Working across the boundary:
Regional climate model applications

Allison Steiner
University of Michigan
Atmospheric, Oceanic and Space Sciences (AOSS)

Alex Bryan and Samantha Basile, AOSS
AOSS 588 2012: Steven Boland, Lingli He, Liza Jenkins, Kevin Kuo,
Xiaojian Liu, David Wright, Melissa Zagorski
Larissa Larsen and AOSS 588 2011: Evan Mallen, Nicholas Kahn,
Scott Kalafatis, Maria Ryen, Peter Sotherland, Ahmed Tawfik

Adaptation in the Great Lakes Region : 25 June 2014
Projections and Downscaling Panel
Research tool: Dynamical downscaling

- Dynamically downscaled model (RegCM4)
- Evaluating Great Lakes hydroclimate

- Winter precip is overestimated, summer precip is underestimated
Research application 1: Harmful algal blooms

- Role of extreme precipitation in 2011 Lake Erie bloom
- Spring precipitation intensity from CMIP5 global models

Michalak et al., 2013; National Science Foundation Water, Sustainability and Climate Program
Research application 2: Western Lake Erie Basin

- Extended WSC analysis to other models and seasons for NOAA COCA project
- Comparing NARCCAP (dynamically downscaled) and CMIP5 data (global)

Present Day (black) and Future (blue) NARCCAP precipitation (4 models)

```
Modelled:
- 1971-1999
- 2041-2069

Observed:
- 1971-1999
- CPC

Model Count:
- 4
- 3
- 2
- 1
```
Research application 2: Western Lake Erie Basin

- Dynamically downscaled models typically show more intense events than global
- Spring and Fall: Projected increase in intense events

PRESENT DAY (black) and FUTURE (blue) CMIP5 precipitation (4 models)
Research application 3: Urban climate

- Urban planning student class project
- Comparing climate projections for three Great Lakes cities from (1) statistical downscaling, (2) dynamical downscaling, and (3) global CMIP3 data

-Marquette, MI
-Detroit, MI
-Buffalo, NY

Larsen et al., in preparation
Research application 3: Urban climate

- Present-day (1971-2000) model bias, or comparison with observations (CRU)
Research application 3: Urban climate

• Change in future precipitation in Great Lakes cities (2041-2070) as compared to present day (1971-2000)
Summary Points

• All models and downscaling methods show large variability in precipitation response to climate change
• Consistent response of increased precipitation intensity in both GCMs and RCMs
• More intense events are occurring in the RCMs
• For the Great Lakes region, the largest future changes in precipitation intensity are in spring and fall
• More discussion on methods and applications are greatly needed