Extreme climate indices in selected basins (Wadi Diqah, Nahr Al Kabir, Medjerda)

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The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD)
objective

• The objective of this study is to provide insights to extreme events over the coming decades due to climate change in three hydrological basins in the Arab region.
Hydrological modeling
HEC-HMS

- HEC-HMS, HEC-HMS is GIS-based semidistributed rainfall-runoff model developed by Hydrologic Engineering Centre (HEC) of United States Army Corps of Engineers (USACE),
Hec-GeoHMS

- Hec-GeoHMS is an ArcGIS extension developed by the U.S. Army Corps of Engineers (USACE).
- Hec-GeoHMS is used for computing the flow direction, flow accumulation, stream delineation, watershed delineation, drainage networks derivation.
Input data

- Land use data
- Soil data
- Topographic data
- Streamflow Data (for model calibration and validation)
Mejerda basin— Tunisia
WADIDAYQAH - SULTANATE OF OMAN

located 60 km southeast of Muscat
Rainfall station
Nahr el Kabir Al-Junoubi-Syria
Linking RCM data to HEC-HMS

- The outputs of the RCM are in NetCDF format.

What is NetCDF?

- NetCDF (network Common Data Form)
  A platform independent format for representing multi-dimensional array-orientated scientific data.
results
Nahr el Kabir Al-Junoubi
Changes in Hydro extreme Indices
Number of extreme flood exceed 90\textsuperscript{th} percentile of maximum daily value

**Scenario RCP4.5**

**Scenario RCP8.5**
Nahr el Kabir Al-Junoubi basin

Mean ensemble change values for 100-year return period flood

<table>
<thead>
<tr>
<th>scenario</th>
<th>1986-2005</th>
<th>2046-2065</th>
<th>2081-2100</th>
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Medjerda River Basin
Medjerda River Basin

Number of extreme flood exceed 90\textsuperscript{th} percentile of maximum daily value

**Scenario RCP4.5**

**Scenario RCP8.5**
Mean ensemble change values for 100-year return period flood for Medjerda River Basin

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Wadi Dayqah Basin
Wadi Dayqah Basin

Number of extreme flood exceed 90\textsuperscript{th} percentile of maximum daily value under

**Scenario RCP4.5**  
**Scenario RCP8.5**
Mean ensemble change values for 100-year return period flood for Wadi Dayqah Basin

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SUMMARY

- Wadi Dayqah Basin is likely to experience a progressive increase in the magnitude and peak flow.
- Mejerda Basin is likely to experience an increase in the magnitude of peak flow for moderate emission scenario together with decreasing in the number of extreme flood. However, for high emission scenario, the magnitude of peak flow is projected to decrease.
SUMMARY

- Nahr el Kabir Al-Junoubi basin is likely to experience an increase in the magnitude of peak flow and flood frequencies over the 21st century under both climate change emission scenarios.
Thanks