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

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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 (0.44° and 0.11°)

• 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 °C for the end of the century
- Stronger warming in summer (not shown)

Seasonal precipitation change (RCP 8.5):
- General drying
- Stronger changes in wintertime
Summer temperature change:
+ 2-4 °C 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

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

Winter precipitation change:
- Mostly negative trends
- No strong signal. (±0.1 mm/day)
The Cyprus Institute’s CORDEX simulations

- WRF v3.6.1
- CL-WRF modifications activated
- Resolution of 50-km (0.44°)
- 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
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

WRF-CESM RCP8.5 / TG WINTER / DELTA
MID(2046-2065)-CTL(1986-2005)

WRF-CESM RCP8.5 / TG WINTER / DELTA
END(2081-2100)-CTL(1986-2005)

WRF-CESM RCP8.5 / TG SUMMER / DELTA
MID(2046-2065)-CTL(1986-2005)

WRF- CESM RCP8.5 / TG SUMMER / DELTA
END(2081-2100)-CTL(1986-2005)
The Cyprus Institute’s CORDEX simulations

Rainfall changes relative to 1986-2005 baseline period

**Mid-century**

Winter

Summer

**End-century**

Precipitation change (%)
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

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