An Overview of Progress in NA-CORDEX

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Talk Outline

• Description of NA-CORDEX Program
• ERA-Interim driven runs
• GCM-driven historical runs
• Climate projections
• Next Steps
• Domain – most of North America (many larger than NARCCAP domain)
• ERA-Interim Simulations: 1990-2009
  – 9 RCMs – 50, 25, 12 kms (CRCM5)
• 6 RCMs, 5 CMIP5 GCMs (1950-2100)
  – Some 25-km & 50-km resolution (RegCM4, WRF, and CanRCM4)
  – RCP8.5 scenario (some also with RCP 4.5)
• Hosting most commonly used variables from all completed simulations at NCAR, with access at na-cordex.org
<table>
<thead>
<tr>
<th>CS</th>
<th>GFDL-ESM2M (2.5)</th>
<th>MPI-ESM-LR (3.6)</th>
<th>HadGEM2-ES (4.6)</th>
<th>CanESM2 (3.7)</th>
<th>EC-EARTH (3.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RegCM4 (Iowa State &amp; NCAR)</td>
<td>25km 50km</td>
<td>25km 50km</td>
<td>25km 50km</td>
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<tr>
<td>WRF (U. of Arizona &amp; NCAR)</td>
<td>25km* 50km*</td>
<td>25km 50km</td>
<td>25km* 50km</td>
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<td>HIRHAM5 (DMI)</td>
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<td>50km</td>
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<td>CanRCM4 (CCCma)</td>
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<td>25km 50km</td>
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<tr>
<td>RCA4 (SMHI)</td>
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<td>50km</td>
<td>50km</td>
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<tr>
<td>CRCM5 (UQAM)</td>
<td>50km 4.5 = LR, 8.5 = MR</td>
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<td>50km</td>
</tr>
</tbody>
</table>

Orange = RCP4.5 and RCP8.5, all others RCP 8.5 only; * runs in progress
1971-99
2041-69
July-August
Average
Precip Change:
CORDEX RCP8.5

(Hatching = statistically significant)

M. Bukovsky
ERA-Interim Driven Runs

Comparison with Observations,
Seasonal Temperature and
Precipitation
1990 -2010
RCM3+NCEP, JJA Avg, 1979-2004

Precipitation mm/day

0.5 1 2 3 4 5 6 7 8
Snowfall, DJF 1988-1997, Great Lakes

North America 0.44°

North America 0.11°

[mm/day]

CRCM5

Snowbelts

Resolution Limitations
Regions of Intermountain West

Wang et al., 2009

Winter Precip, UDEL obs
North American Regional Reanalysis (NARR)  
Canadian Regional Climate Model (CRCM)  
Exp. CPC Regional Spectral Model (ECPC)  
MM5-PSU/NCAR mesoscale model (MM5I)  
Regional Climate Model version 3 (RCM3)  
Weather Research & Forecasting model (WRFP)  
Hadley Center Regional Model v.3 (HRM3)
NARCCAP
Winter

WRFG+NCEP, DJF Avg, 1979-2004

Temperature (Deg C)

-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30
WRFG+NCEP, JJA Avg, 1979-2004

Temperature Deg C

-30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30

NARCCAP Summer
CanRCM4 NAM-22 JJA

Near-Surface Air Temperature degC
Driven by GCM
Historical Period
1970-1999
CRCM5 - MPI - CanESM
Projections

RCP 8.5 Future (2041-2070) - Historical (1970-1999)
Precipitation Change

EC-EARTH

RCA4  HIRHAM
Precipitation Change

HadGEM  GFDL

RegCM4

50 km
25 km
Mean total precipitation flux

RegCM4

.DJF

difference

mm/day

NCAR
Temperature Change

EC-EARTH

RCA4
HIRHAM
Temperature Change

GFDL-CM2.1 → RegCM3
GFDL-ESM2M → RegCM4
RegCM4-GFDL NAM-44 rcp85 JJA

Change in Temperature degC

-2 -1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3 4 5 7
RCM3-gfdl JJA Temperature

Change in seasonal average

degC

-2 -1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3 4 5 7
So Now What?

- Finish WRF runs (HadGEM, GFDL)
- Archive data (daily for most variables and perhaps subdaily for precipitation)
- Do bias corrections on surface variables
- Work with Ouranos on production of threshold event frequencies (through PAVICS program)
- Perform analyses on winter precipitation in south central and in the Colorado Basin (for DoD)
- Opportunity for some results to be used in the next US NCA
The END?