Climate Change Research Centre

UNSW THE UNIVERSITY OF NEW SOUTH WALES SYDNEY • AUSTRALIA

NSW GOVERNMENT Office of Environment & Heritage

# Precipitation bias correction of very high resolution regional models

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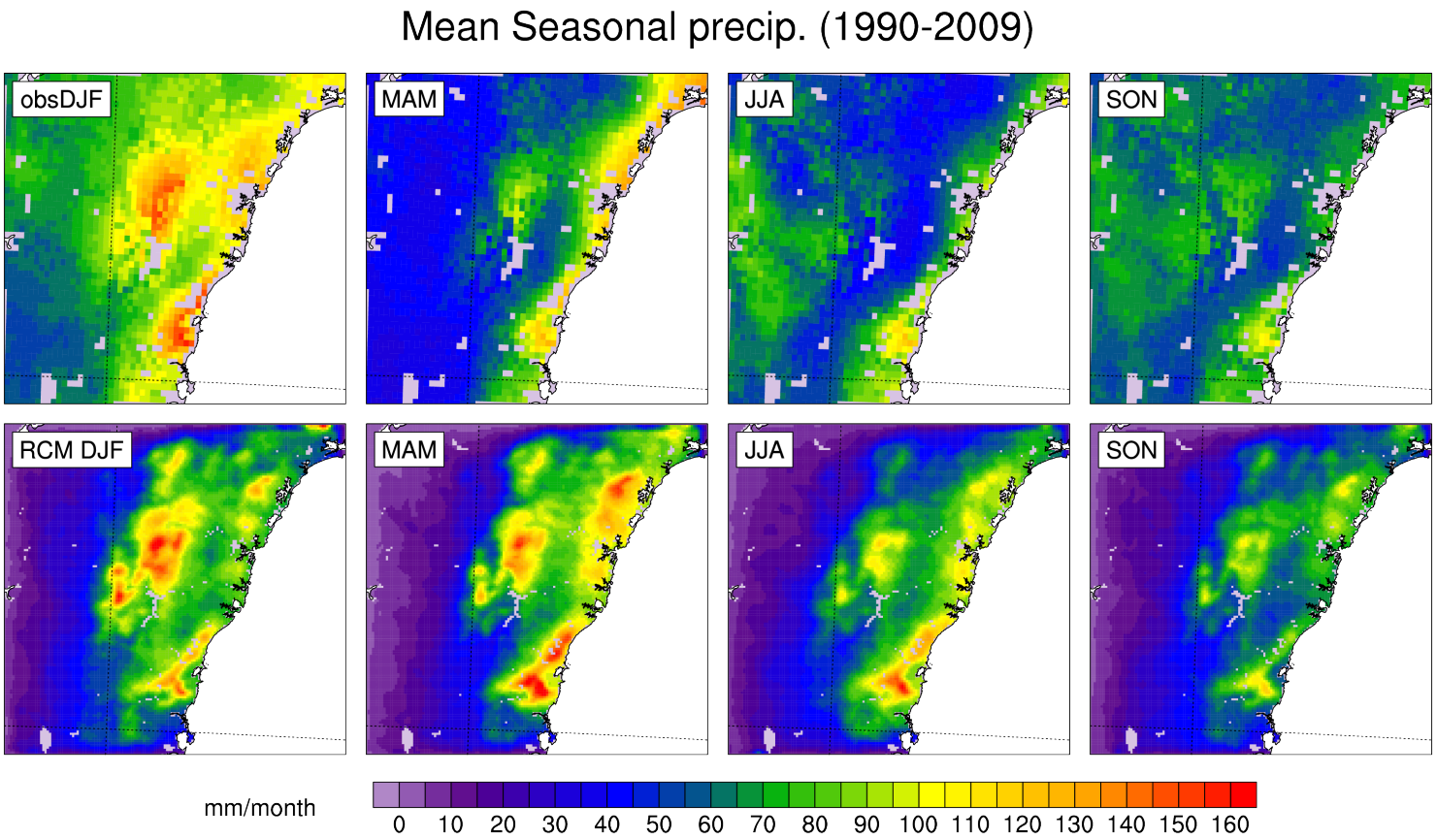
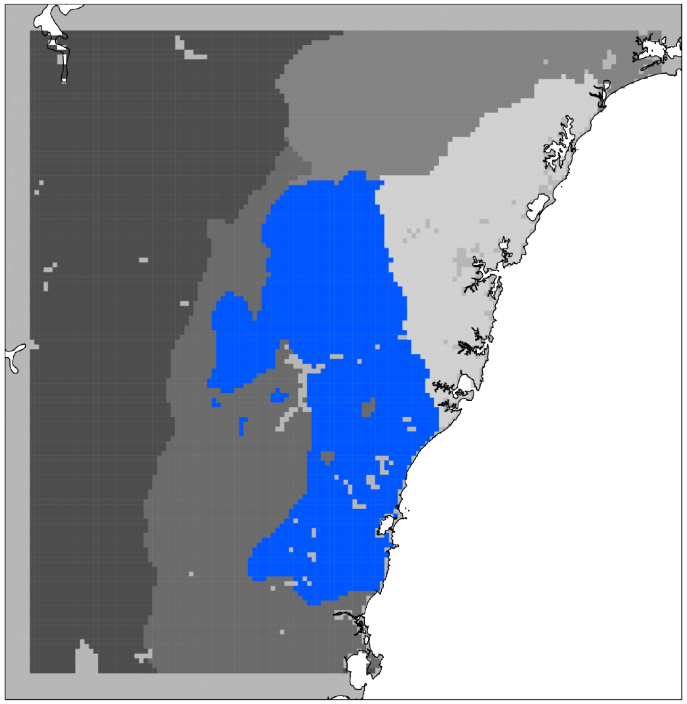
NARCliM
NSW | ACT Regional Climate Modelling project

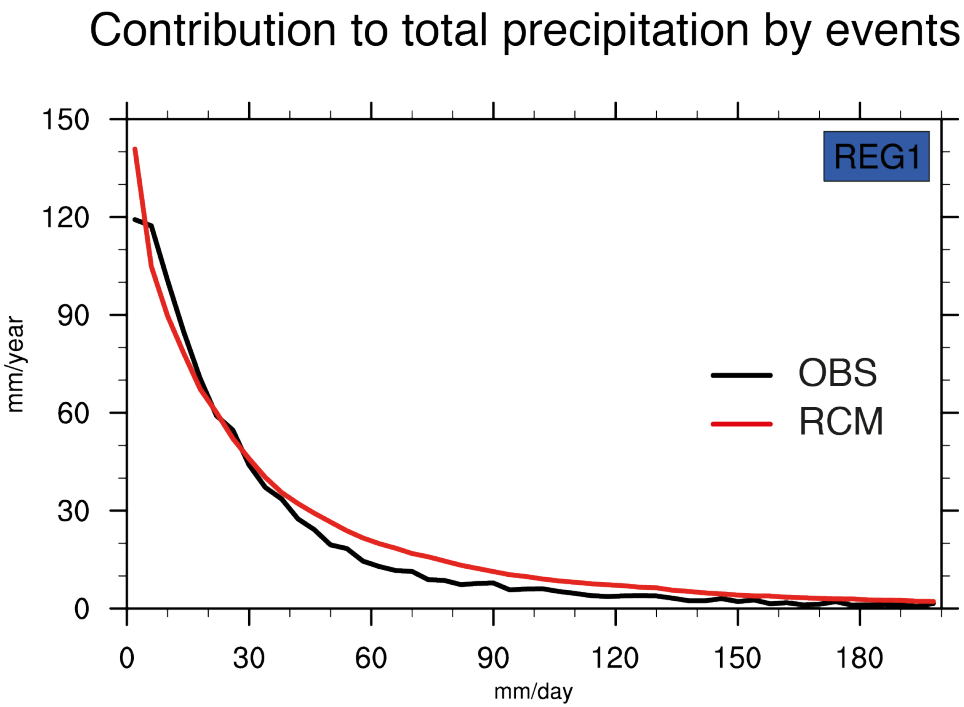
# Why bias correcting?

Impact studies require realistic values



# Why bias correcting?





# Current methods

- Several papers on bias correction methods

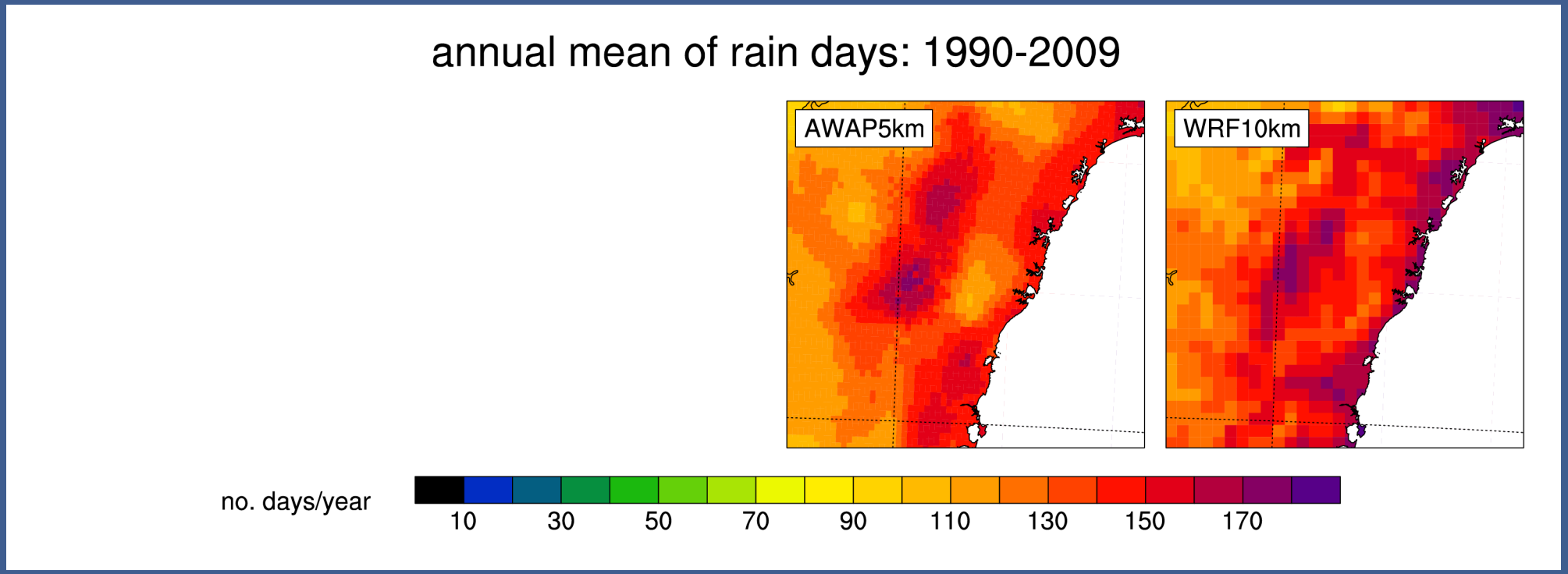
(Berg et al. 2012, Clocke et al. 2012, Dosio et al. 2011, Johnson and Sharma 2012, Lafon et al 2012, Piani et al. 2010, Portoghese et al 2011, Terink et al. 2010, Teutschbein and Seibert 2012)

- Based on a multiplicative factor to adjust intensity
- Different complexity: adjust different orders of distribution
- Generally using gridded observational datasets
- Common assumption:

<u>RCM more rain events than obs</u>.

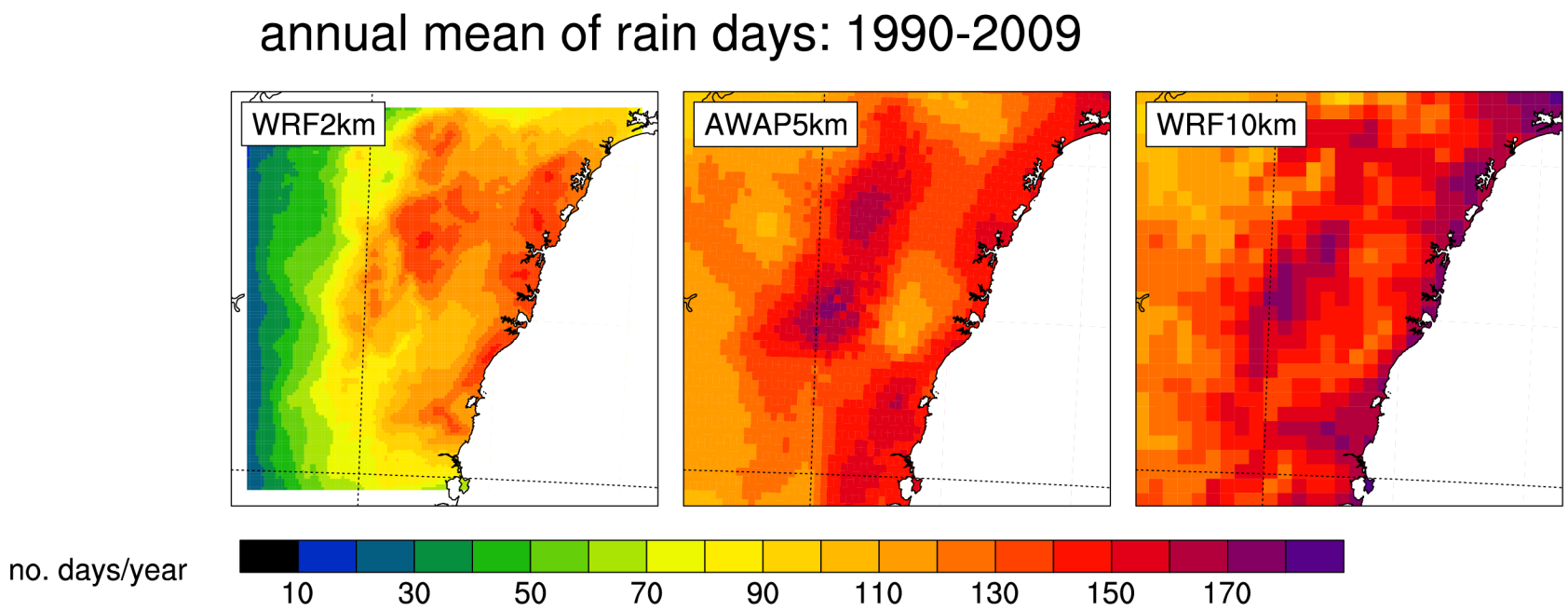
# Assumption: number of rain days

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



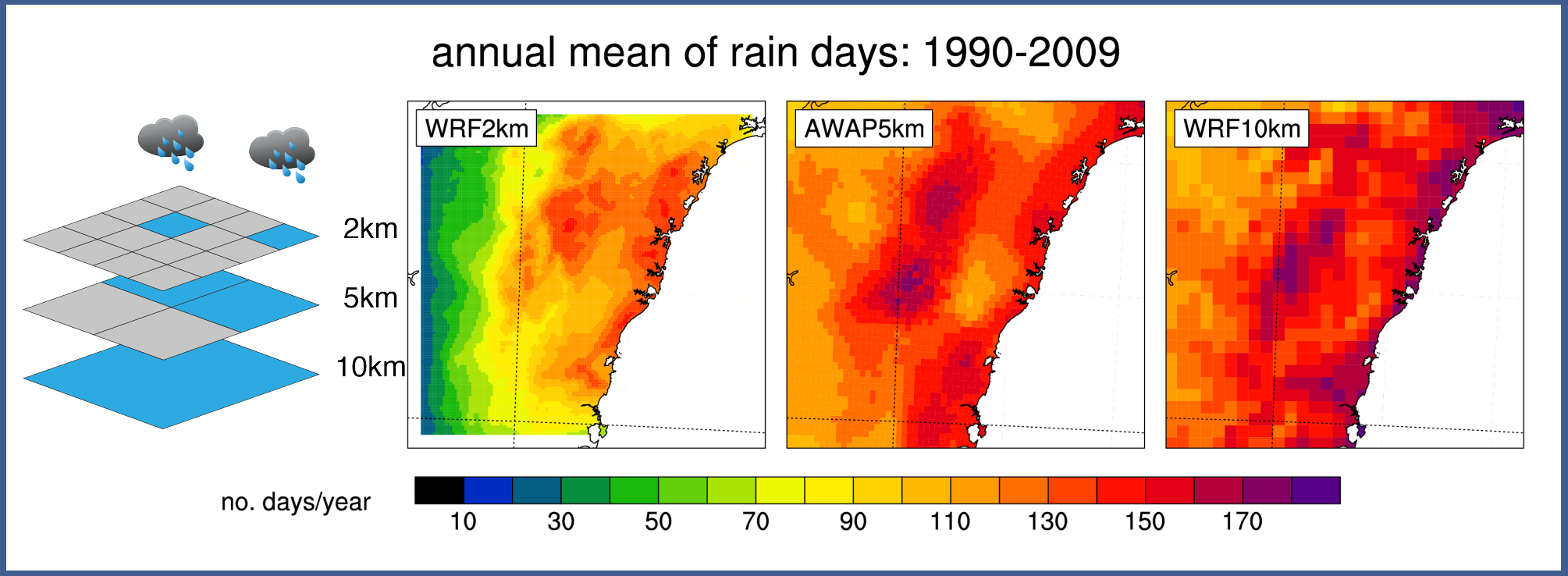
# Assumption: number of rain days

Example of 2-km WRF simulations over Sydney



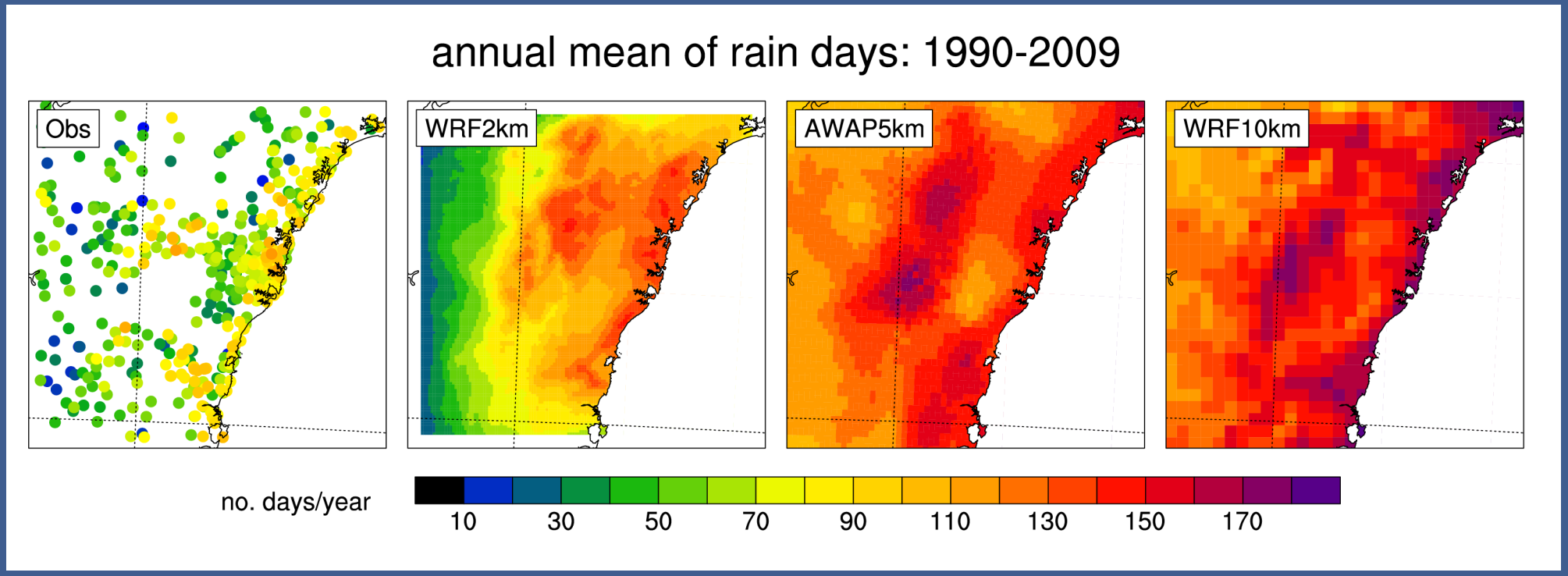
# Assumption: number of rain days

Different spatial scales in different datasets (the “drizzle effect”)



# Assumption: number of rain days

Example of BoM stations over Sydney



# Correcting towards stations

Two main problems:

1) Spatial and temporal coverage issues
2) Grid cells and stations represent different scales

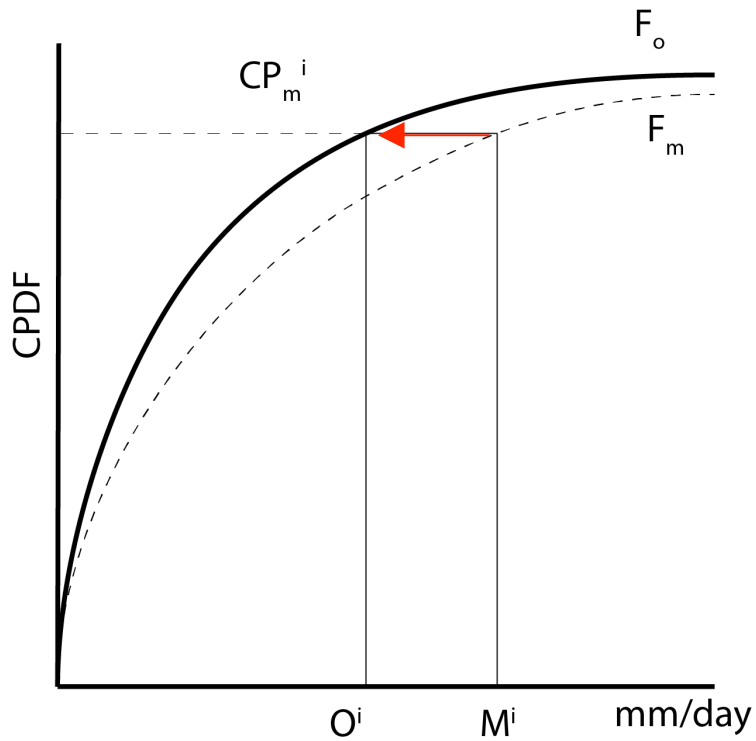
Solution: Adapt an existing method (γ-distribution adjustment, Piani et al. 2010) using several stations.



Piani C. , J. Haerter, E. Coppola, Statistical bias correction for daily precipitation in regional climate models over Europe, Theor Appl Climatol. 99 (2010) 187–192.

# γ-distribution adjustment

## Original γ-distribution method

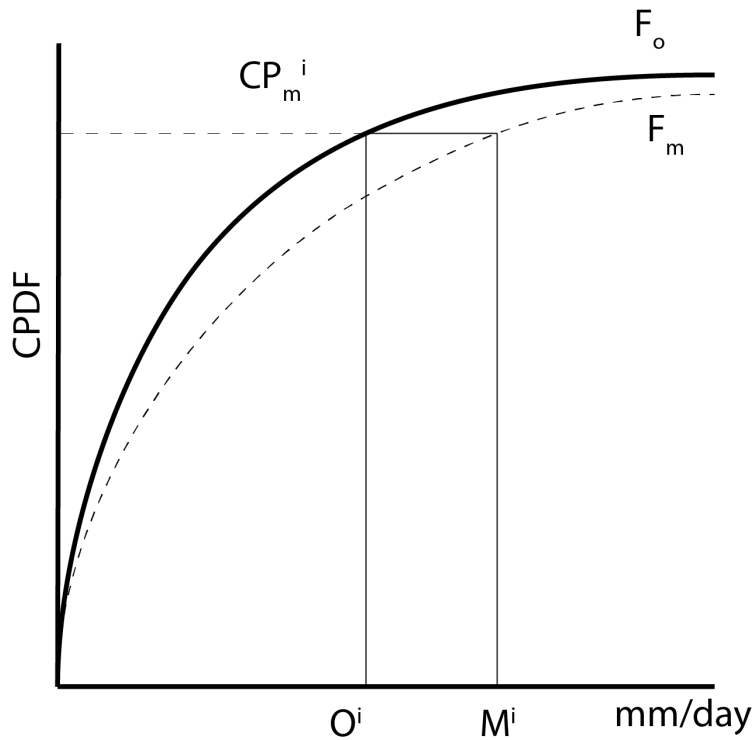


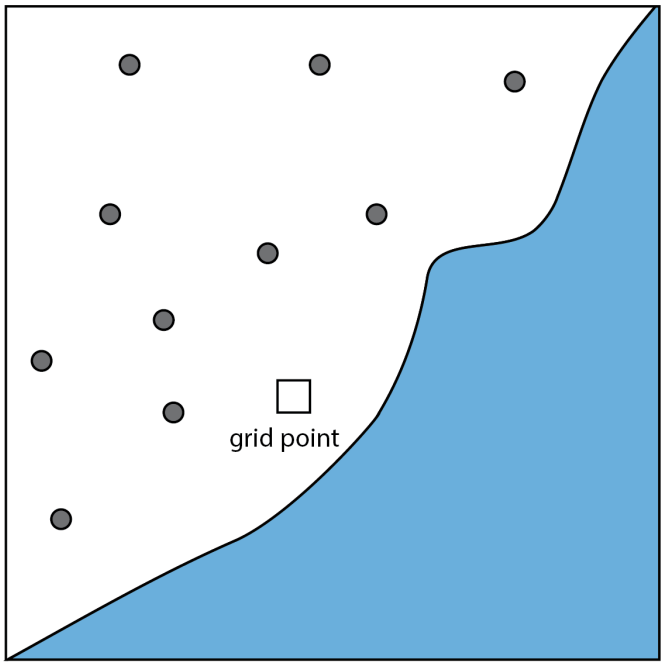



Piani C. , J. Haerter, E. Coppola, Statistical bias correction for daily precipitation in regional climate models over Europe, Theor Appl Climatol. 99 (2010) 187–192.

# ɣ-distribution adjustment

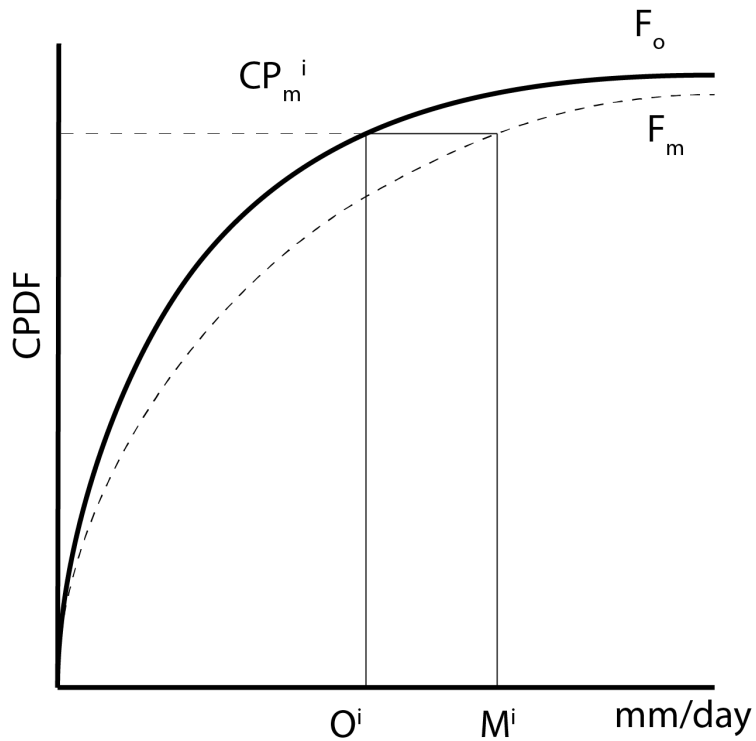
## Situation with stations

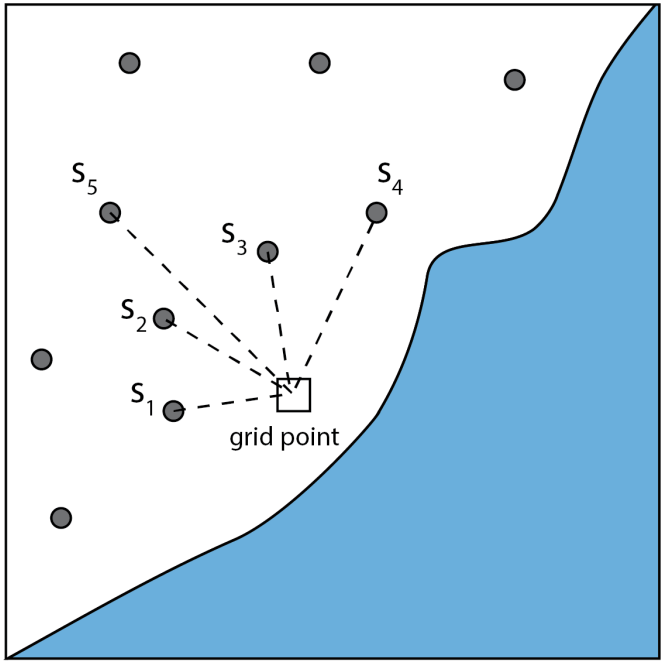


# γ-distribution adjustment

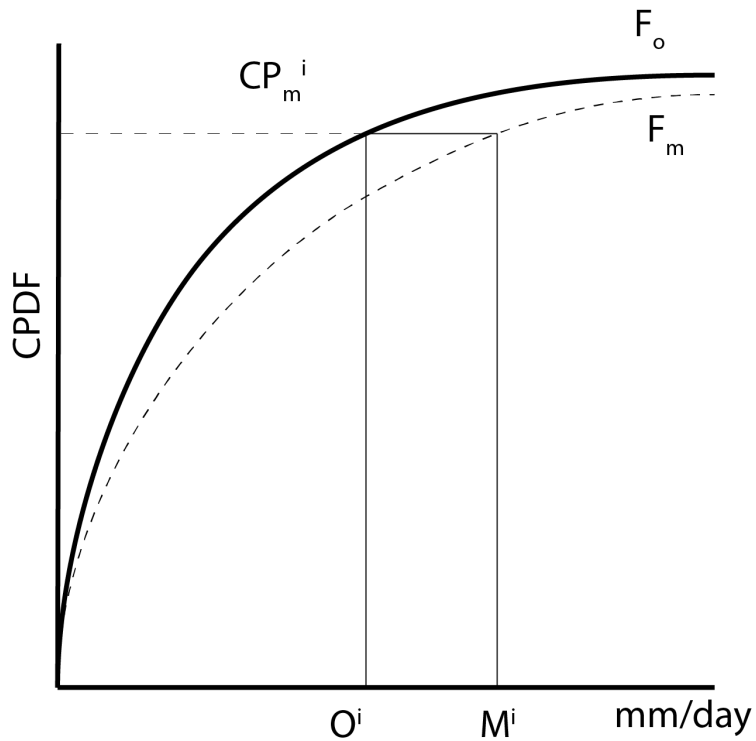
Using 5 closest stations

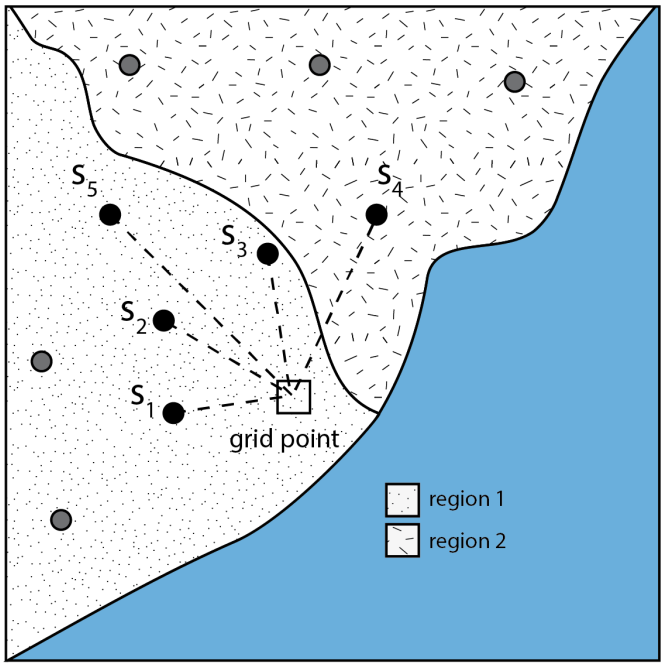


# γ-distribution adjustment

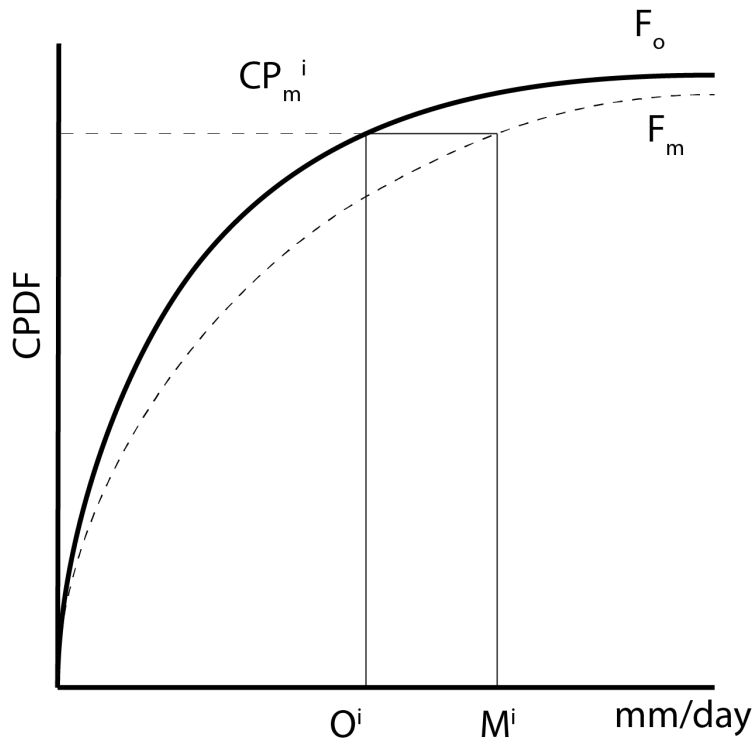
## Further penalising by region

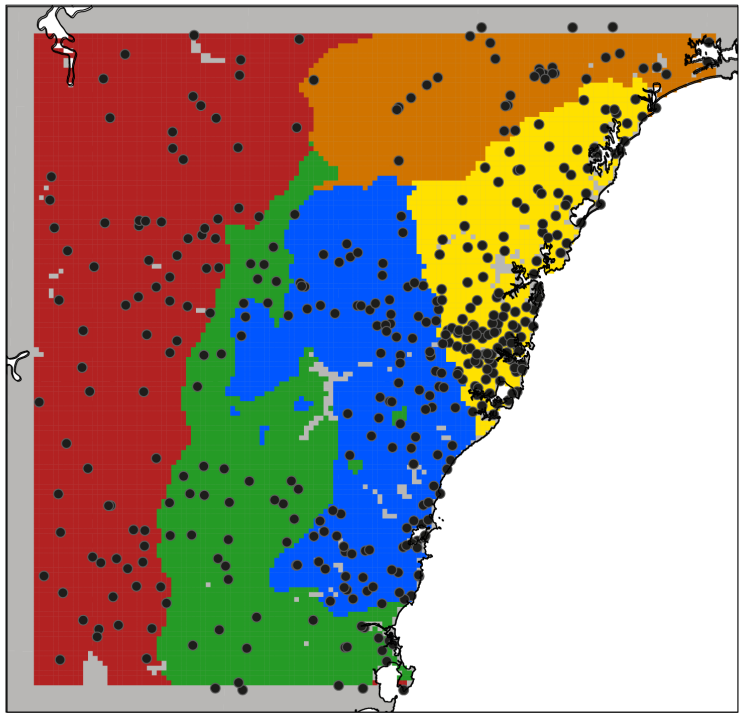


# ɣ-distribution adjustment

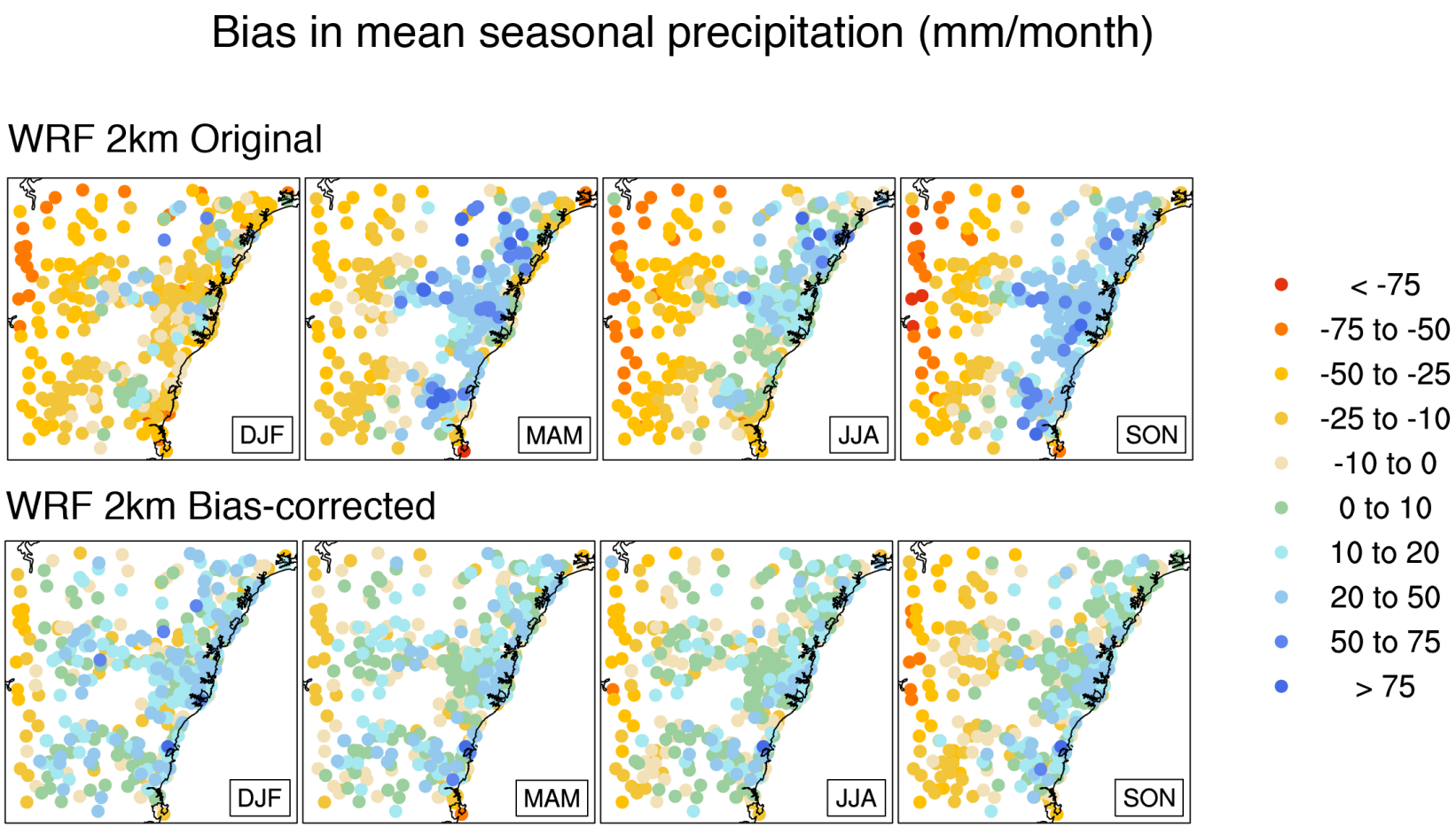
## Regions and stations in Sydney area



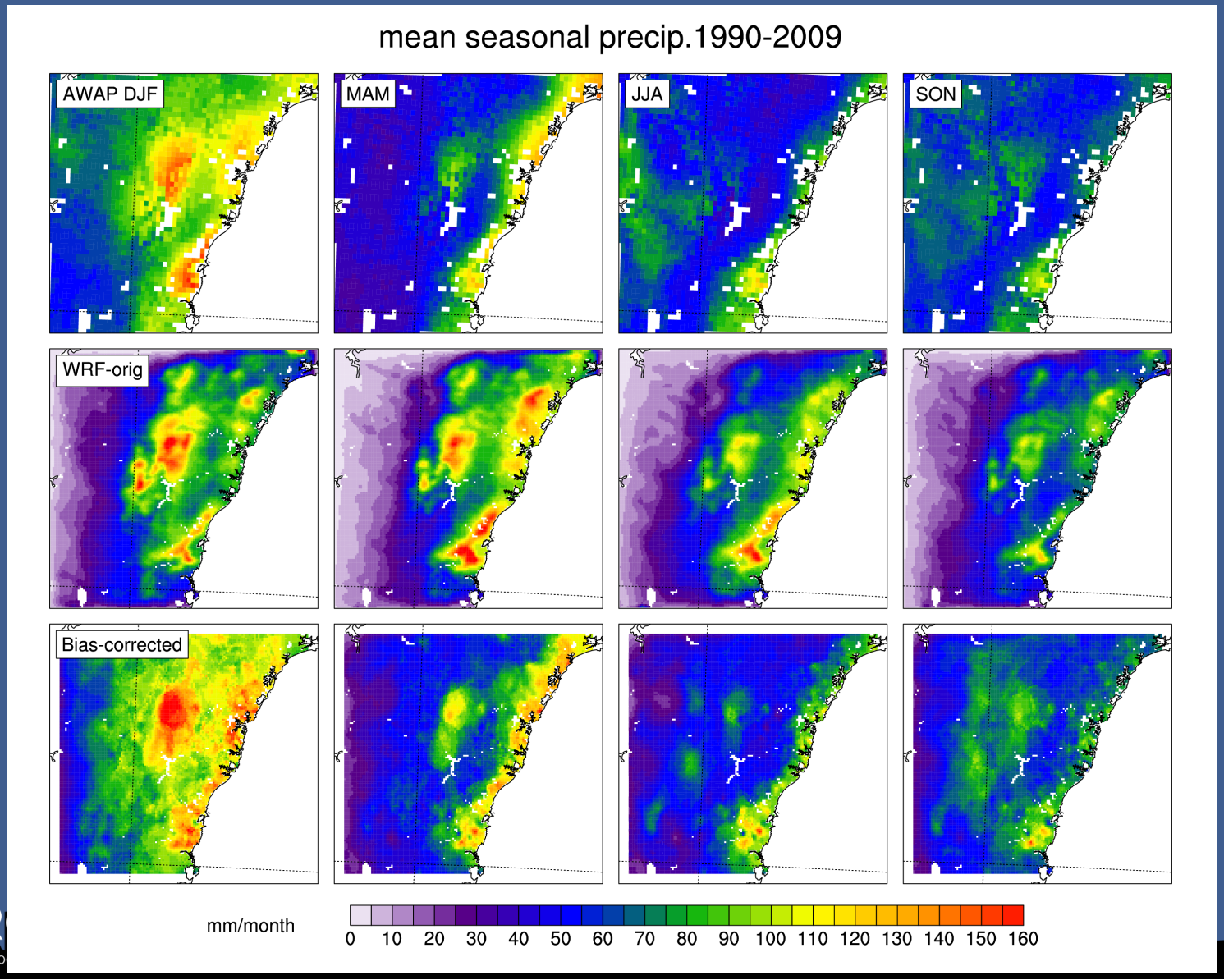
# Results

## Comparison WRF 2km with BoM stations



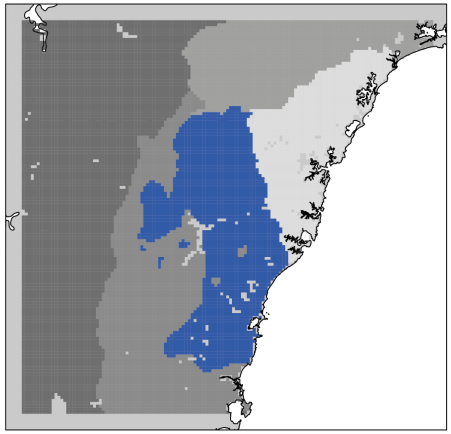
# Results

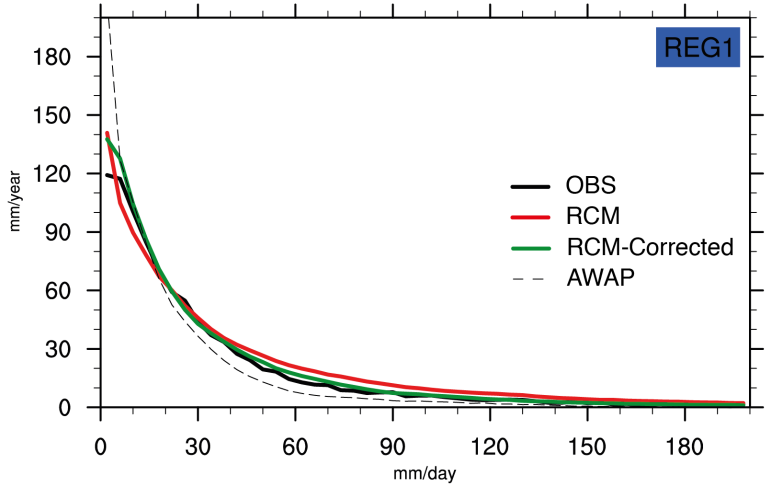
## Comparison WRF 2km with AWAP (~ 5km)

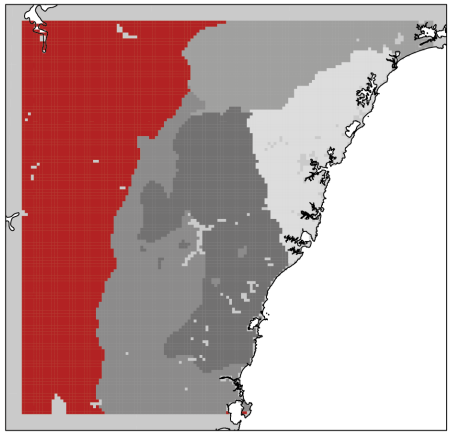


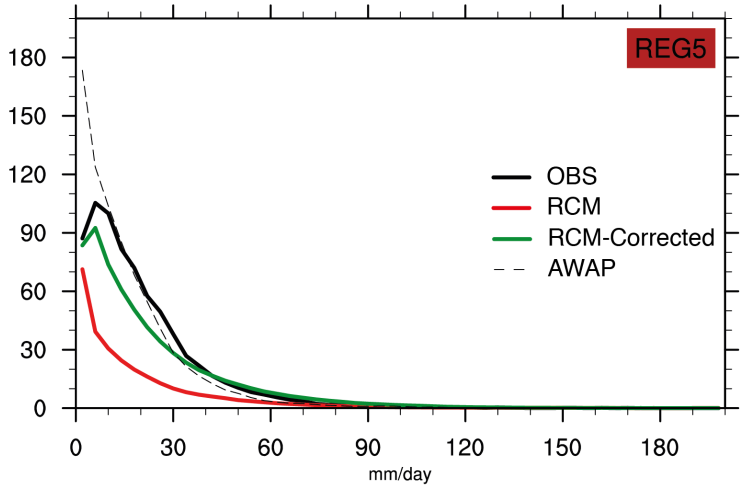
# Results

## Comparison WRF 2km with BoM stations and AWAP





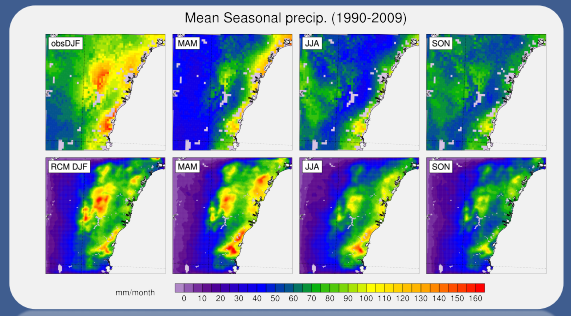





# Conclusions

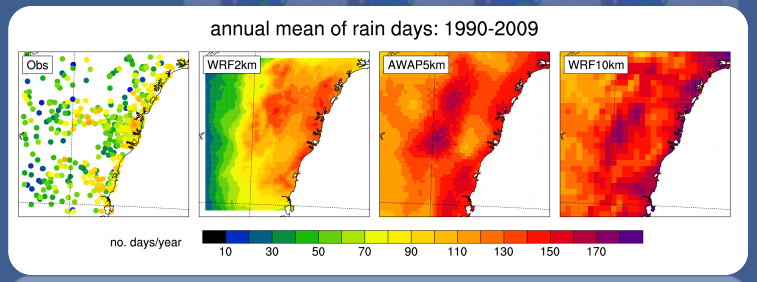
## Need for bias correction

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



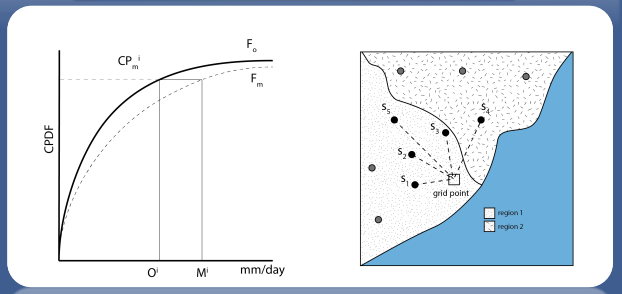

## The number of rain days

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




## Method adapted to high-res

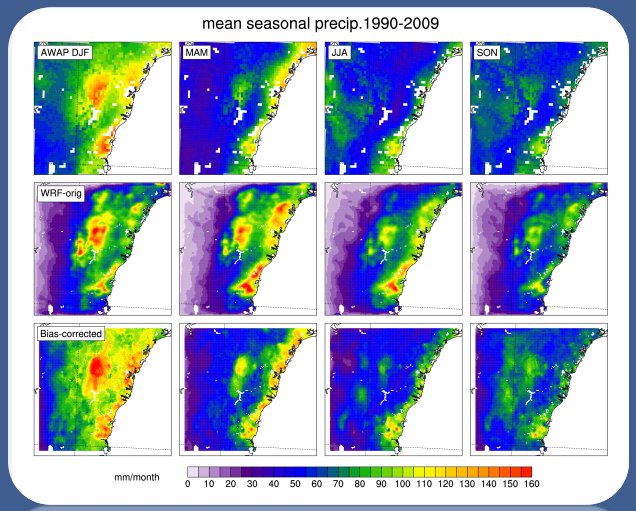
Using stations instead of gridded datasets.
Weighting and regionalising several stations.

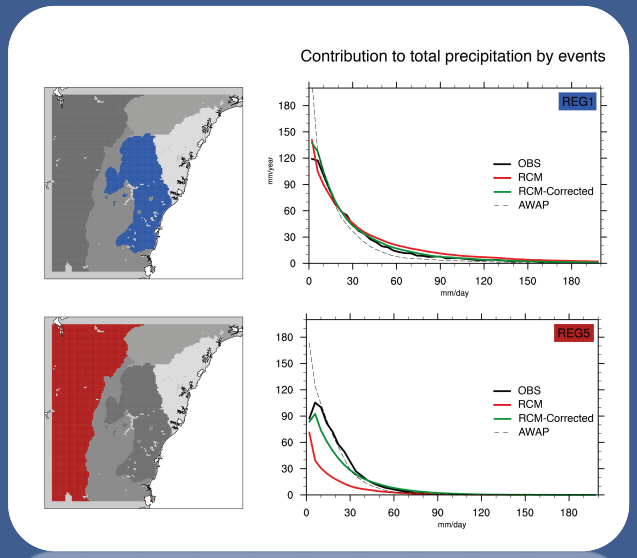


# Conclusions

## 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.