

## SUMMARY

The Black Sea Basin -> Climate change hotspot

Increase in the climate extremes

Complex topography -> High-resolution climate information is required

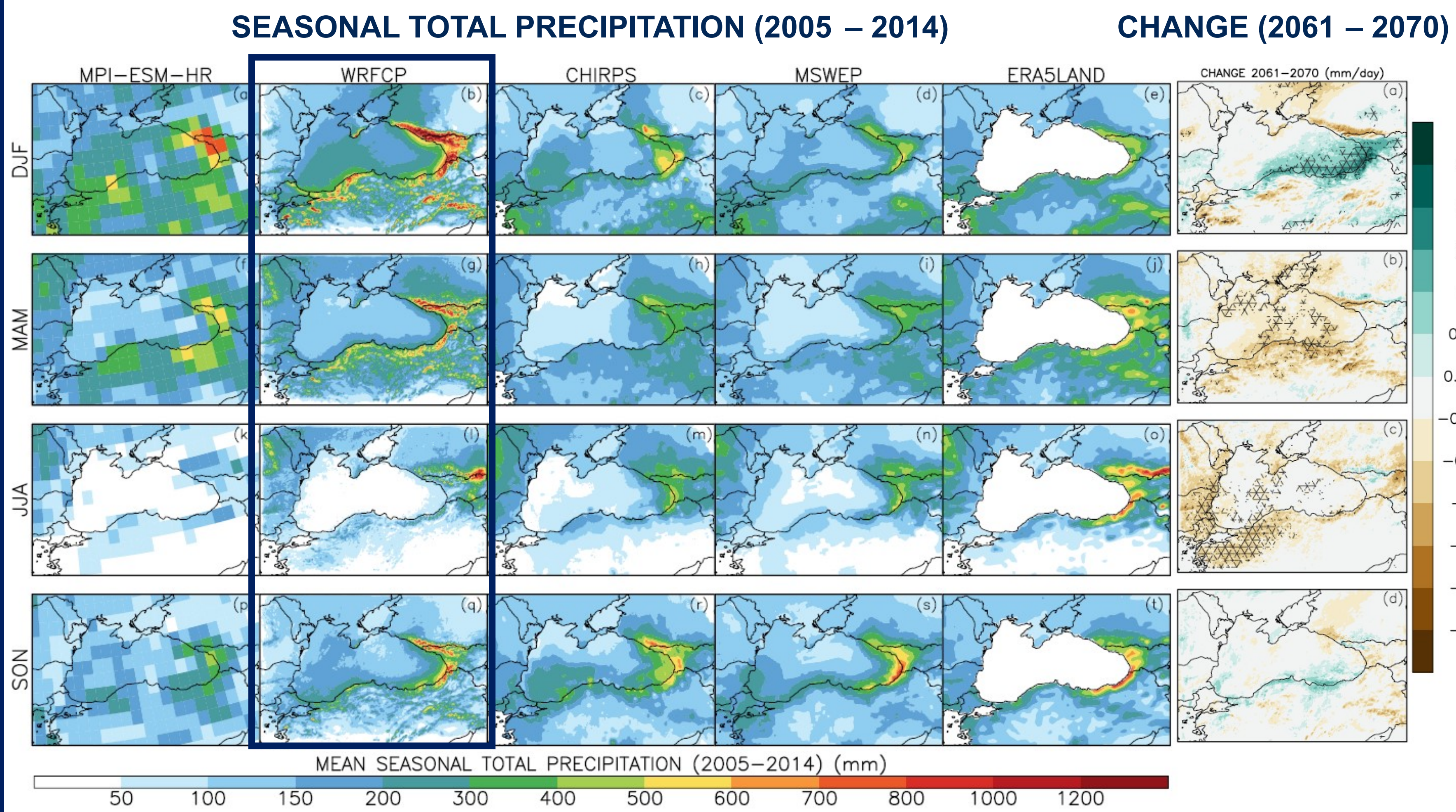
CMIP6 based convection-permitting climate simulations using WRF model

CMIP6 MPI-ESM1.2-HR (100km) -> WRF -> 3km  
2005 – 2014 (HIST) | 2061 – 2070 (SSP3-7.0)

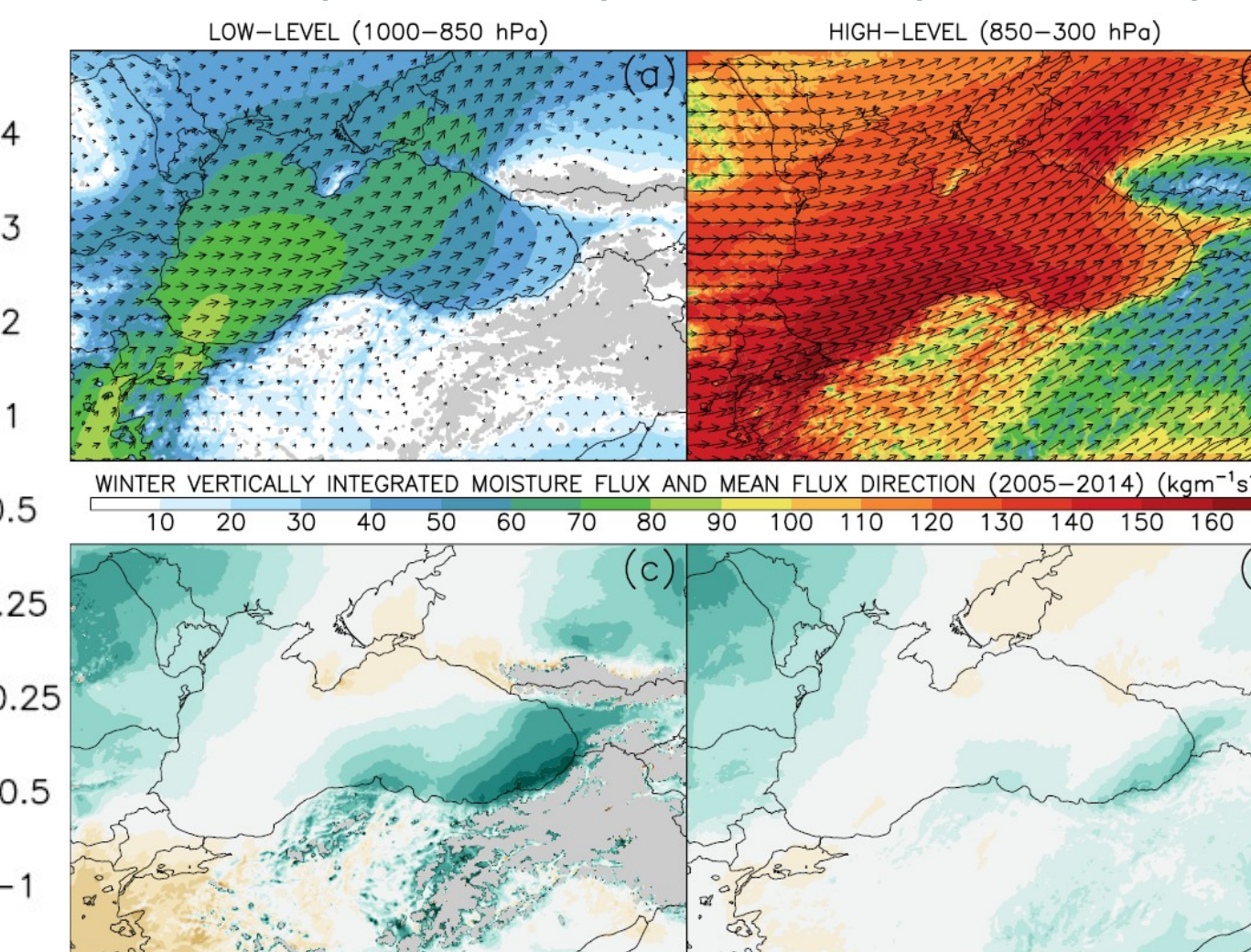
## DOMAIN & WRF (V3.9.1) MODEL CONFIGURATION

WRF (V3.9.1) MODEL CONFIGURATION

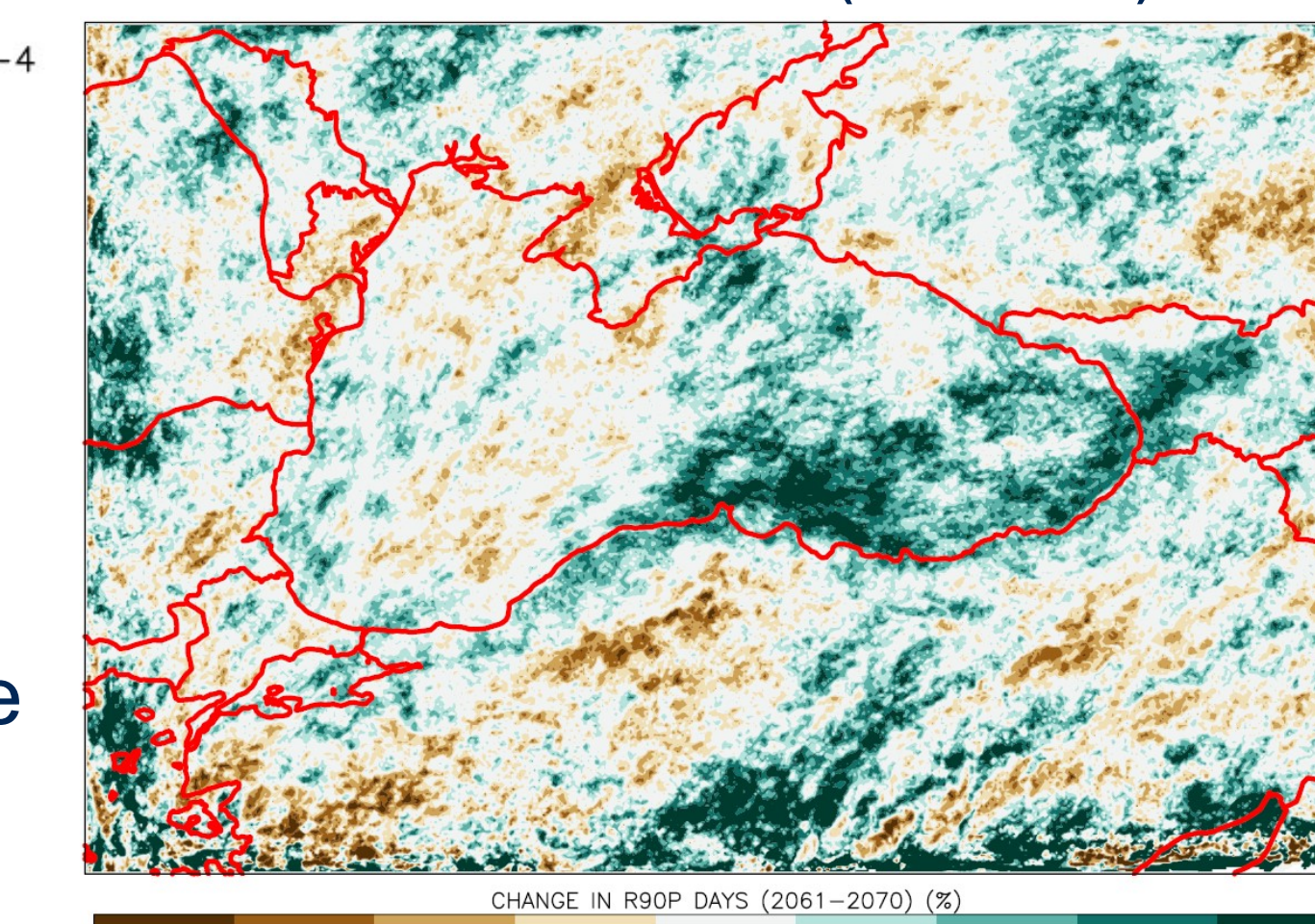
- 3 km horizontal resolution (547x364 grids)
- 50 vertical levels
- Thompson microphysics scheme
- YSU Planetary Boundary Layer scheme
- RRTMG SW&LW radiation schemes
- Noah land-surface model



## WINTER VERTICALLY INTEGRATED MOISTURE FLUX (2005 – 2014) & CHANGE (2061 – 2070)

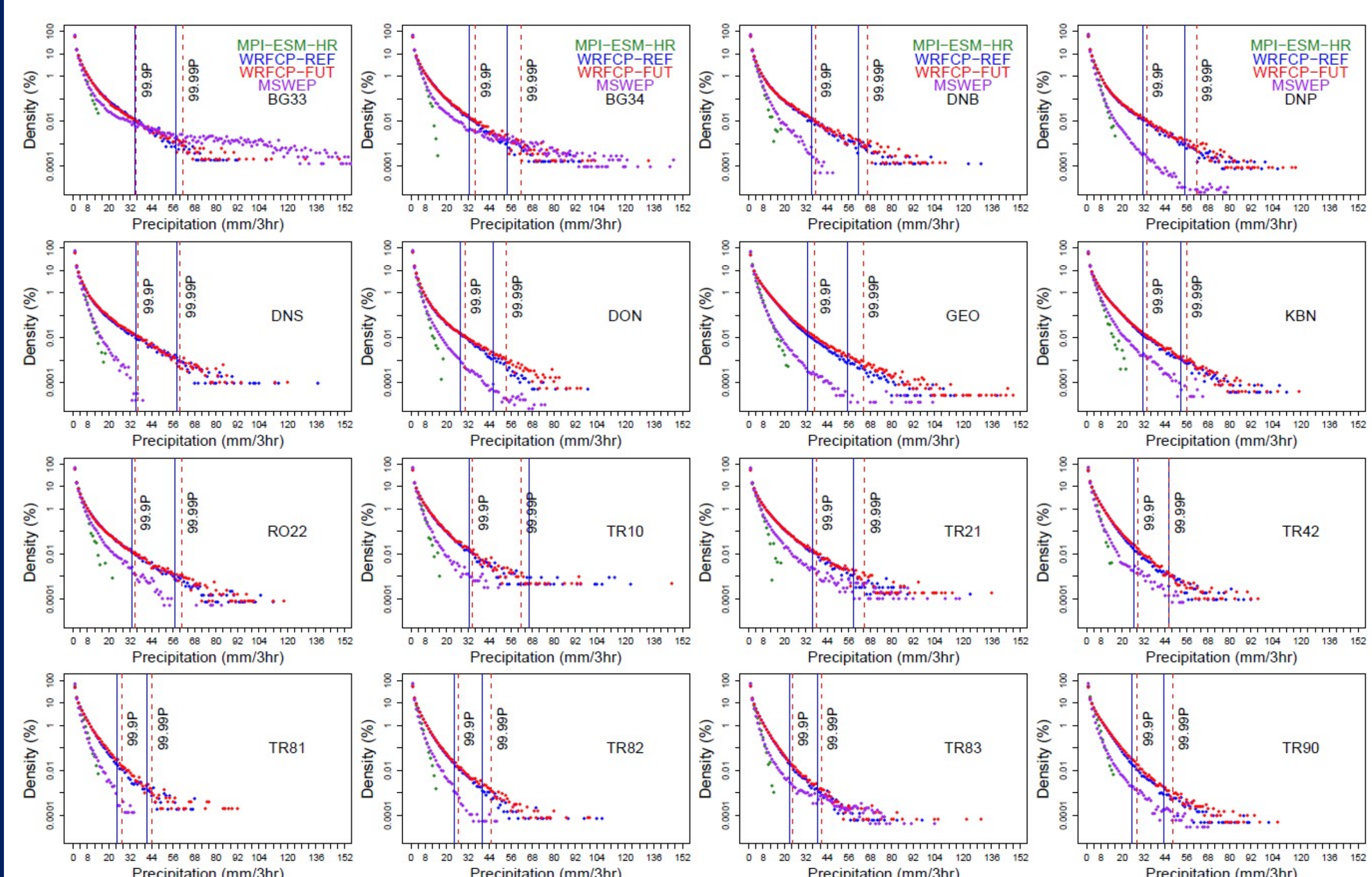


## R90P DAYS CHANGE (2061 – 2070)



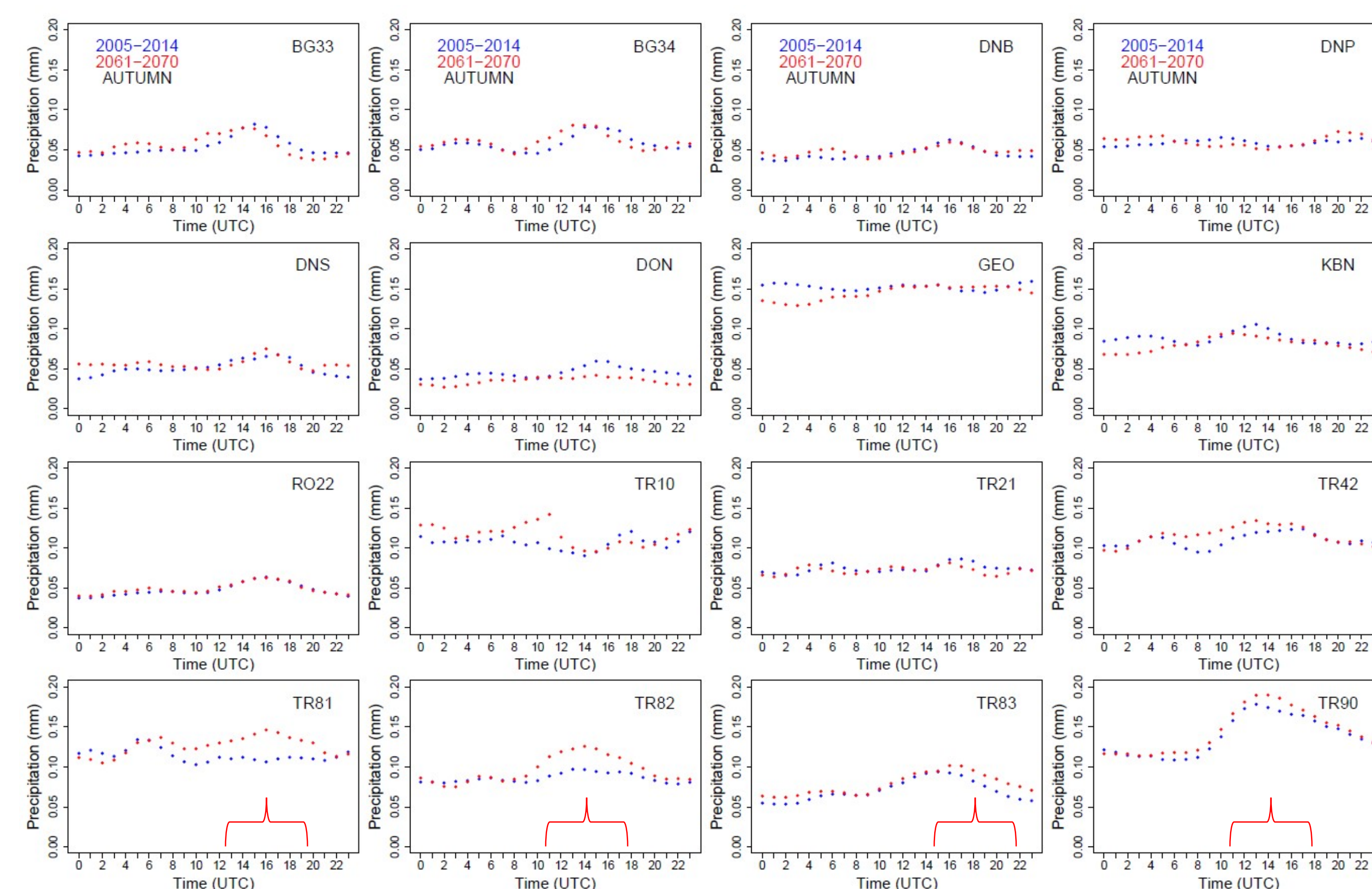
- The model simulates seasonal total precipitation well.
- The winter precipitation increases by about 3 mm/day over the Eastern Black Sea due to enhanced evaporation (~15%) and low-level moisture transport.
- Daily precipitation extremes intensify in the future.

## SUB-DAILY PRECIPITATION ANALYSES



MPI-ESM-HR  
WRF (2005 – 2014)  
WRF (2061 – 2070)  
MSWEP (OBS)

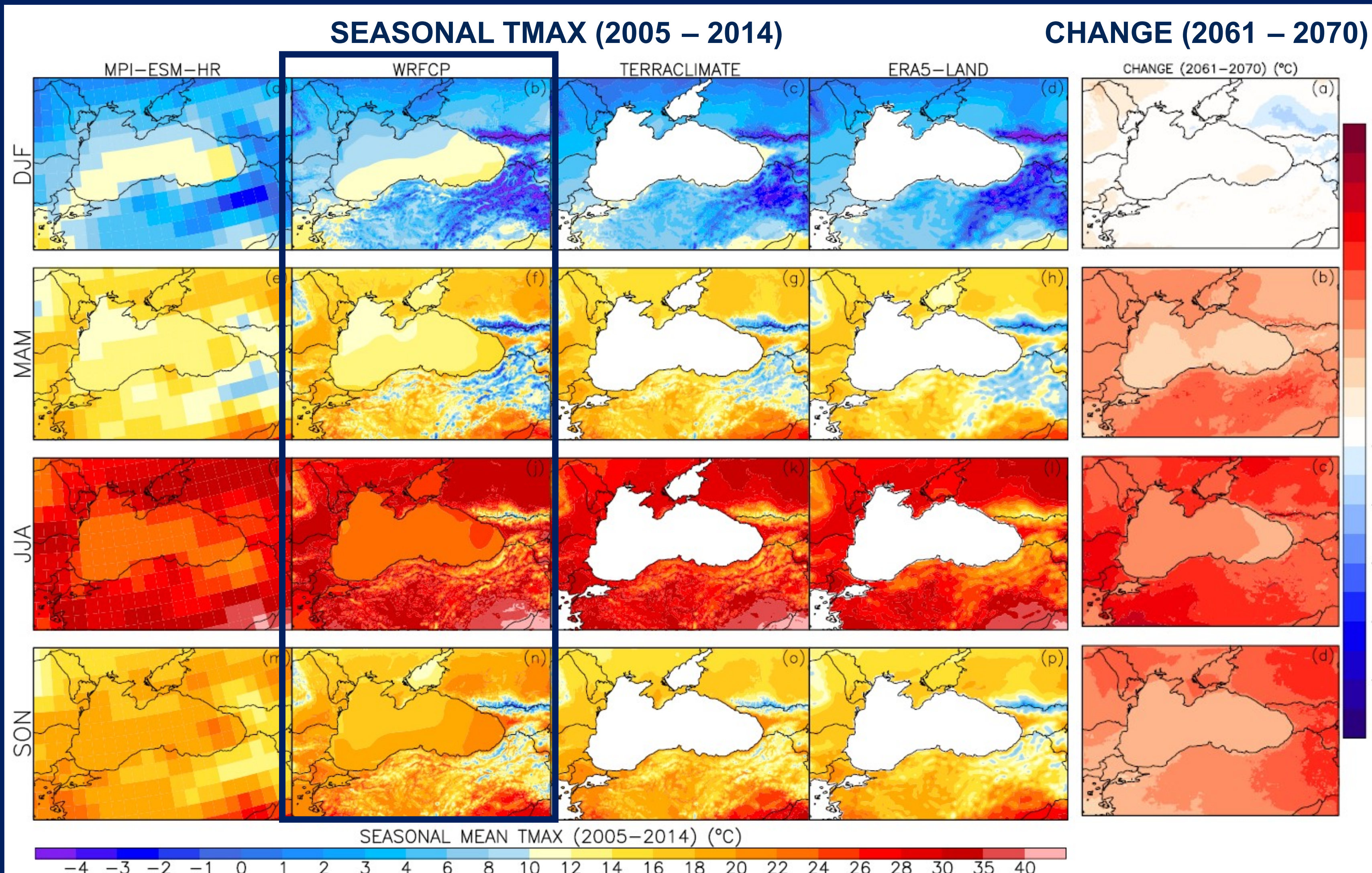
- WRF model (3-km) improves 3-hourly precipitation of MPI-ESM-HR (100-km) within the subregions of the Black Sea Basin
- Sub-daily precipitation increases in the future (exceeds 120 mm/3hr)



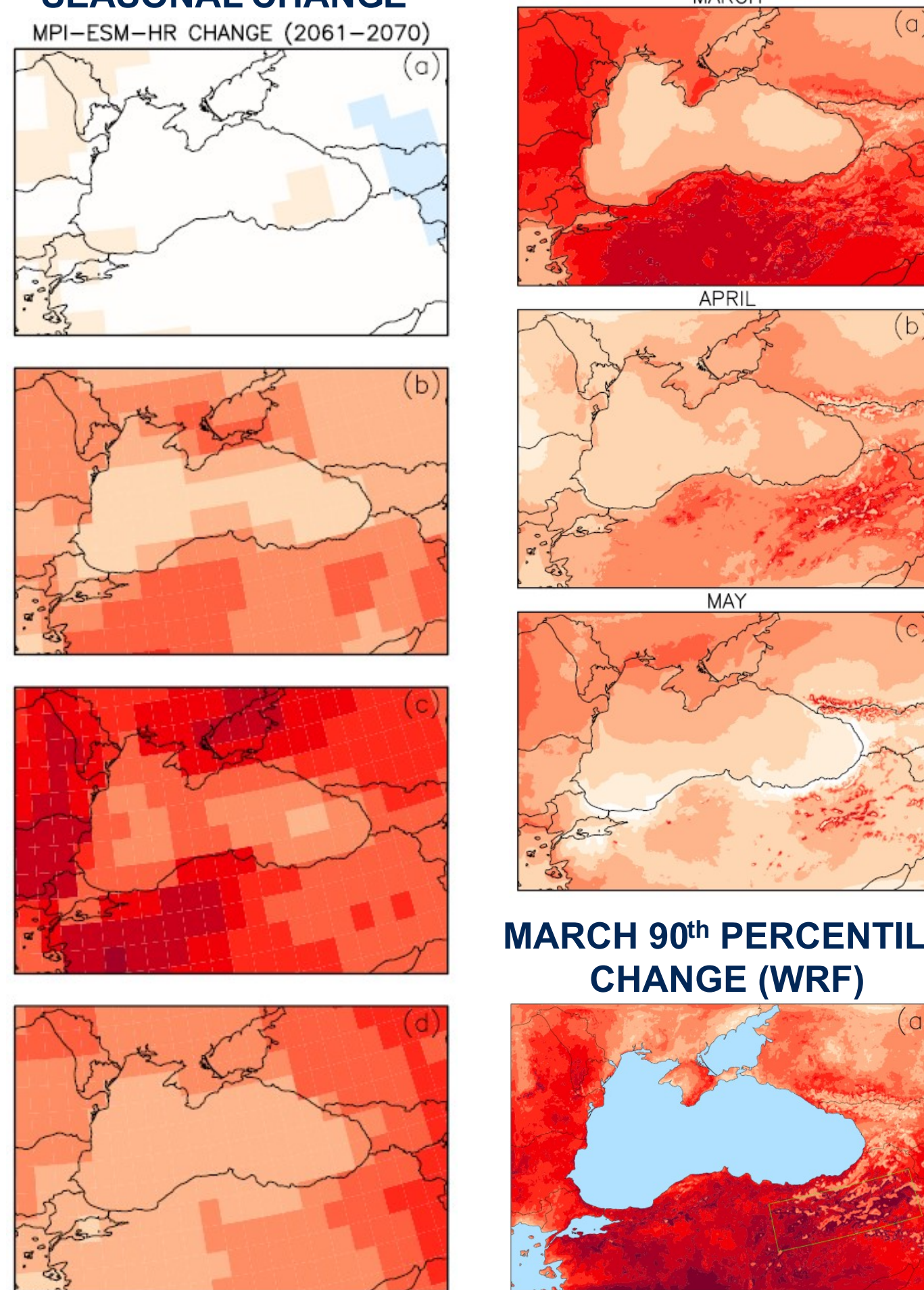
WRF (2005 – 2014)  
WRF (2061 – 2070)

AUTUMN HOURLY PRECIPITATION CYCLE

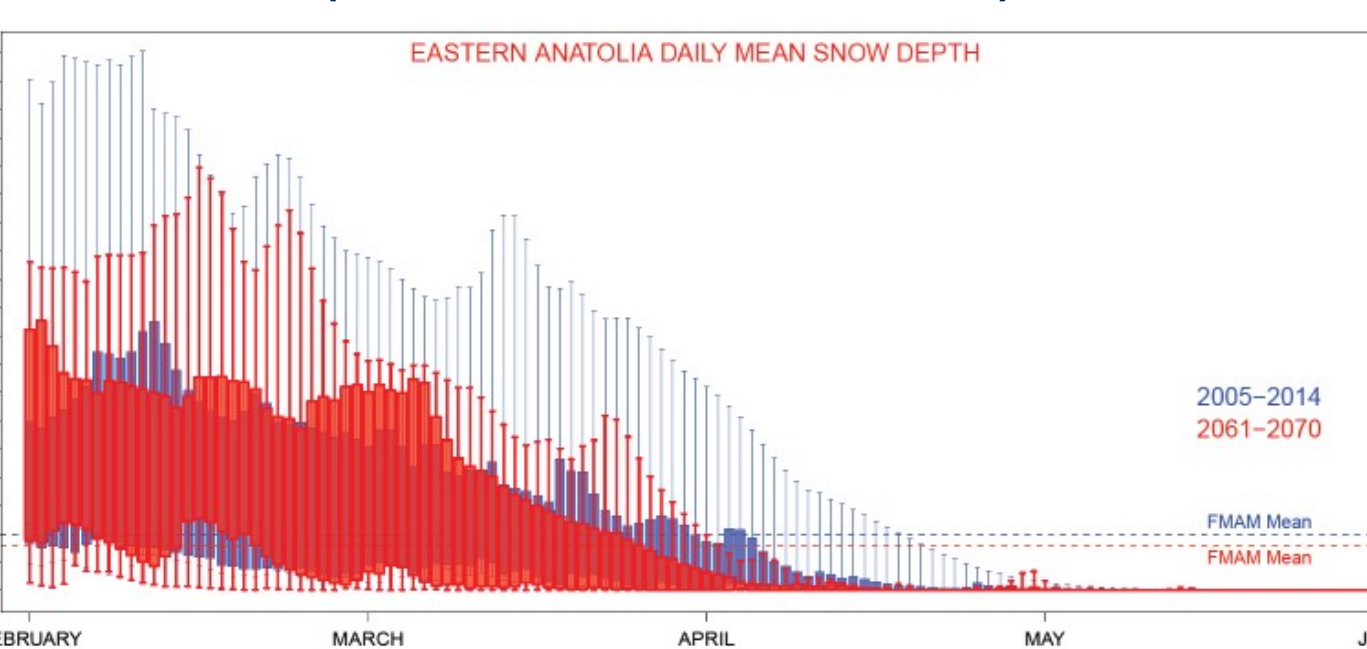
Afternoon precipitation intensifies in the autumn over the Black Sea coast of Turkey.



## MPI-ESM-HR SEASONAL CHANGE MONTHLY CHANGE (WRF)



## FEBRUARY-MARCH-APRIL-MAY EASTERN ANATOLIA DAILY MEAN SNOW DEPTH (2005 – 2014 & 2061 – 2070)



- The maximum air temperature increases in the spring, summer, and autumn by about 3°C. The suppressed warming in the winter is due to boundary conditions.
- The local warming maxima around 3.5°C in the spring over the Eastern Anatolia is due to shrinking snow cover (positive feedback). Significant warming in March.