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Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socio-Economic Vulnerability in the Arab Region

Comparison of RICCAR Results for the MENA Domain and other Regional Climate Modeling Domains

George Zittis
Post-doctoral Researcher
The Cyprus Institute
Cyprus

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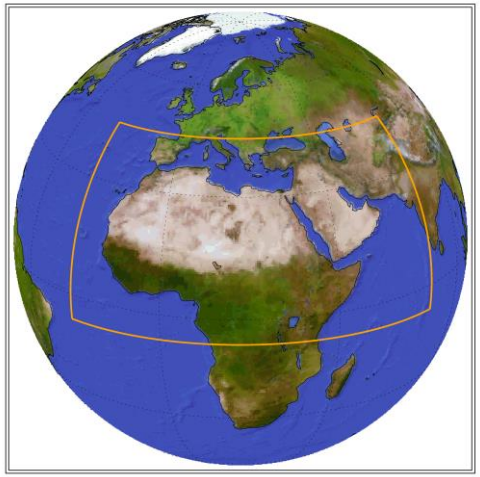
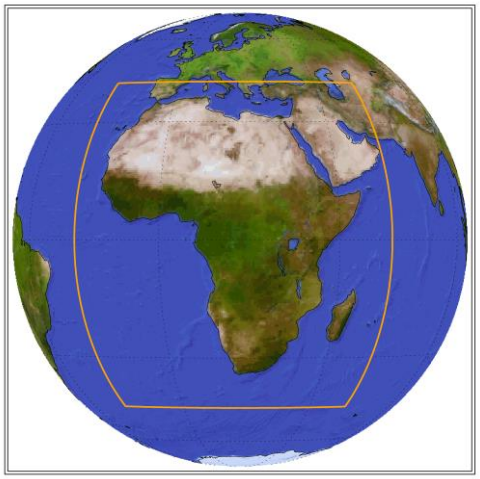
Overlaps between CORDEX domains

MENA



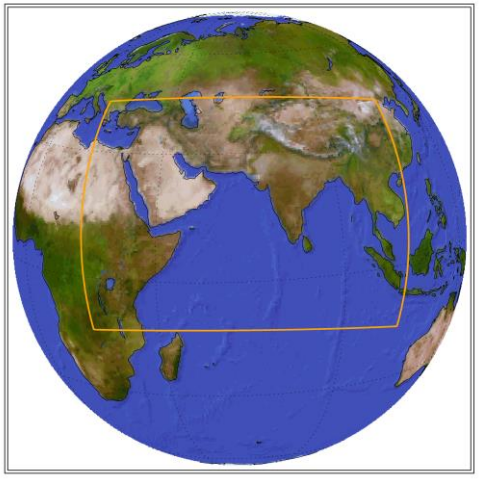
AFRICA



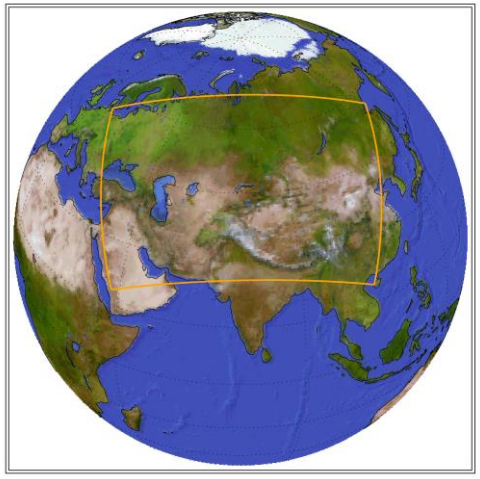
EUROPE

MEDITERRANEAN

EAST ASIA



CENTRAL ASIA



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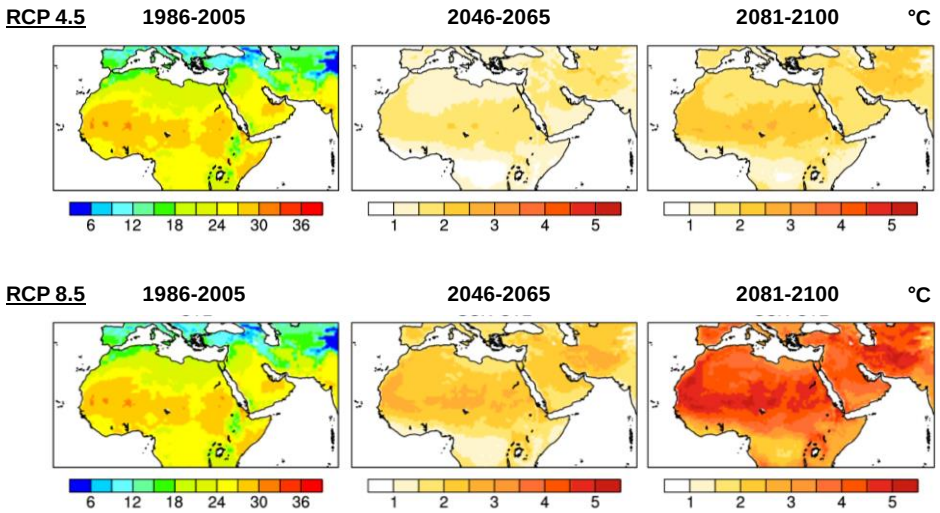
Overlaps between CORDEX domains

- CORDEX-AFRICA: Key region of CORDEX PHASE I / Large overlap with MENA-CORDEX domain
- Published literature mainly on model inter-comparison / validation or focus on parts of Africa out of MENA
- EURO-CORDEX: Large ensemble set of simulations available (0.44º and 0.11º)
- CA-CORDEX: limited number of future climate studies
- East Asia and MED-CORDEX: few studies on model validation/optimization
- **Missing available literature on systematic and coordinated climate change projections over the region!!!!**

RICCAR simulations for MENA (RCA4)

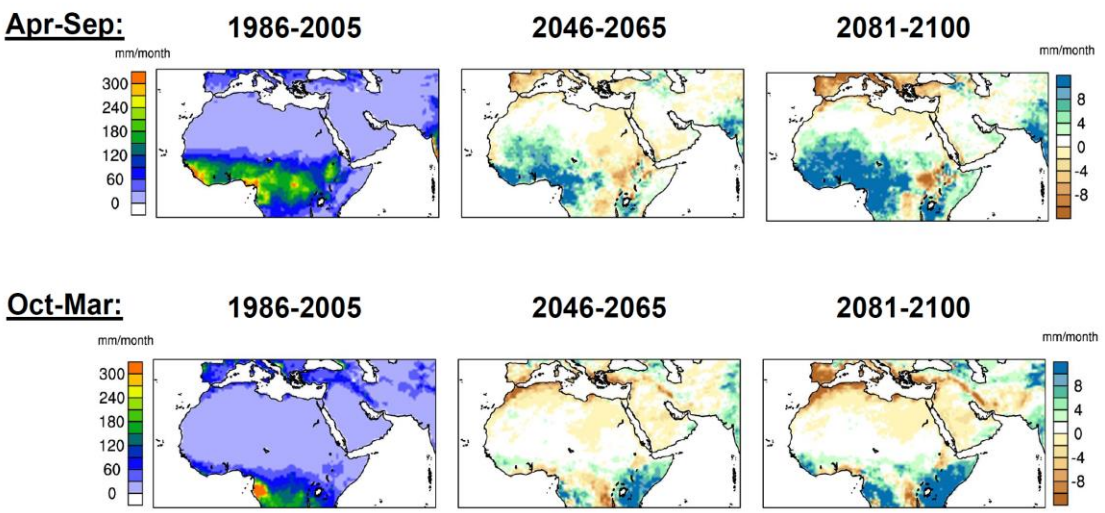


Annual temperature change:

- + 1.5-5 ºC for the end of the century
- Stronger warming in summer (not shown)

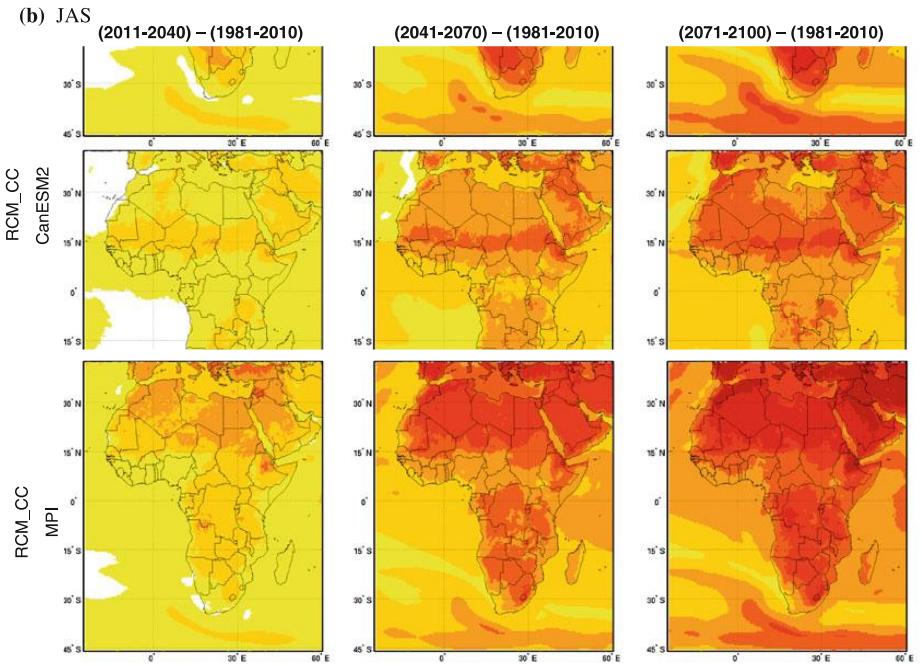
Seasonal precipitation change (RCP 8.5):

- General drying
- Stronger changes in wintertime

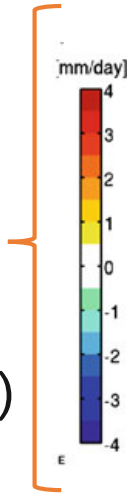


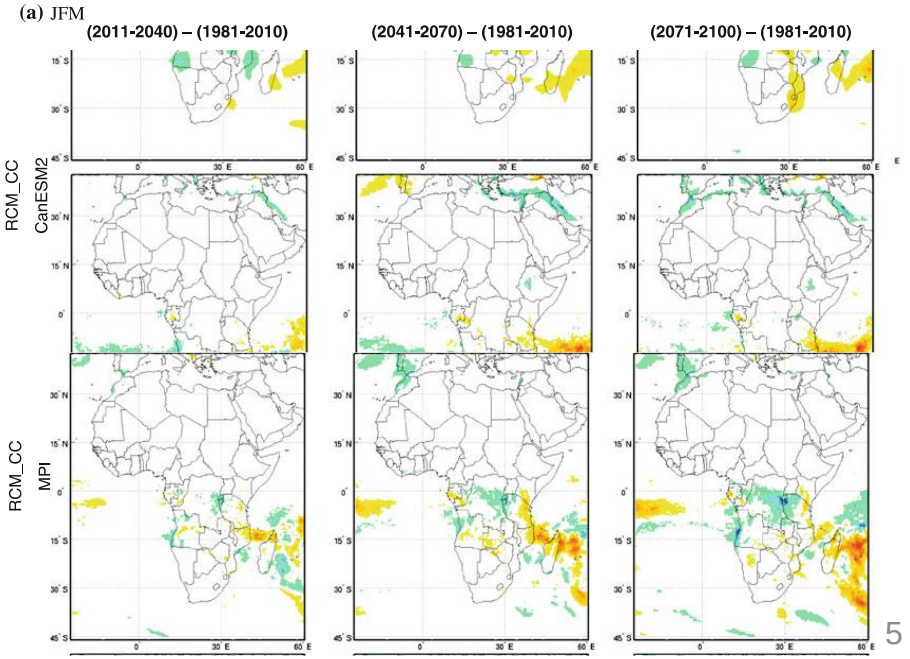
CORDEX-AFRICA: Laprise et al., 2013

- Canadian RCM
- 2 global models
- RCP4.5



Summer temperature change:
+ 2-4 ºC for the end of the century



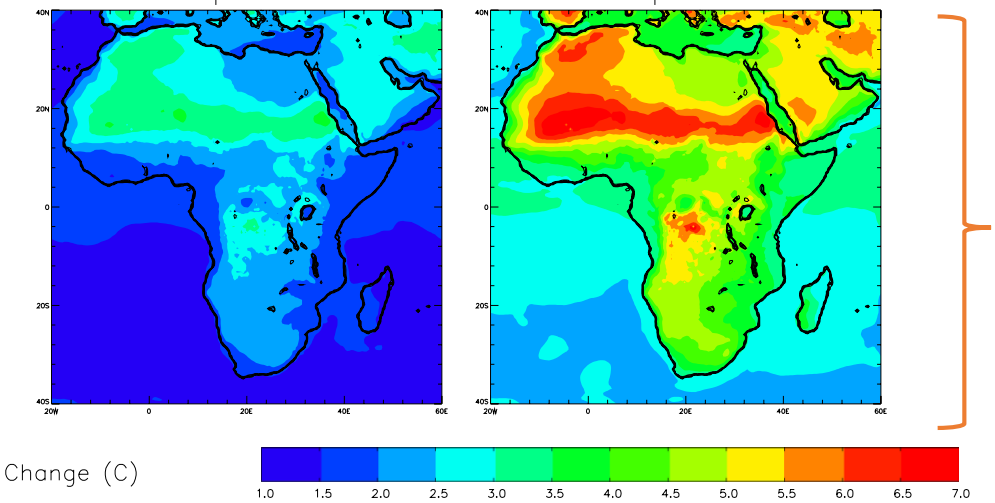


Winter precipitation change:
No strong signal. (some drying over Morocco, Levant)

CORDEX-AFRICA: Dosio and Panitz, 2016

- COSMO-CLM
- 4 global models
- RCP4.5 & RCP8.5

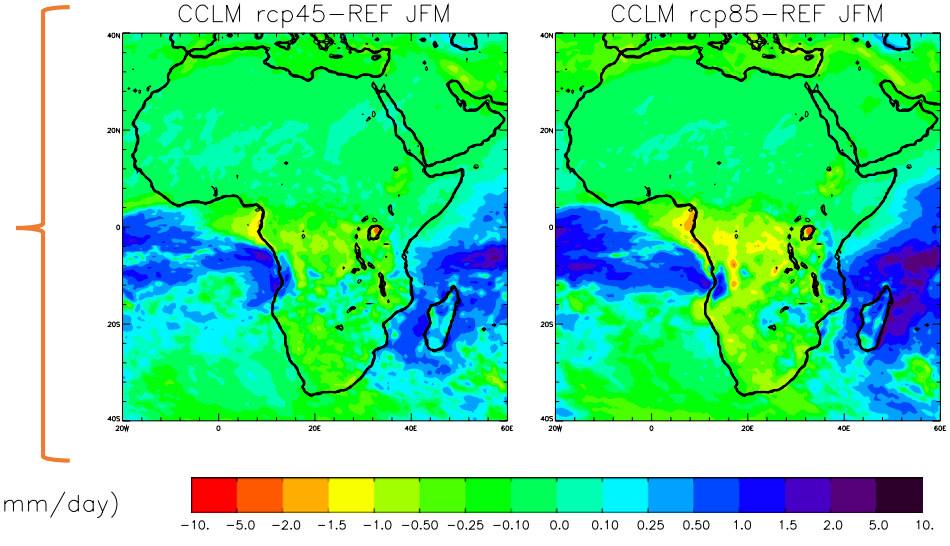
RCP4.5 **RCP8.5**



Summer temperature change:
+ 2-7 ºC for the end of the century

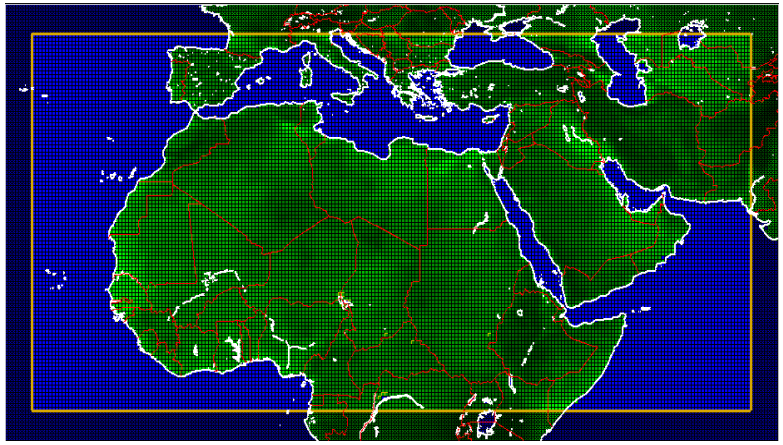
Winter precipitation change:
- Mostly negative trends
- No strong signal. (±0.1 mm/day)

RCP4.5 **RCP8.5**



The Cyprus Institute's CORDEX simulations

- WRF v3.6.1
- CL-WRF modifications activated
- Resolution of 50-km (0.44º)
- Experiments
  - CONTROL (1951-2005)
  - RCP4.5 (2006-2100)
  - RCP8.5 (2006-2100)
- Global model: CESM1 (bias corrected)



The MENA-CORDEX/Arab domain

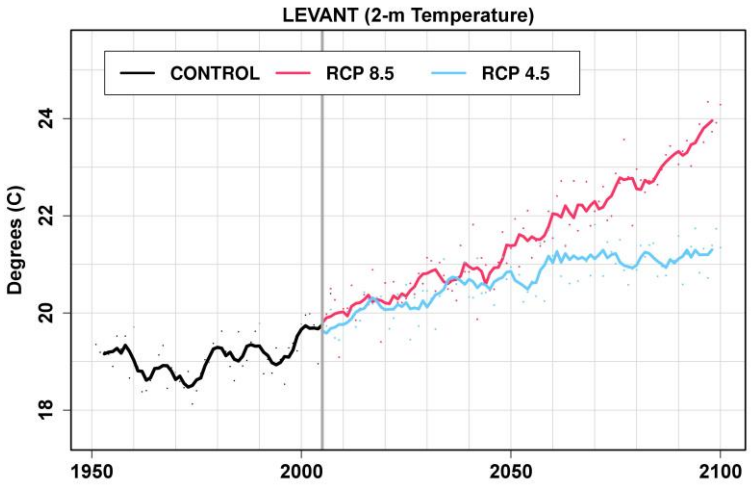
The CY-TERA HPC facility

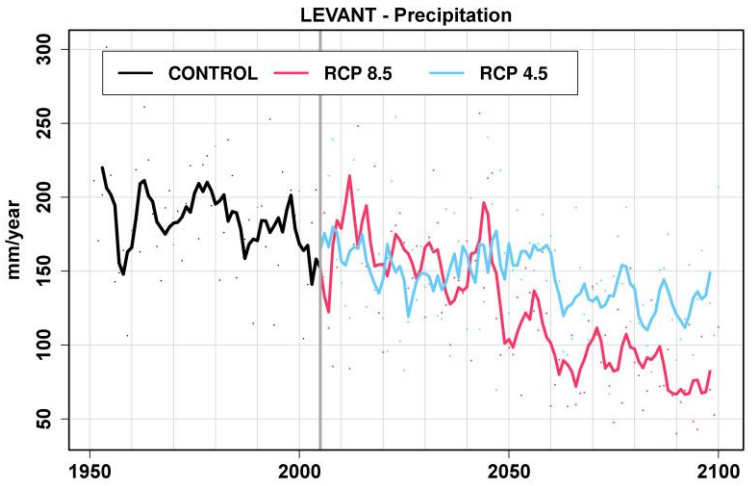
The Cyprus Institute's CORDEX simulations

Mean annual temperature

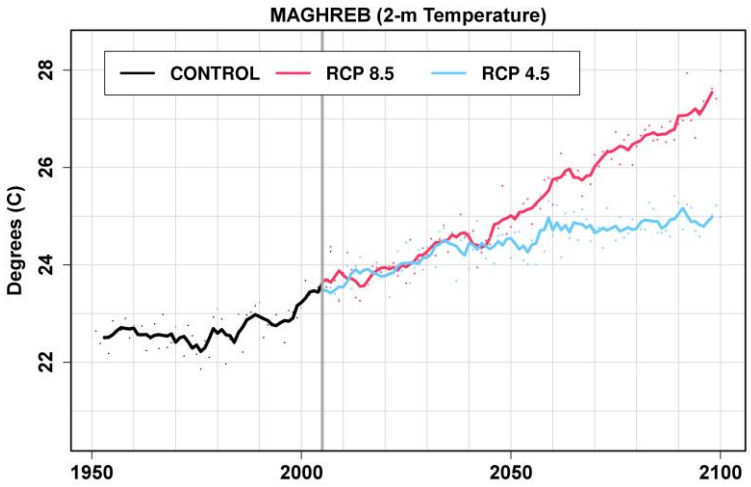
Annual rainfall sum

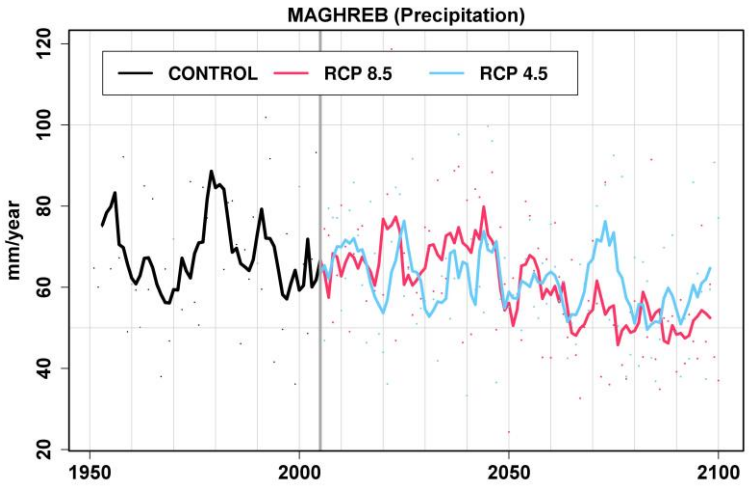
Levantine





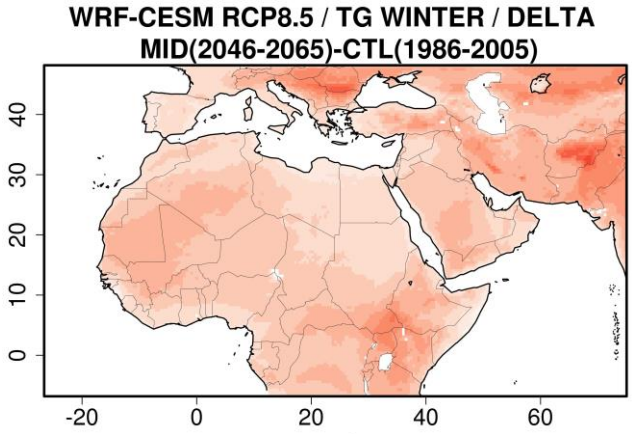
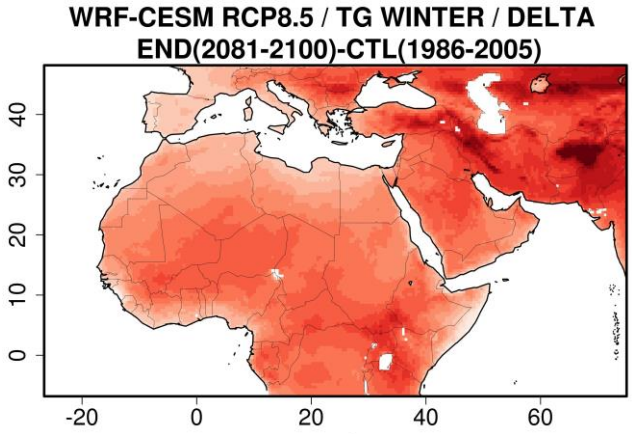
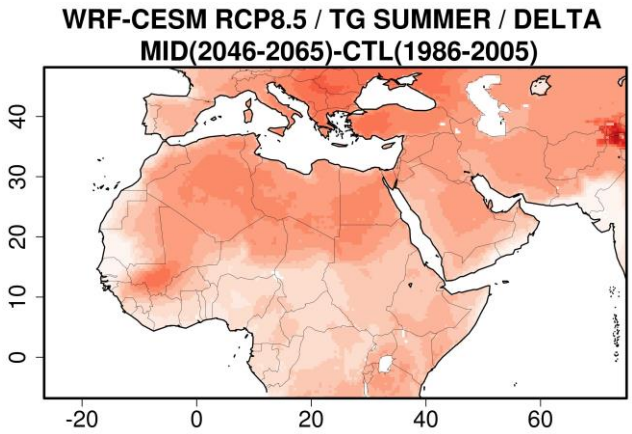
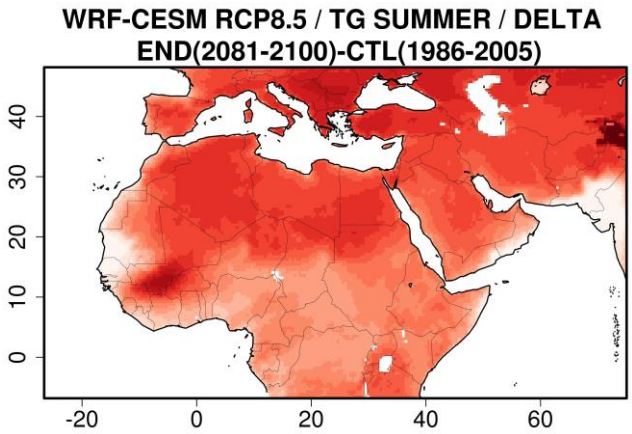
Maghreb





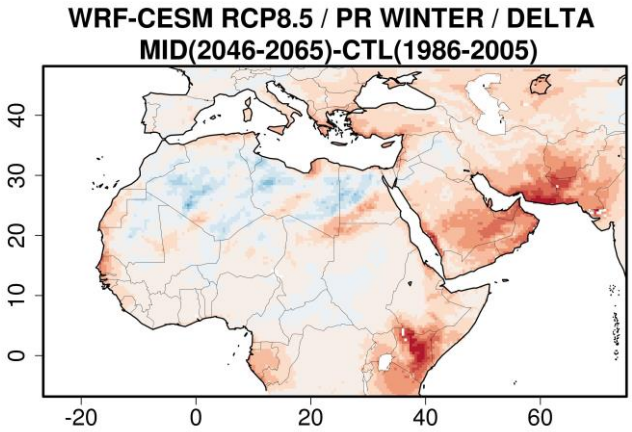
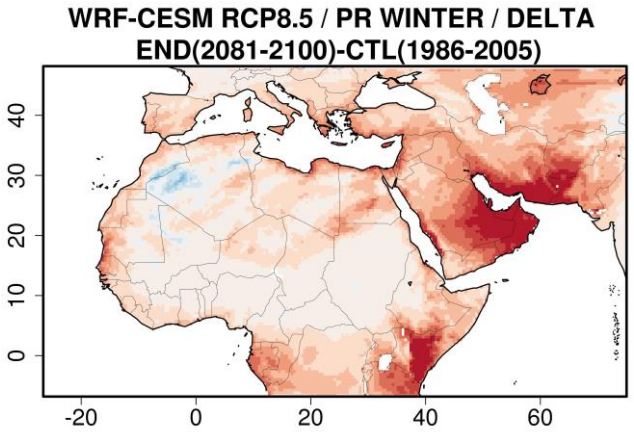
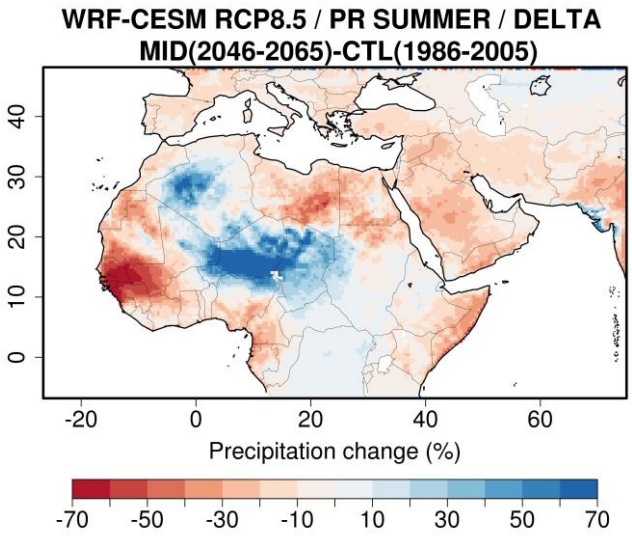
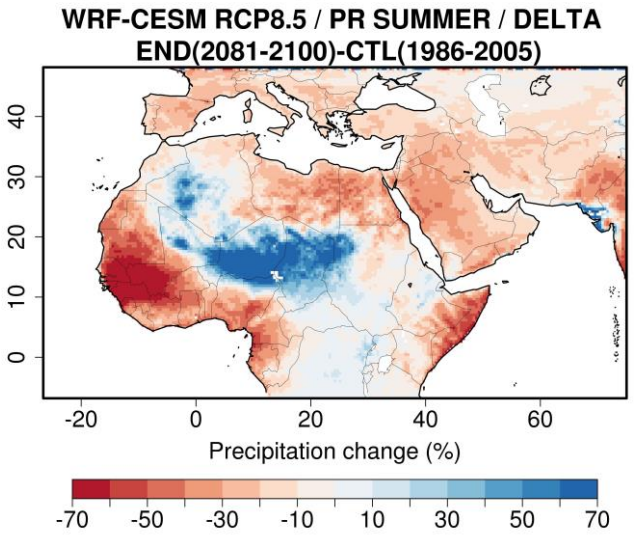
The Cyprus Institute's CORDEX simulations

Temperature changes relative to 1986-2005 baseline period

	Mid-century	End-century
Winter		
Summer		

The Cyprus Institute's CORDEX simulations

Rainfall changes relative to 1986-2005 baseline period

	Mid-century	End-century
Winter		
Summer		

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Conclusions/Next steps

- Insufficient information/literature on climate change projections/impacts for the MENA region
- Most studies suggest a strong warming (stronger in summer)
- Precipitation signal is less robust (general drying – stronger in winter)
- RICCAR simulations with RCA4 are in general agreement and within the range of most regional studies
- A comprehensive multi-model inter-comparison study with a MENA focus is planned

Thank you for your attention

Contact details:
Dr. George Zittis,
Post-doctoral fellow,
Energy, Environment and Water Research Center,
The Cyprus Institute, Nicosia, Cyprus
Web: www.cyi.ac.cy
E-mail: g.zittis@cyi.ac.cy

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