RICCAR Climate Modelling Updates: Mashreq Domain

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Original RICCAR Domain
50 km grid
Compare 50 km grid to Mashreq Domain 10 km grid
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Long Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>evspsbl</td>
<td>Evaporation</td>
</tr>
<tr>
<td>hrs</td>
<td>Near-surface relative humidity</td>
</tr>
<tr>
<td>pr</td>
<td>Precipitation</td>
</tr>
<tr>
<td>ps</td>
<td>Surface air pressure</td>
</tr>
<tr>
<td>rsds</td>
<td>Surface downwelling shortwave radiation</td>
</tr>
<tr>
<td>sfcWind</td>
<td>Near-surface wind speed</td>
</tr>
<tr>
<td>sfcWindmax</td>
<td>Daily maximum near-surface wind speed</td>
</tr>
<tr>
<td>sund</td>
<td>Duration of sunshine</td>
</tr>
<tr>
<td>tas</td>
<td>Near-surface air temperature</td>
</tr>
<tr>
<td>tasmax</td>
<td>Daily maximum near-surface air temperature</td>
</tr>
<tr>
<td>tasmin</td>
<td>Daily minimum near-surface air temperature</td>
</tr>
<tr>
<td>uas</td>
<td>Eastward near-surface wind</td>
</tr>
<tr>
<td>vas</td>
<td>Northward near-surface wind</td>
</tr>
<tr>
<td>wsgsmax</td>
<td>Daily maximum near-surface wind speed of gust</td>
</tr>
</tbody>
</table>
### GCM Institute Ref

- **CMCC-CM2-SR5**: Euro-Mediterranean Centre on Climate Change (Italy) — Cherchi et al. (2019)
- **CNRM-ESM2-1**: National Centre for Meteorological Research and Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique (France) — Séférian et al. (2019)
- **EC-Earth3-Veg**: European Consortium — Wyser et al. (2020)
- **MPI-ESM1-2-LR**: Max Planck Institute for Meteorology (Germany) — Mauritsen et al. (2019)
- **MRI-ESM2-0**: Meteorological Research Institute (Japan) — Yukimoto et al. (2019)
- **NorESM2-MM**: Norwegian Earth System Model — Tjiputra et al. (2020)

### RCM Institute Ref

- **HCLIM-ALADIN**: Swedish Meterological and Hydrological Institute — Belušić et al. (2020)

Mashreq Domain Regional Climate Modelling Outputs are based on 6 downscaled CMIP6 GCMs.
Based on CMIP6 scenarios (SSPs)
- Mashreq outputs only consider SSP5-8.5
- Historical period 1961-2014
- Future scenarios 2015-2070

SSPs are the basis of the new scenarios
- Narrative storylines
- Quantitative scenarios (demographics, economics, technology)
- Other socioeconomic indicators

Represent a range of future development pathways, defined around
- Challenges to adaptation
- Challenges to mitigation

SSP Narratives

SSP5: Conventional Development
- Rapid economic development
- Stabilizing population
- Consumerism
- High fossil fuel dependency
- Eradication of extreme poverty and universal access to education and basic services
- Highly engineered infrastructure and ecosystems

SSP2: Middle of the Road
- Current trends continue
- Moderate population growth
- Slowly converging incomes between industrialized and developing countries
- Delayed MDG achievement
- Reductions in resource and energy intensity at historic rates
- Environmental degradation

SSP4: Inequality
- Increasing inequality within and across countries
- Effective governance controlled by a small number of rich global elites
- Most of populations with limited access to higher education and basic services
- Energy tech R&D made by global energy corporations
- Low social cohesion

SSP3: Fragmentation
- Rapid population growth
- Slow economic growth
- Failing to achieve MDG
- High resource intensity and fossil fuel dependency
- Low investments in technology development and education
- Unplanned settlements
- Weak int’l governance and local institutions

Adapted from the meeting report of the Workshop on The Nature and Use of New Socioeconomic Pathways for Climate Change Research. https://www.isp.ucar.edu/sites/default/files/Boulder%20Workshop%20Report_0_0.pdf
Source: Carbon Brief
Can help with any climate and/or geospatial request

- Mashreq Regional Climate Modelling Outputs
- RICCAR Regional Climate Modelling Outputs (Arab Domain)
- ERA5 Reanalysis Data from Copernicus Climate Change Service
- WaPOR Remote Sensing Data
- Euro-CORDEX Regional Climate Modelling Outputs (small scale for N Africa)

https://wapor.apps.fao.org/
https://climate.copernicus.eu/
https://www.euro-cordex.net/
Future Seasonal Drought Conditions over the CORDEX-MENA/Arab Domain

Marlena A. Tomaszkiewicz

1. Introduction

The Middle East and North Africa, also known as the Arab region, is perpetually faced with multiple complex issues that arguably pose one common denominator: drought. Water scarcity is most obviously connected to drought, impacting agriculture and food security [1-4], ecosystems [5,6], drinking water demand [7], and energy sustainability [8]. Drought also perpetuates other climate-related extreme events such as floods [8], forest fires [9], desertification [10-12]. Lastly, geopolitical challenges in the region have been intensified due to drought including migration [13,14], conflict [15-16], and vulnerable population groups [17,18].

Drought is not a new phenomenon in the region. Geophysical evidence has revealed drought occurrences as early as the Aurignacian Neolithic period [18,19]. Several atmospheric circulation patterns influence precipitation patterns, most notably North Atlantic Oscillation (NAO) and El Niño-Southern Oscillation (ENSO), which have partially triggered the most extreme disasters in the region [20,21]. Drought was blamed for devastating famines in Sudan during the 1980s and 1990s [22], the near collapse of the canal irrigation economy in Jordan during the mid-20th century [23], and a severe decline wheat and barley production during 2007-2010 in the Tigra-Euphrates Basin [14]. Thus, the question is not whether drought is a recurring problem. Rather, it is whether drought frequency and severity are increasing due to climate change and the potential impacts upon differing sectors.

Often overlooked due to smaller scales, short-term or seasonal drought can be crucial to detect reductions in soil moisture content and is a risk factor for climate-related extreme events. Over the last 75 years, a study conducted by Spitan et al. [23] detected over 420