Precipitation bias correction of very high resolution regional models

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Why bias correcting?

Impact studies require realistic values
Why bias correcting?
Current methods

- Several papers on bias correction methods
- Based on a multiplicative factor to adjust intensity
- Different complexity: adjust different orders of distribution
- Generally using gridded observational datasets
- Common assumption:
  RCM more rain events than obs.
Assumption: number of rain days

Example of a 10-km WRF simulation over Sydney and AWAP (~ 5km)

Annual mean of rain days: 1990-2009

No. days/year

10 30 50 70 90 110 130 150 170
Assumption: number of rain days

Example of 2-km WRF simulations over Sydney

annual mean of rain days: 1990-2009
Assumption: number of rain days

Example of BoM stations over Sydney

annual mean of rain days: 1990-2009
Correcting towards stations

Two main problems:
1) Spatial and temporal coverage issues
2) Grid cells and stations represent different scales

Solution: Adapt an existing method (y-distribution adjustment, Piani et al. 2010) using several stations.
γ-distribution adjustment

Original γ-distribution method

Situation with stations

\[ \gamma \text{-distribution adjustment} \]
γ-distribution adjustment

Using 5 closest stations
Further penalising by region
γ-distribution adjustment

Regions and stations in Sydney area
Results

Comparison WRF 2km with BoM stations

Bias in mean seasonal precipitation (mm/month)

WRF 2km Original

WRF 2km Bias-corrected

- < -75
- -75 to -50
- -50 to -25
- -25 to -10
- -10 to 0
- 0 to 10
- 10 to 20
- 20 to 50
- 50 to 75
- > 75
Results

Comparison WRF 2km with AWAP (~ 5km)
Results

Comparison WRF 2km with BoM stations and AWAP

Contribution to total precipitation by events
Conclusions

Need for bias correction
Impact studies require realistic values. RCMs are of great value but often diverge from obs.

The number of rain days
Bias correction method assume that RCMs generate more rain days than obs. This is not true as resolution increases.

Method adapted to high-res
Using stations instead of gridded datasets. Weighting and regionalising several stations.
Conclusions

Significant improvement at seasonal timescales
With respect both stations and AWAP gridded dataset, the bias-corrected output compares much better.

Also improvement in the precip. distribution
The bias correction method produces more realistic precipitation distribution at daily timescales.
Thanks
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