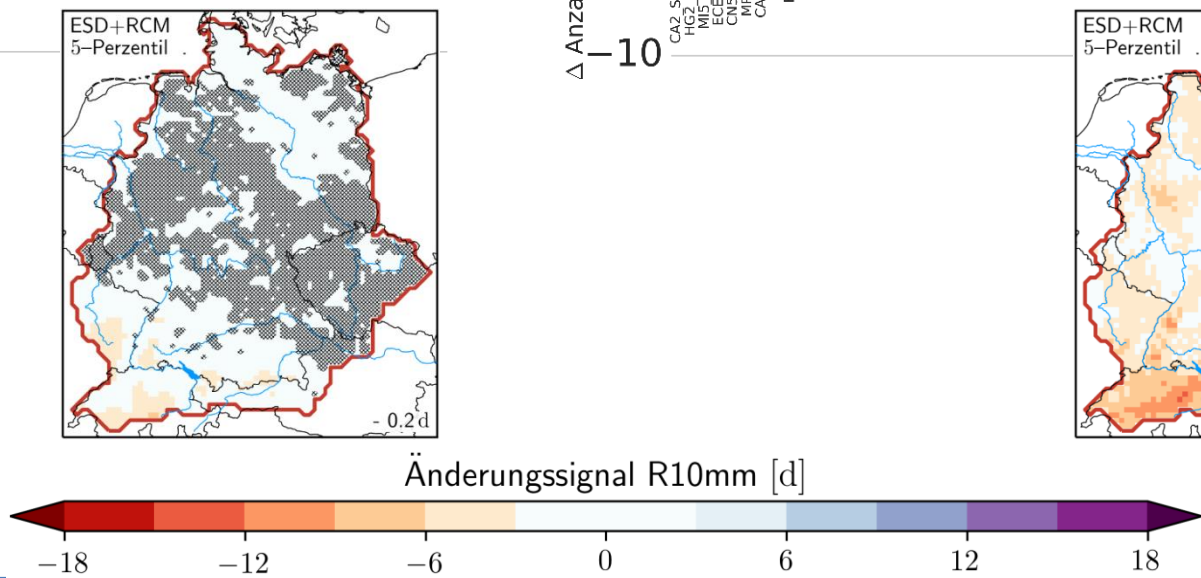
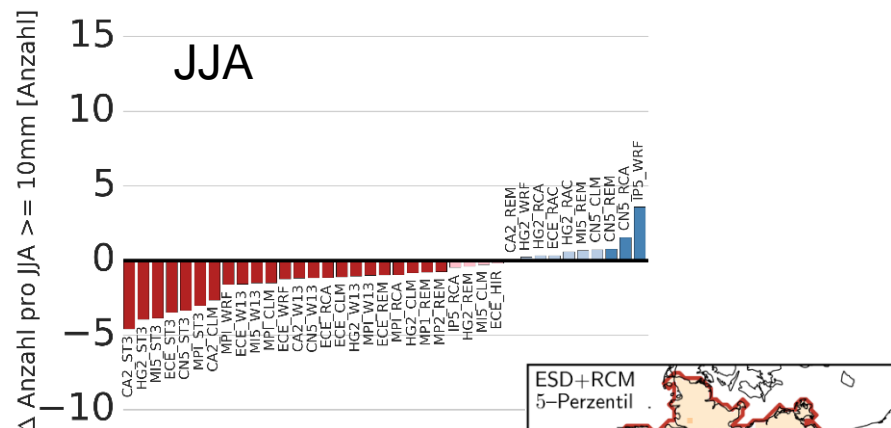
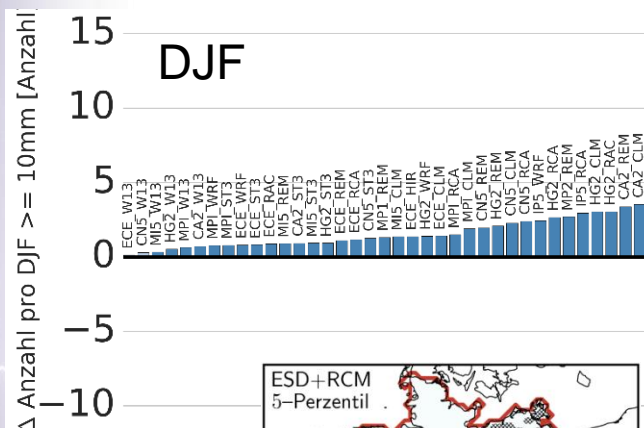
ReKliEs-De Gebiet, RCP8.5, 2070-99 minus 1971-2000



- MPI\_CLM\_R85
- ECE\_CLM\_R85
- HG2\_CLM\_R85
- CN5\_CLM\_R85
- CA2\_CLM\_R85
- MI5\_CLM\_R85
- - - MP1\_REM\_R85
- - - MP2\_REM\_R85
- - - ECE\_REM\_R85
- - - HG2\_REM\_R85
- - - CN5\_REM\_R85
- - - CA2\_REM\_R85
- - - MI5\_REM\_R85
- - - MPI\_RCA\_R85
- - - ECE\_RCA\_R85
- - - HG2\_RCA\_R85
- - - CN5\_RCA\_R85
- - - IP5\_RCA\_R85
- - - ECE\_RAC\_R85
- - - HG2\_RAC\_R85
- - - ECE\_HIR\_R85
- - - IP5\_WRF\_R85
- - - MPI\_WRF\_R85
- - - ECE\_WRF\_R85
- - - HG2\_WRF\_R85
- - - MPI\_W13\_R85
- - - CN5\_W13\_R85
- - - HG2\_W13\_R85
- - - ECE\_W13\_R85
- - - MI5\_W13\_R85
- - - CA2\_W13\_R85
- - - MPI\_ST3\_R85
- - - CN5\_ST3\_R85
- - - CA2\_ST3\_R85
- - - ECE\_ST3\_R85
- - - MI5\_ST3\_R85
- - - HG2\_ST3\_R85

# Änderung der Anzahl von Niederschlagstagen $\geq 10\text{mm}/\text{Tag}$

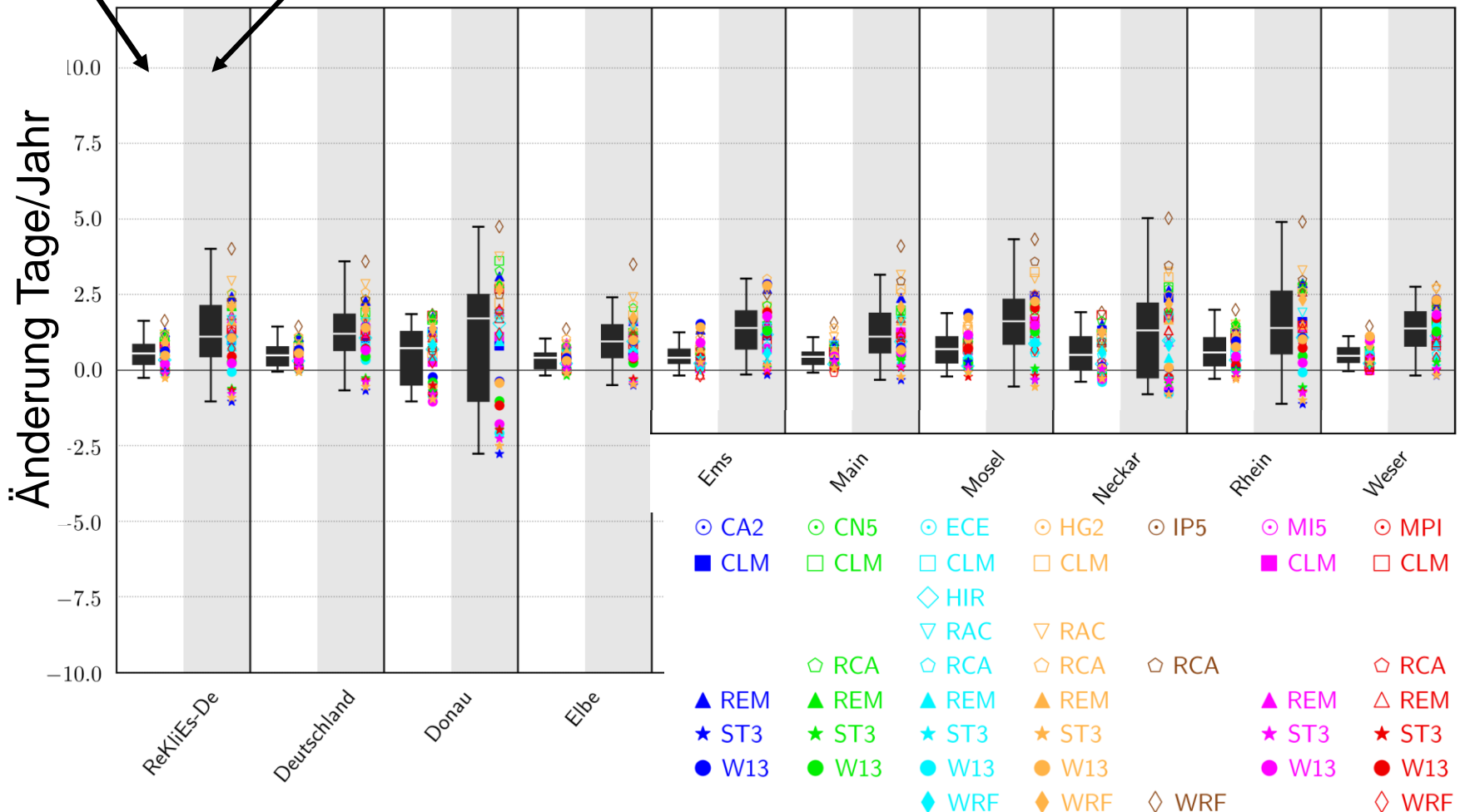
ReKliEs-De Gebiet, RCP8.5, 2070-99 minus 1971-2000





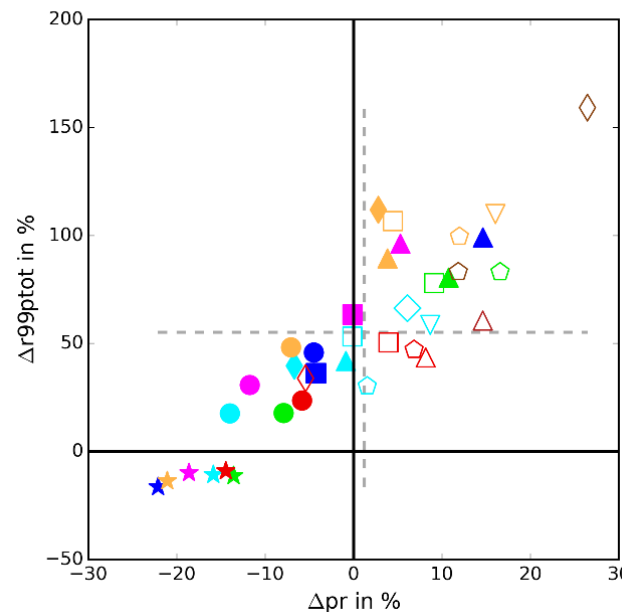
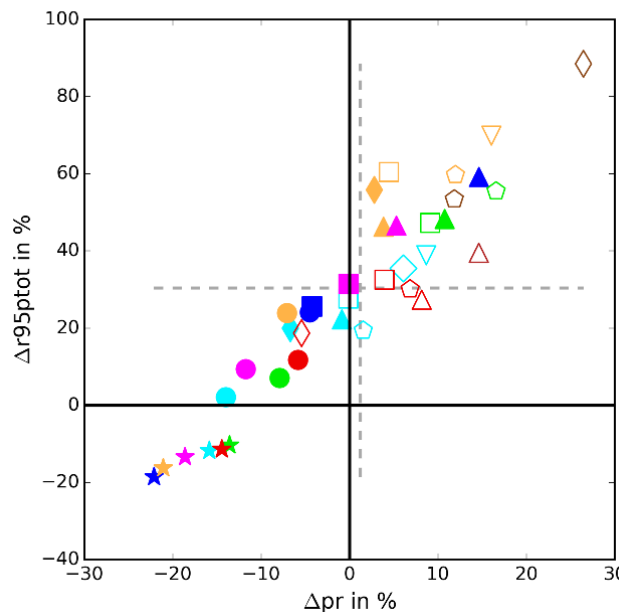
# Änderung der Anzahl von Niederschlagstagen $\geq 20\text{mm/Tag}$

2021-50, 2071-2100 minus (1971-2000)



# Änderung der Niederschlagsmenge oberhalb des 95. und 99. Perzentsils pro Jahr

ReKliEs-De Gebiet, RCP8.5, 2071-2100 minus 1971-2000



- |               |               |               |
|---------------|---------------|---------------|
| ■ CA2_CLM_R85 | ▲ ECE_REM_R85 | ◇ IP5_WRF_R85 |
| ▲ CA2_REM_R85 | ★ ECE_ST3_R85 | ■ MI5_CLM_R85 |
| ★ CA2_ST3_R85 | ● ECE_W13_R85 | ▲ MI5_REM_R85 |
| ● CA2_W13_R85 | ◆ ECE_WRF_R85 | ★ MI5_ST3_R85 |
| ○ CN5_CLM_R85 | □ HG2_CLM_R85 | ● MI5_W13_R85 |
| ○ CN5_RCA_R85 | ▽ HG2_RAC_R85 | □ MP1_CLM_R85 |
| ▲ CN5_REM_R85 | ○ HG2_RCA_R85 | ○ MP1_RCA_R85 |
| ★ CN5_ST3_R85 | ▲ HG2_REM_R85 | △ MP1_REM_R85 |
| ● CN5_W13_R85 | ★ HG2_ST3_R85 | ★ MP1_ST3_R85 |
| □ ECE_CLM_R85 | ● HG2_W13_R85 | ● MP1_W13_R85 |
| ◆ ECE_HIR_R85 | ◆ HG2_WRF_R85 | ◇ MP1_WRF_R85 |
| ▽ ECE_RAC_R85 | ○ IP5_RCA_R85 | △ MP2_REM_R85 |
| ○ ECE_RCA_R85 |               |               |



# Zusammenfassung

## Saisonale Unterschiede in der Niederschlagsänderung

### Sommer:

- Zunahme der Anzahl der trockenen Tage  $\leq 1\text{mm}/\text{Tag}$
- Zunahme langer Perioden aufeinanderfolgender trockener Tage

### Winter:

- Zunahme des Winterniederschlags
- Zunahme der Anzahl von Tagen mit Niederschlag  $\geq 10\text{ mm}$
- Zunahme der Anzahl von Tagen mit Niederschlag  $\geq 20\text{ mm}$
- Horizontale Variabilität (Donau Einzugsgebiet)

Zunahme der Niederschlagsmengen pro Jahr  
oberhalb des 95. und 99. Perzentiles (nicht STARS)

Zunahme der Bandbreite von Änderungen zum Ende des 21. Jhr.

# Vielen Dank !