

# 한반도 상세 기후변화 전망

김맹기

공주대학교 대기과학과

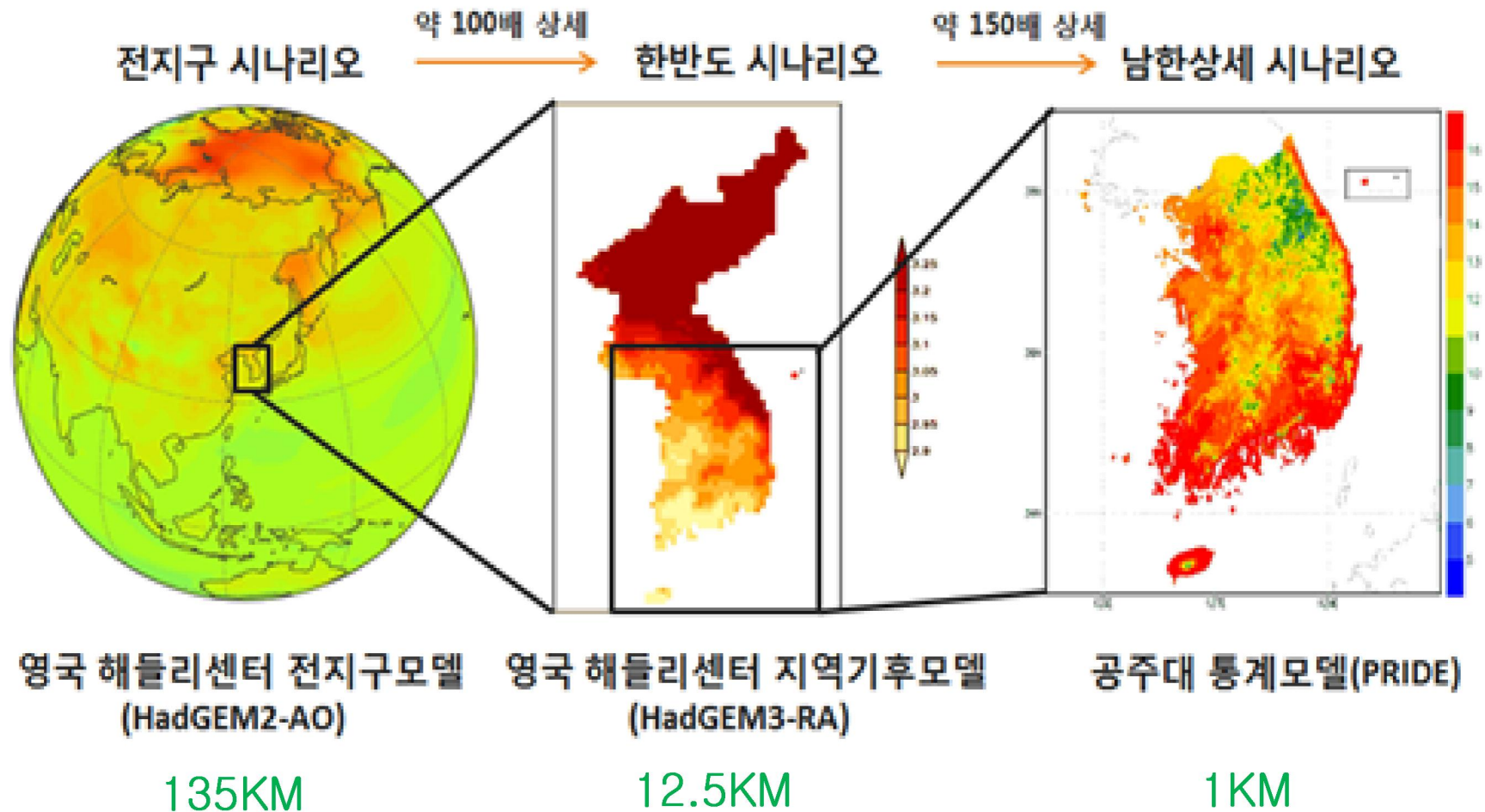
Acknowledgments: 최영은 (건국대), 이대희, 김진욱(공주대)

2012년 10월 23일(화) 대한상공회의소 의원회의실

# 발표순서

1. PRIDE 모델 개관
2. 자료 특성  
(2000년대를 중심으로)
3. 미래 지역기후변화 전망  
(대전충남을 중심으로)
4. 요약

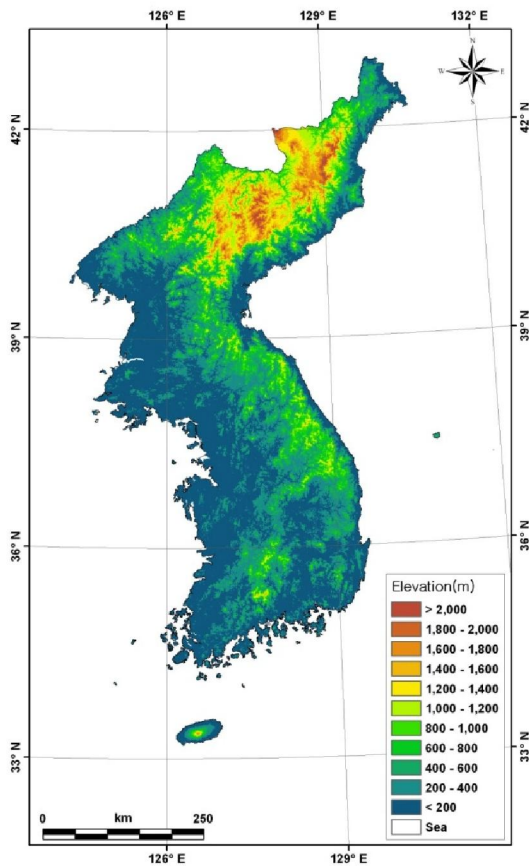
# From GCM TO PRIDE MODEL VIA RCM



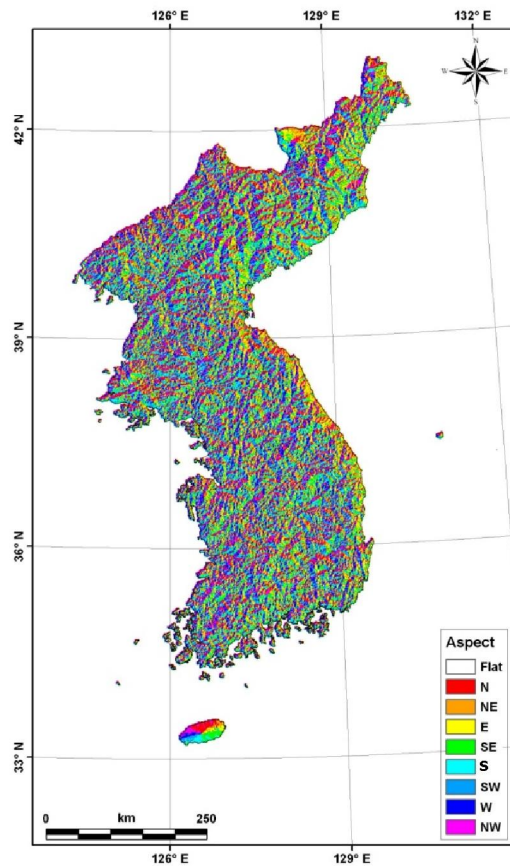
**GCM, RCM, PRIDE 모델 모두 중요함 !!!**

# 1km GIS Information

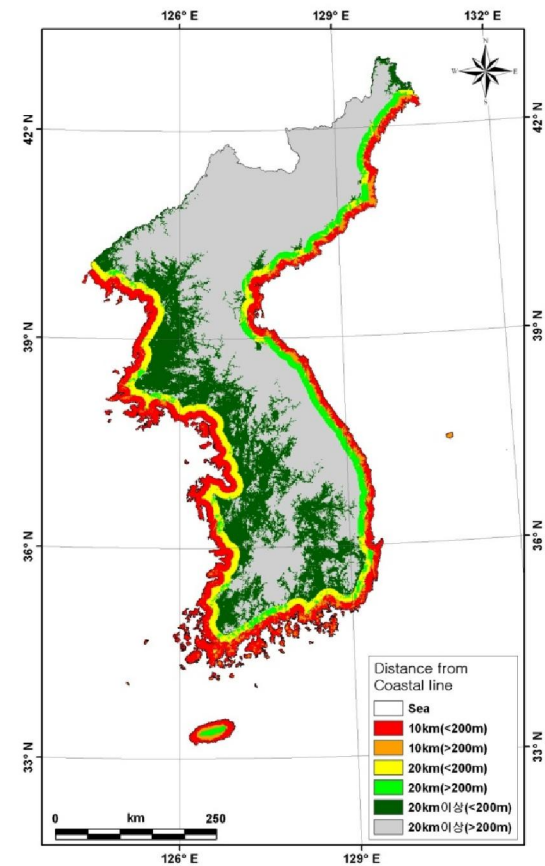
DEM Elevation



Topographic facet



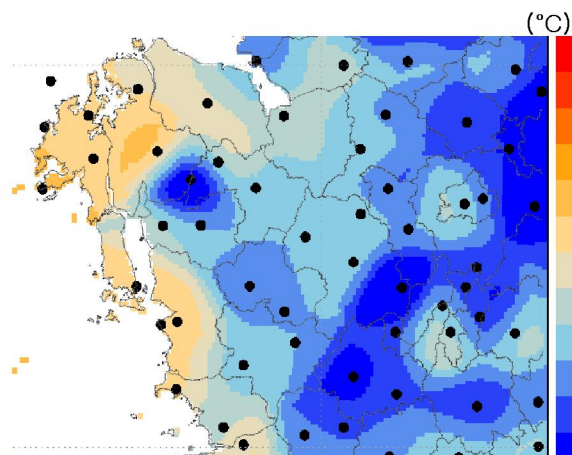
Coastal Proximity



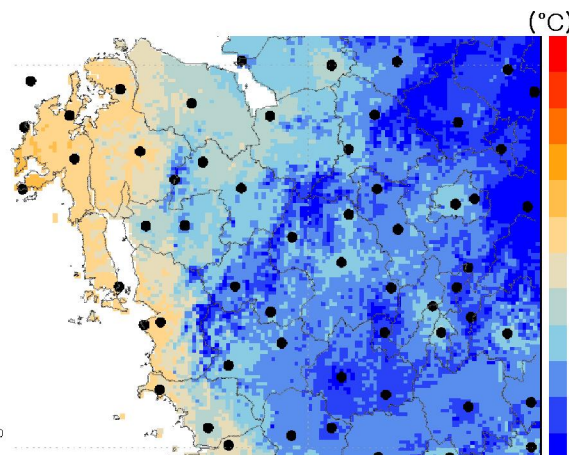
**복잡한 지형에서 기후에 영향을 주는 인자들을 고려한 모델 !!**

# 일평균기온 (대전충남)

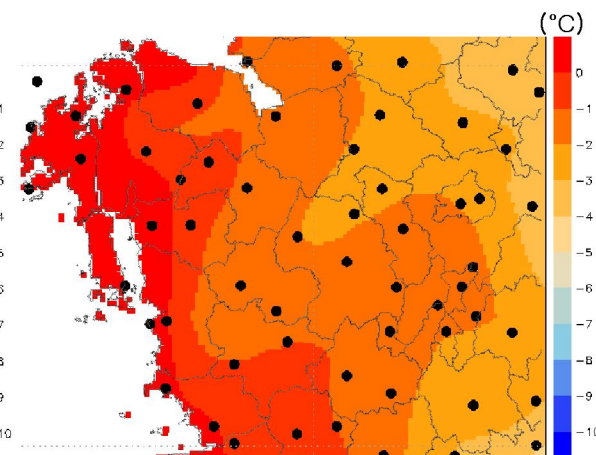
(2010.12.31)



OBS (1KM)

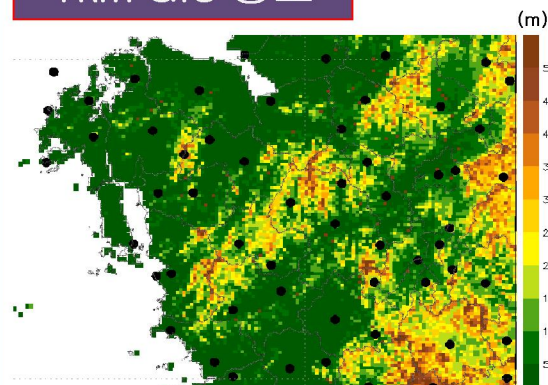


PRIDE (1KM)

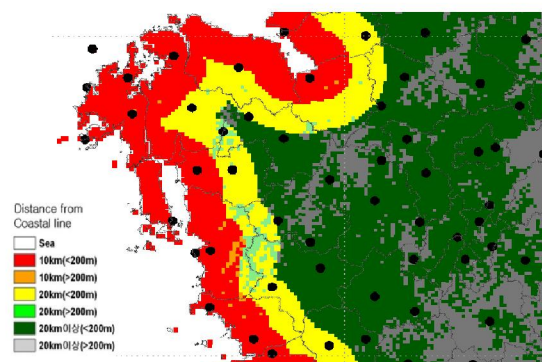


RCM (1KM)

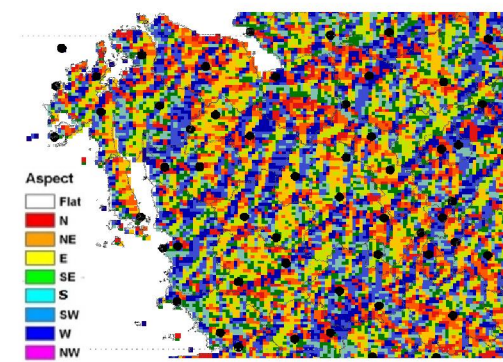
## 1km GIS 정보



고도



해양도

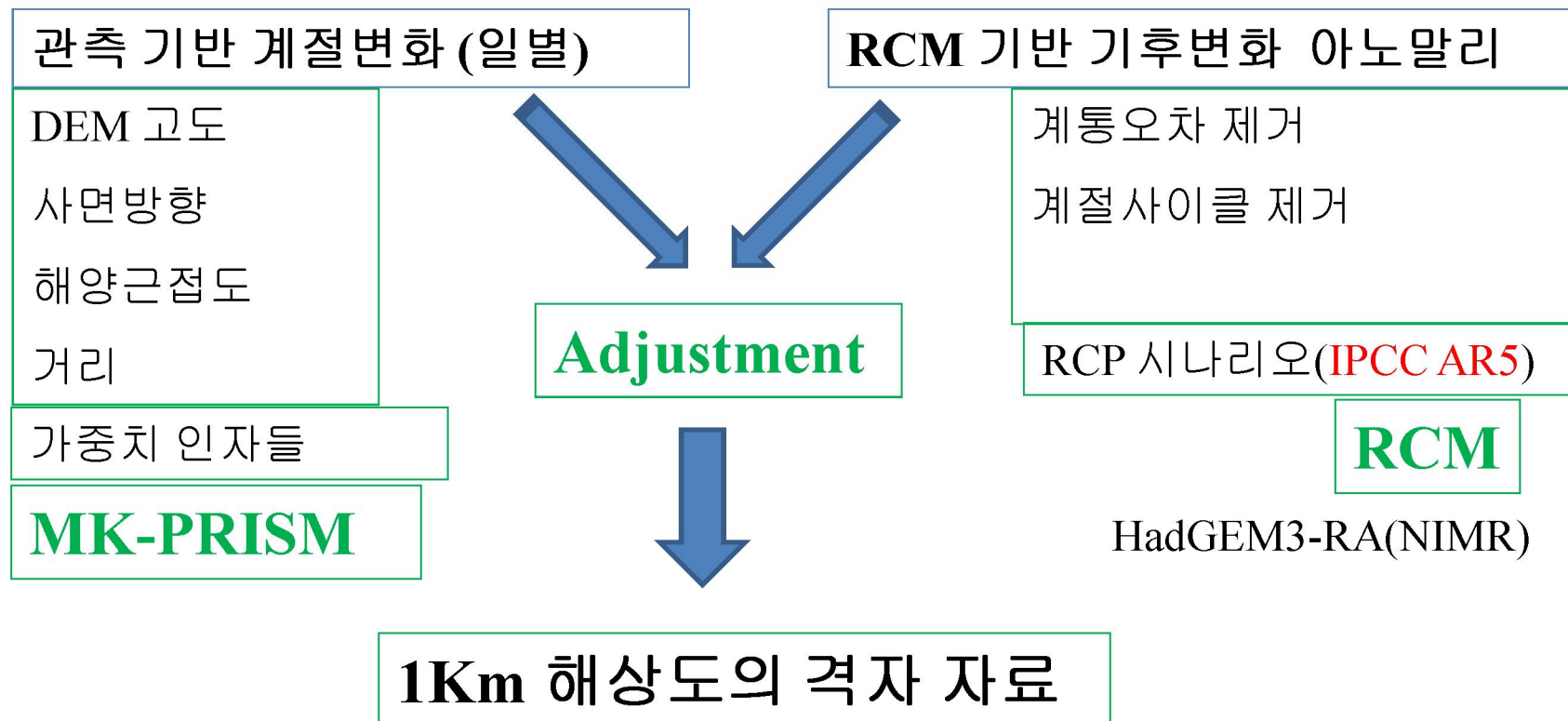


사면경사 (지향면)

같은 1KM 해상도이지만 완전히 다른 패턴 !!!

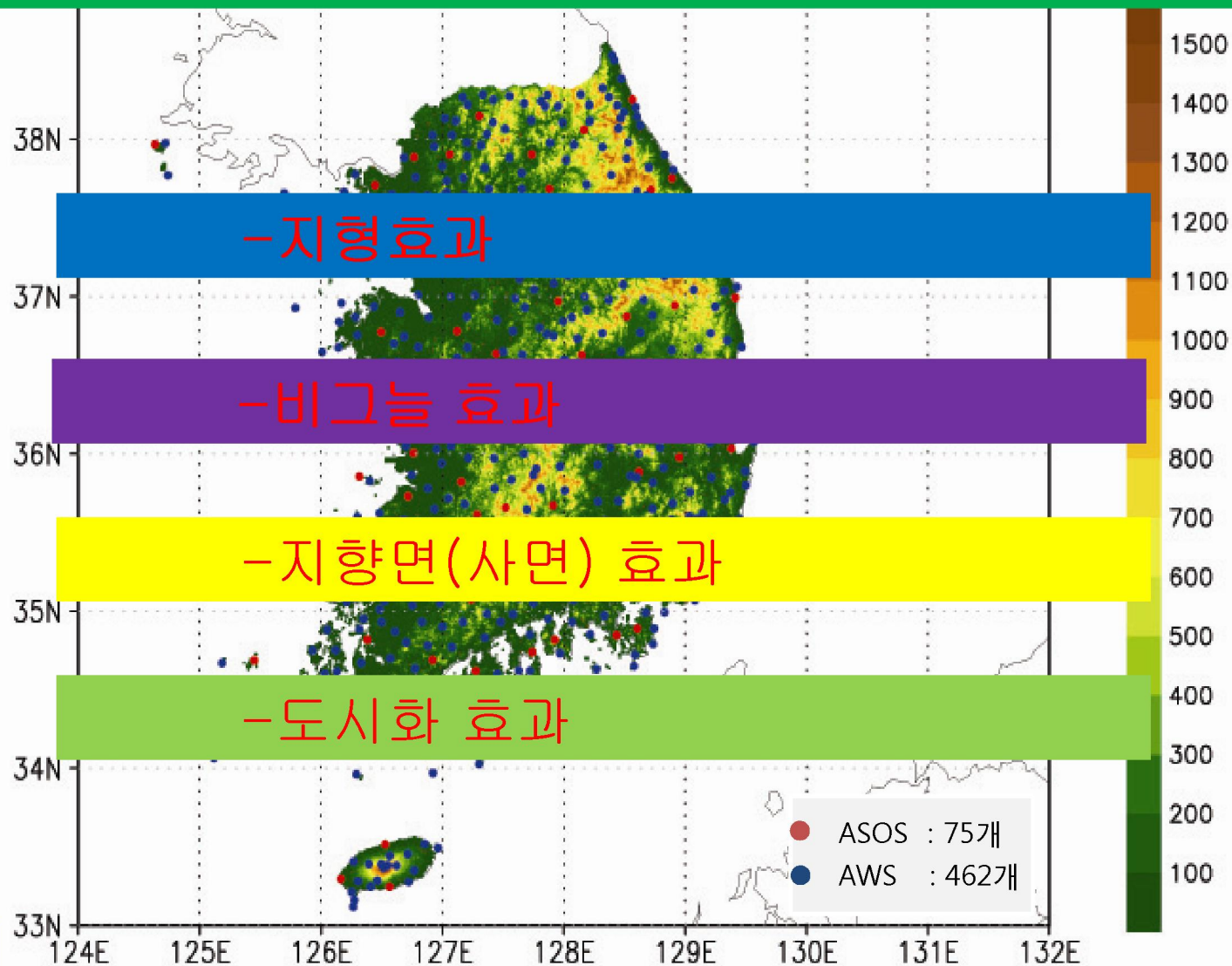
# PRIDE 모델

## PRISM based Downscaling Estimation Model

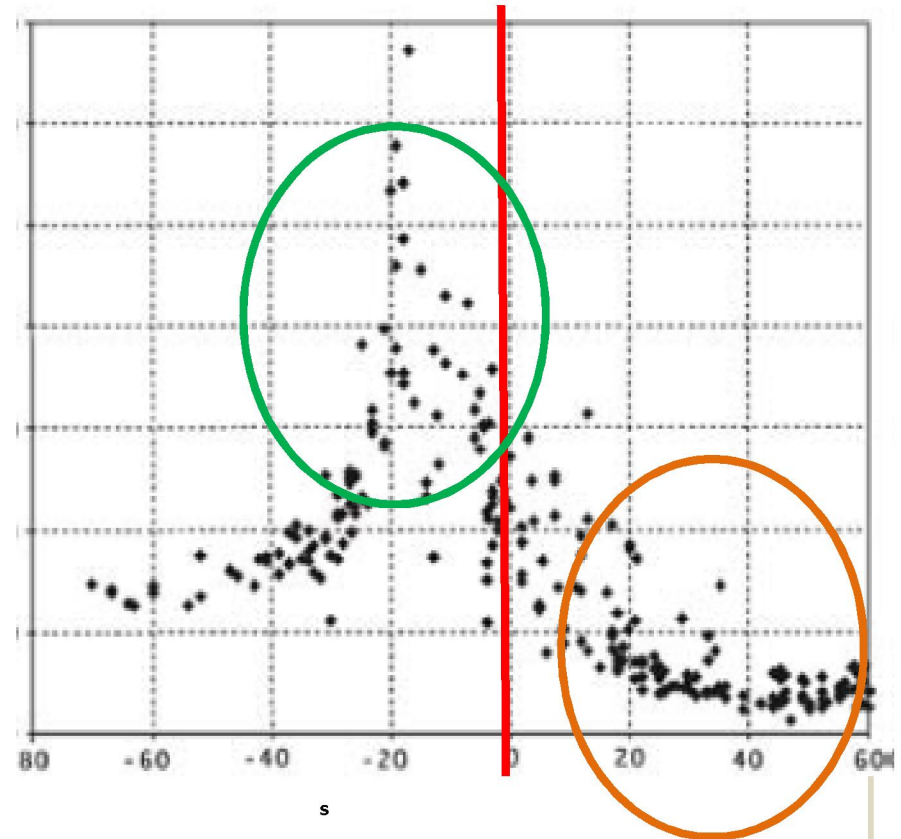
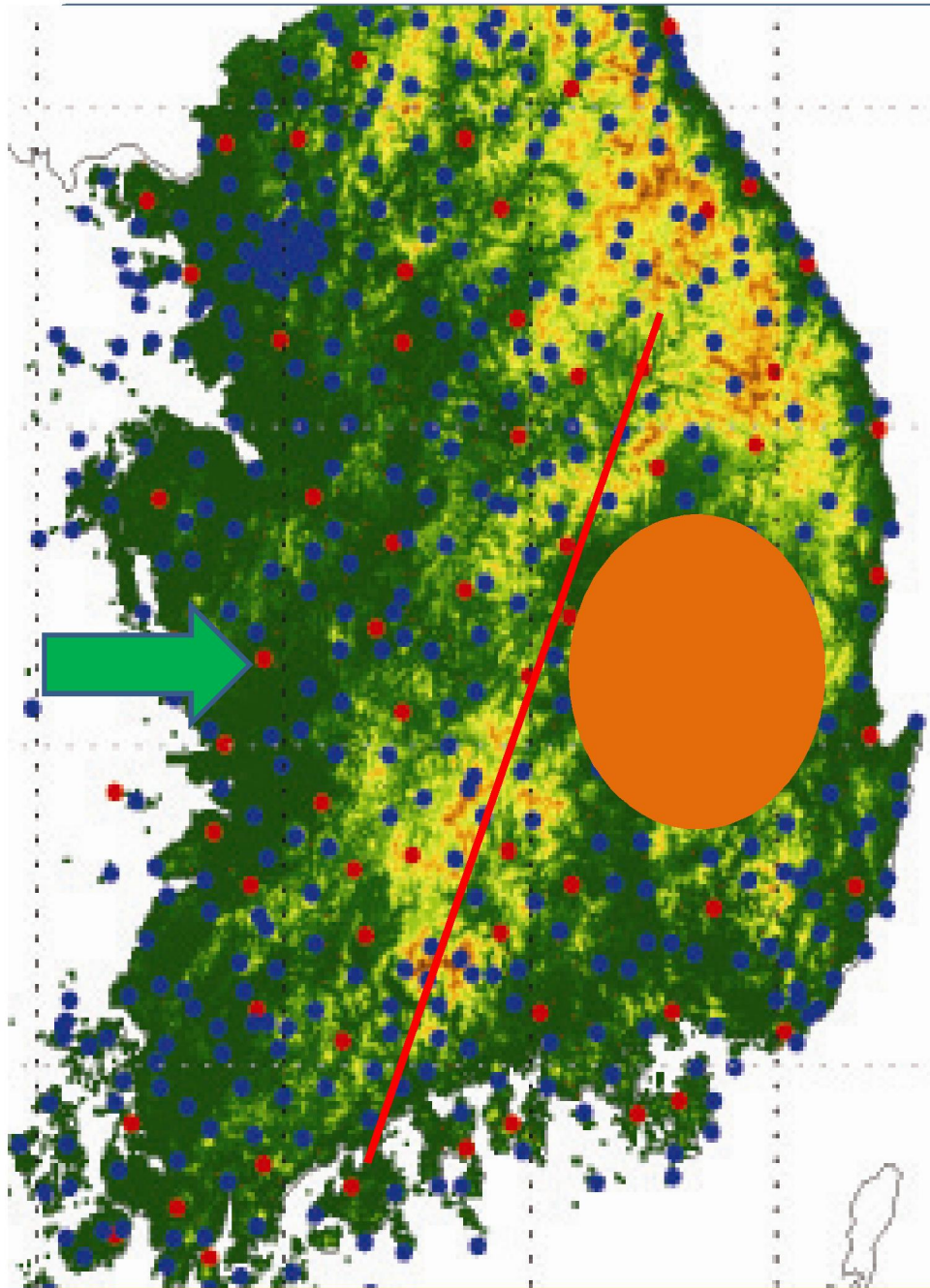


관측과 모델의 단점을 보완하고 장점을 결합하는 방식 !!

## 관측값에는 어떤 정보가 들어있을까요?



## 고도와 사면방향 영향

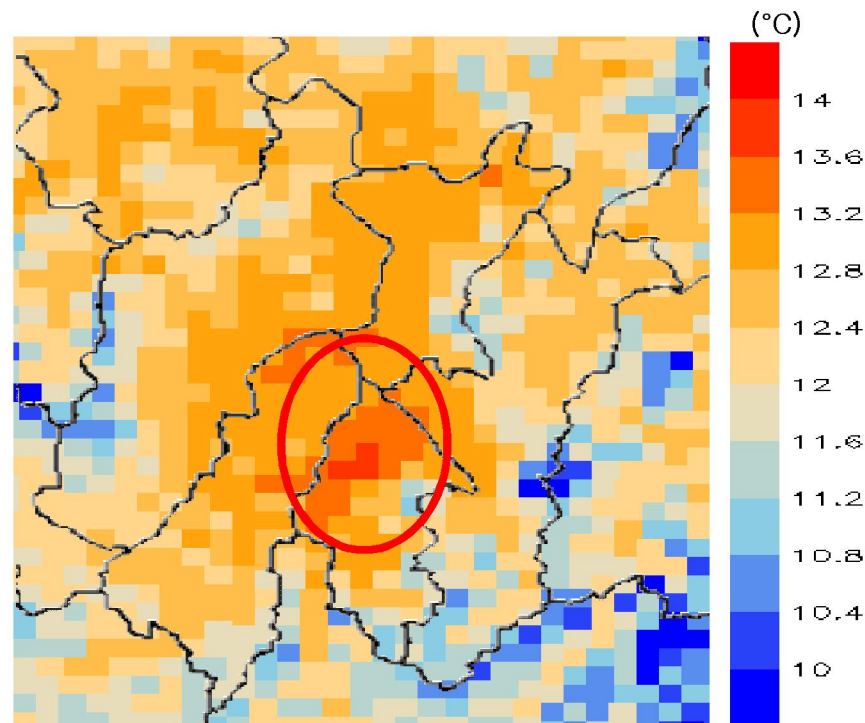


비그늘 효과

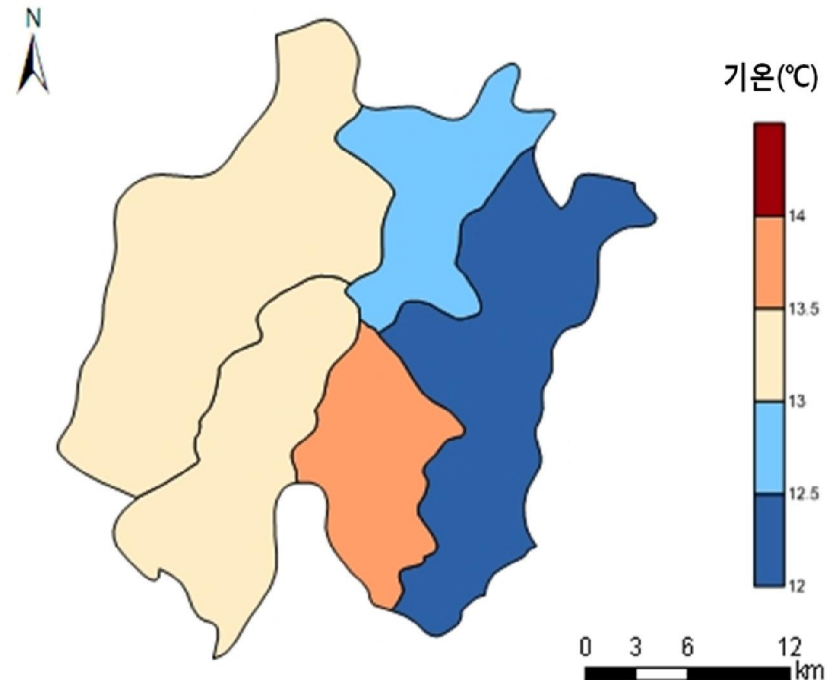
(Rain shadow effect)

# 도시화 효과

(2001~2010)



1KM 해상도

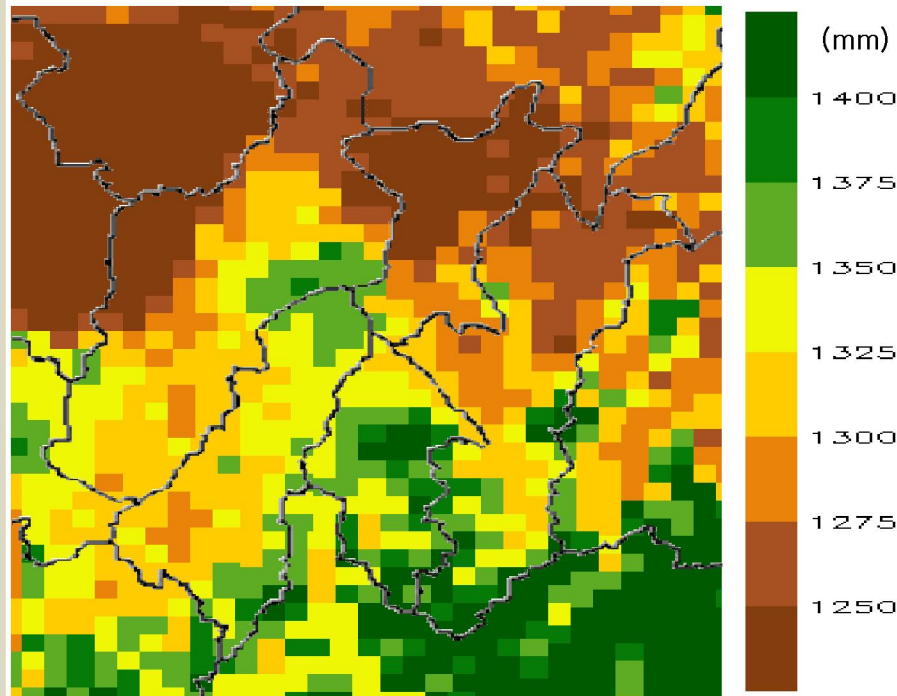


시군구별

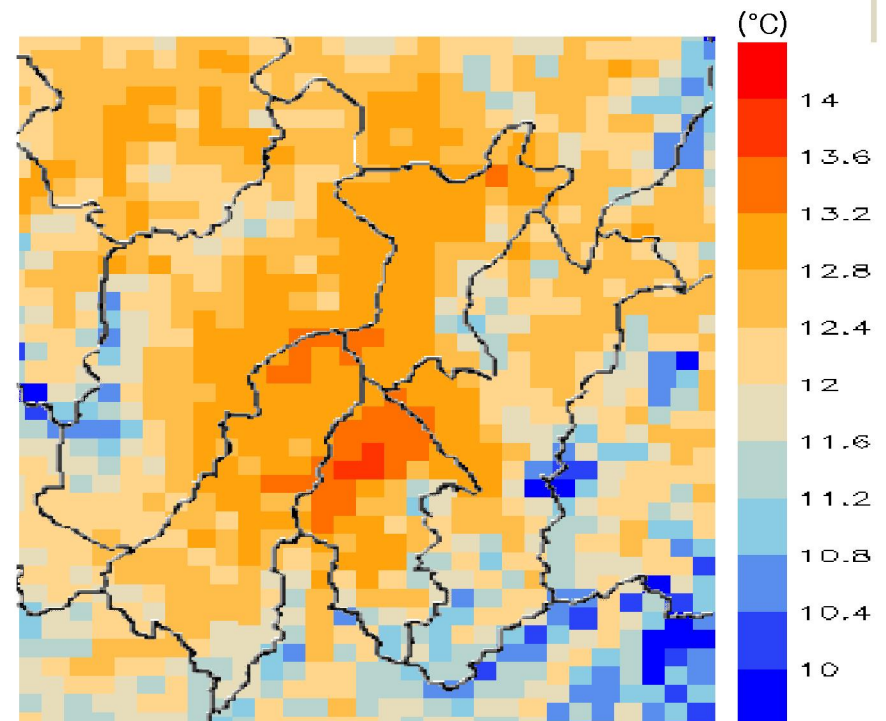
Urban warming effect

# 대전광역시

(2001~2010)



연강수량

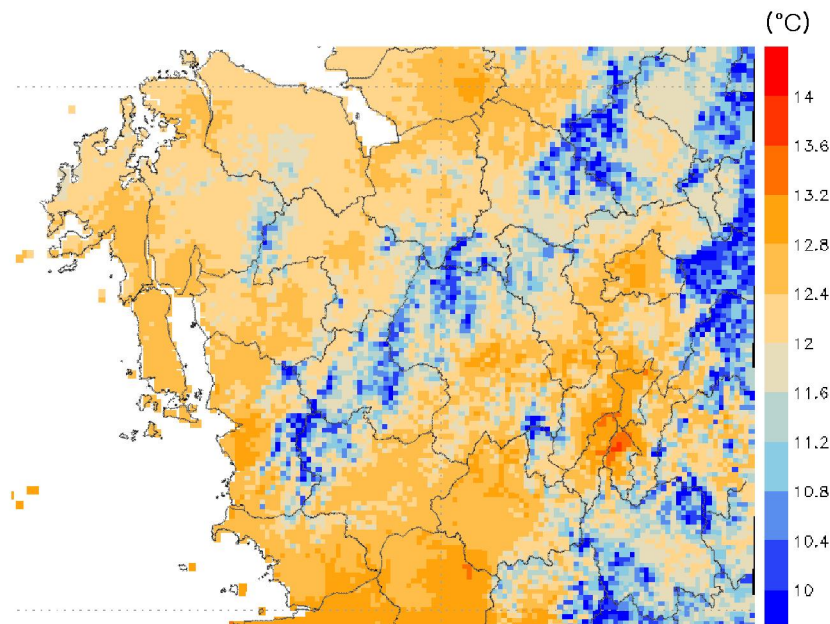


평균기온

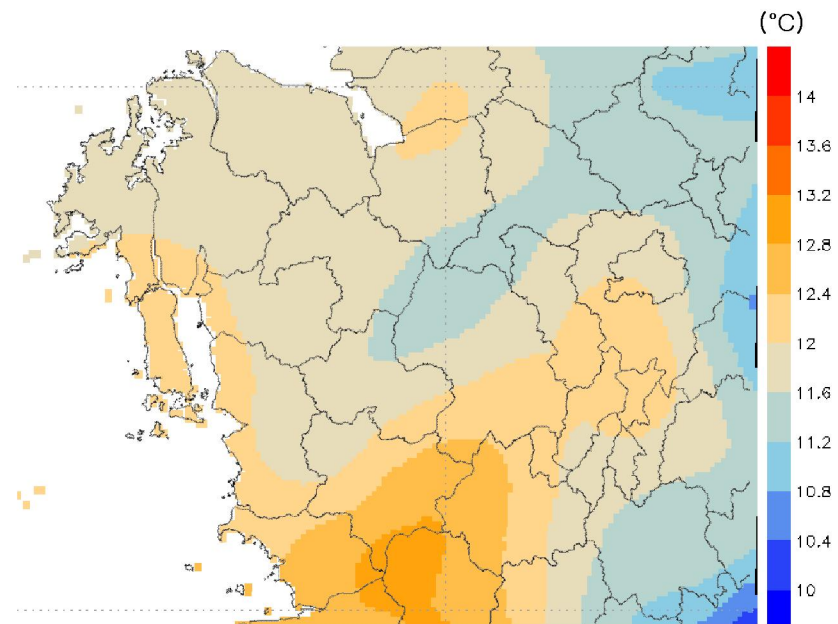
기온과 강수량의 연계성도 잘 나타남!!!

# 일평균기온 (대전충남)

(2001~2010)



PRIDE (1KM)

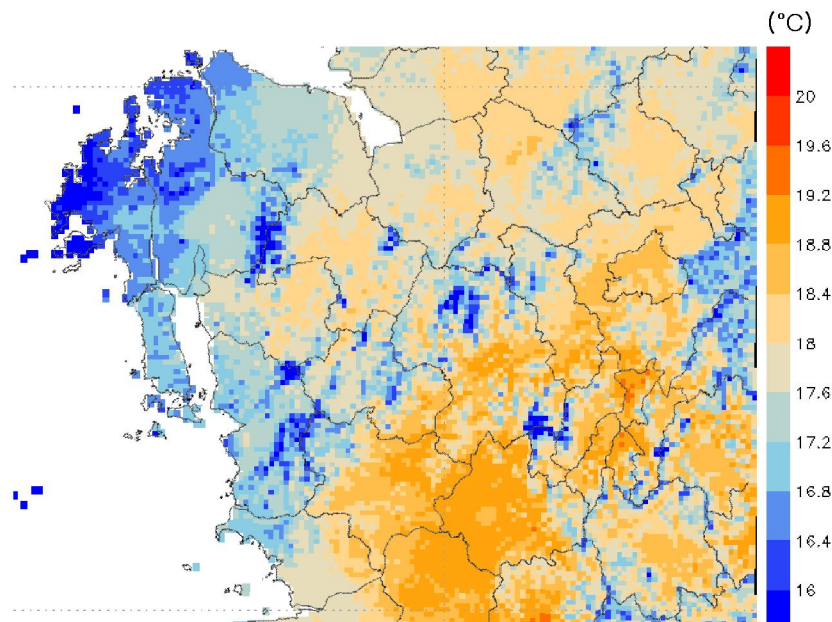


RCM (1KM)

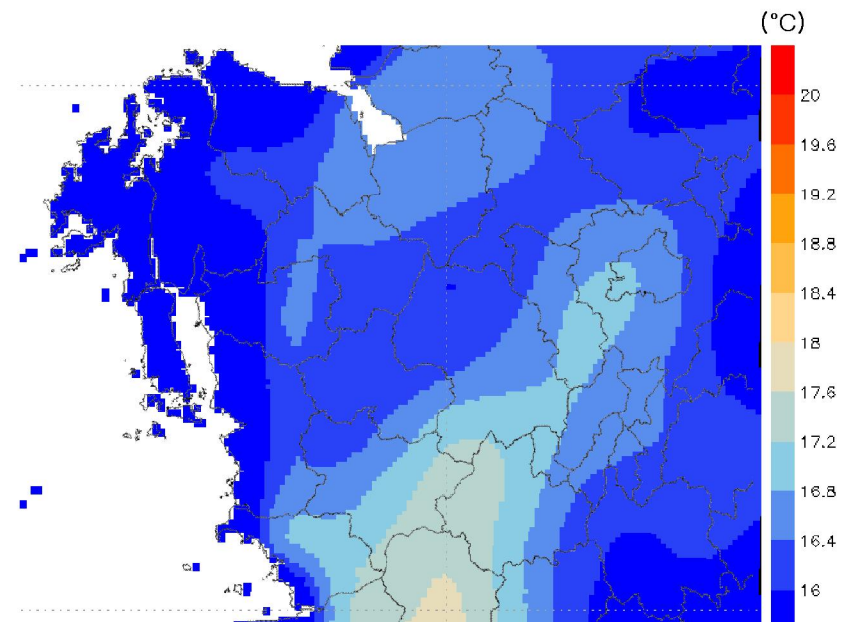
**패턴은 유사하지만 디테일은 상당한 차이 !!**

# 일최고기온 (대전충남)

(2001~2010)



PRIDE (1KM)

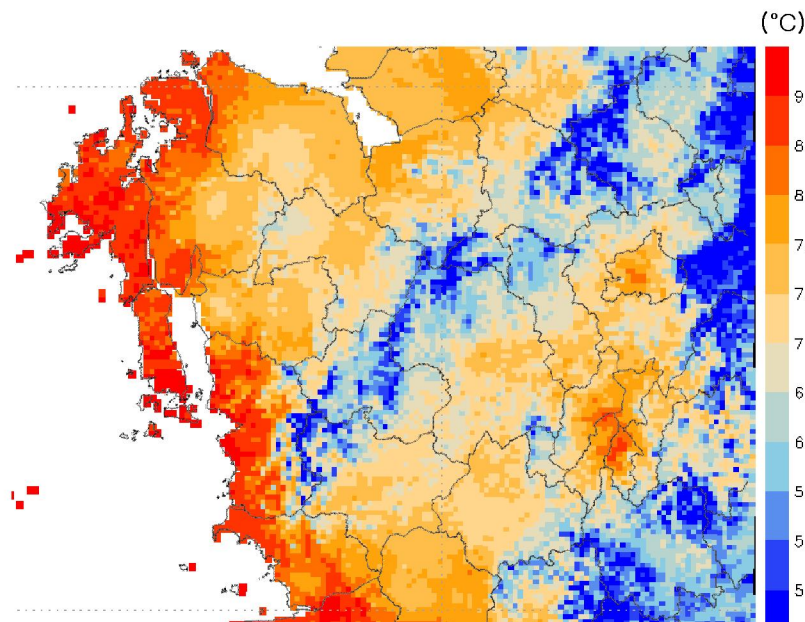


RCM (1KM)

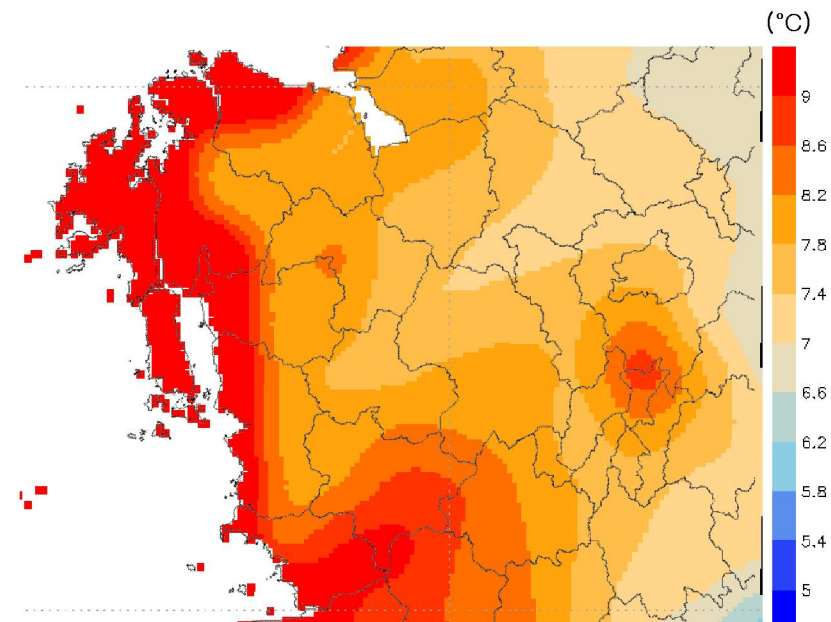
해안 < 내륙평지 < 내륙 산지 일수록 오차보정이 커짐 !!!

# 일최저기온 (대전충남)

(2001~2010)



PRIDE (1KM)

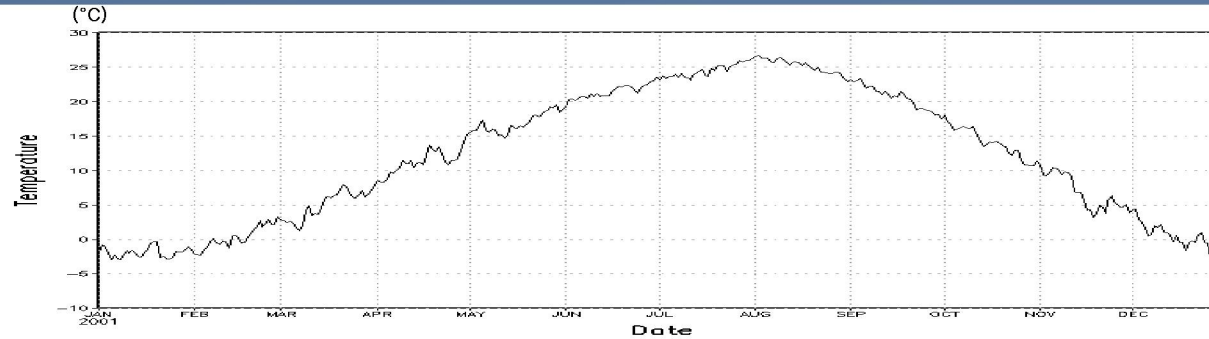


RCM (1KM)

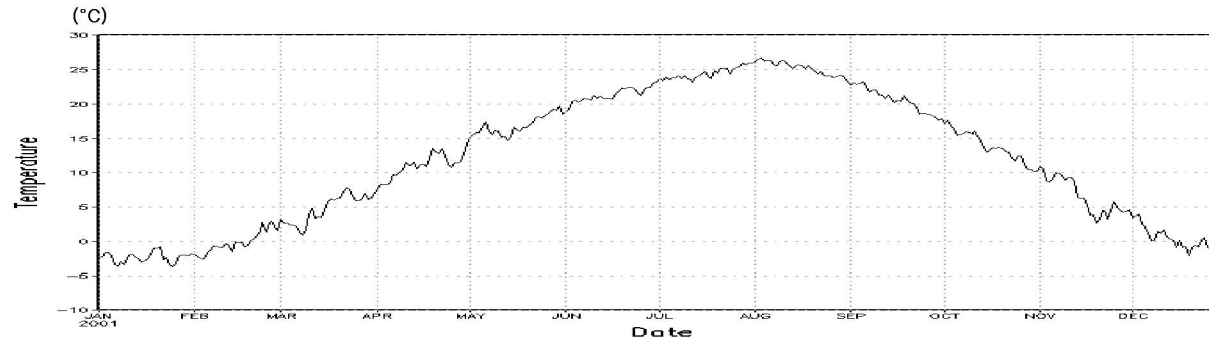
해안 < 내륙평지 < 내륙 산지 일수록 오차보정이 커짐!!!

# Seasonal Cycle (일평균기온) (2001~2010)

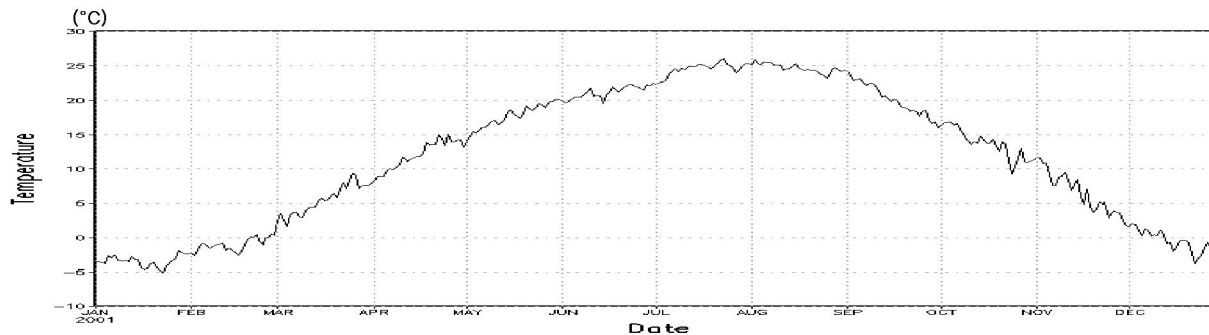
관측



PRIDE



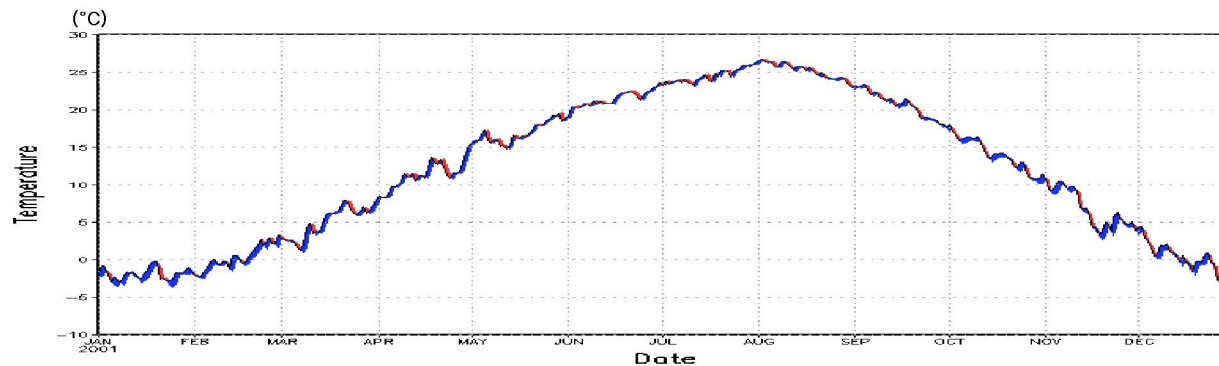
RCM



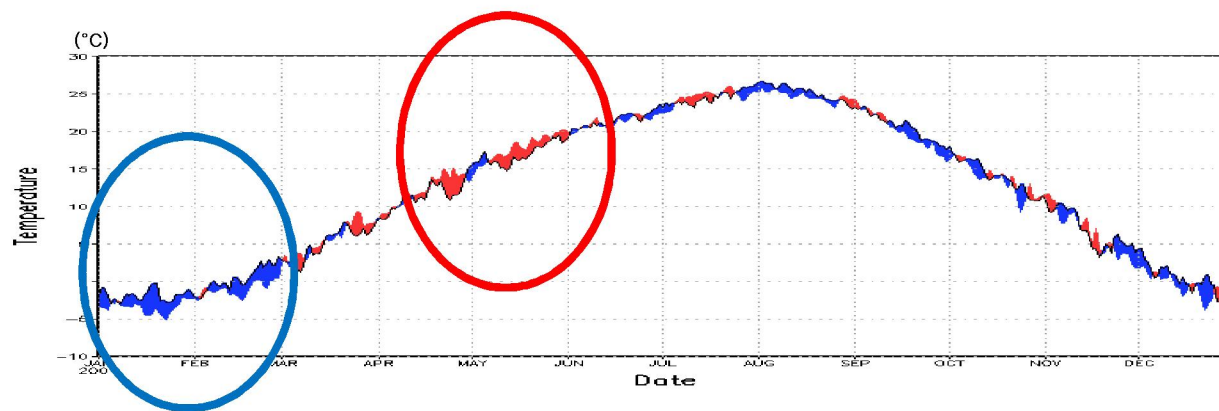
**PRIDE 모델의 계절 사이클이 관측값을 매우 잘 반영!!**

# Seasonal Cycle (일평균기온) (2001~2010)

PRIDE



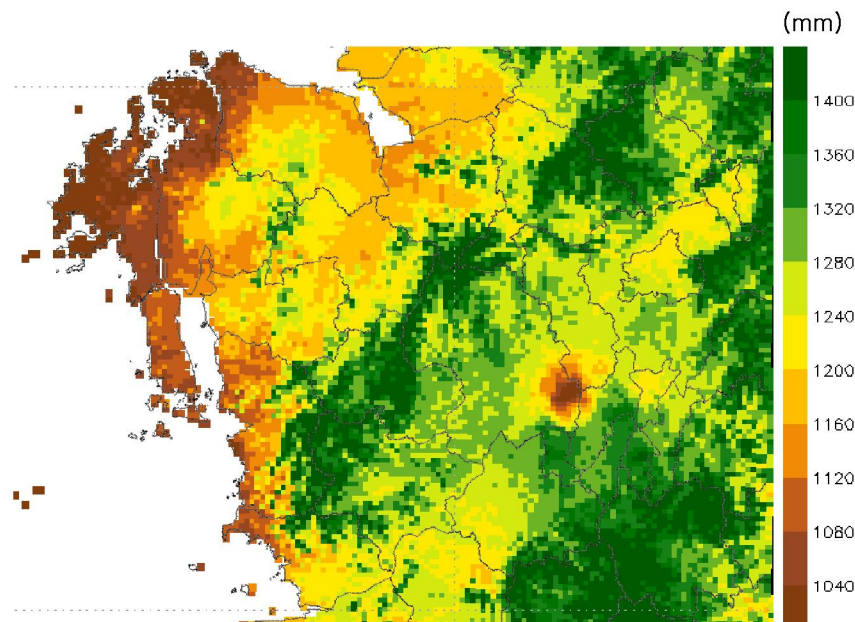
RCM



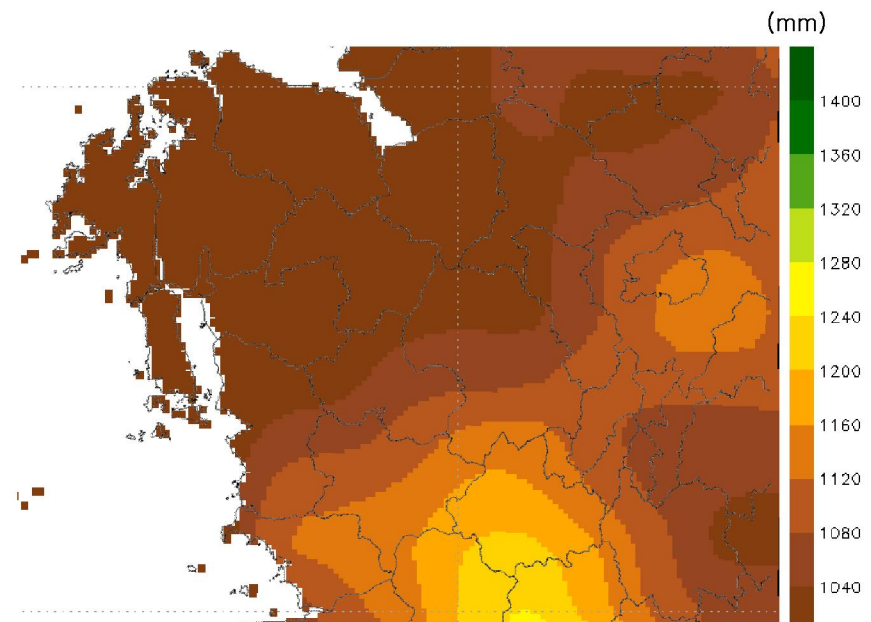
**PRIDE모델은 RCM의 계통오차를 효과적으로 보정함!!**

# 연강수량 (대전충남)

(2001~2010)



PRIDE (1KM)

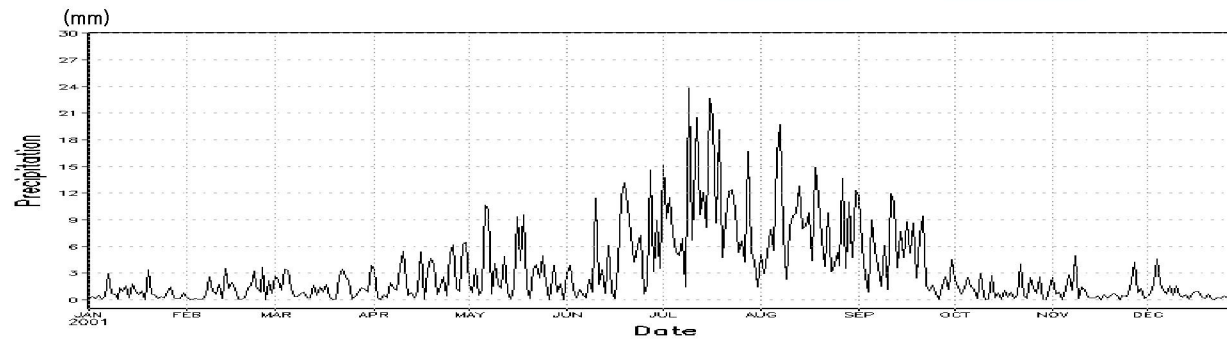


RCM (1KM)

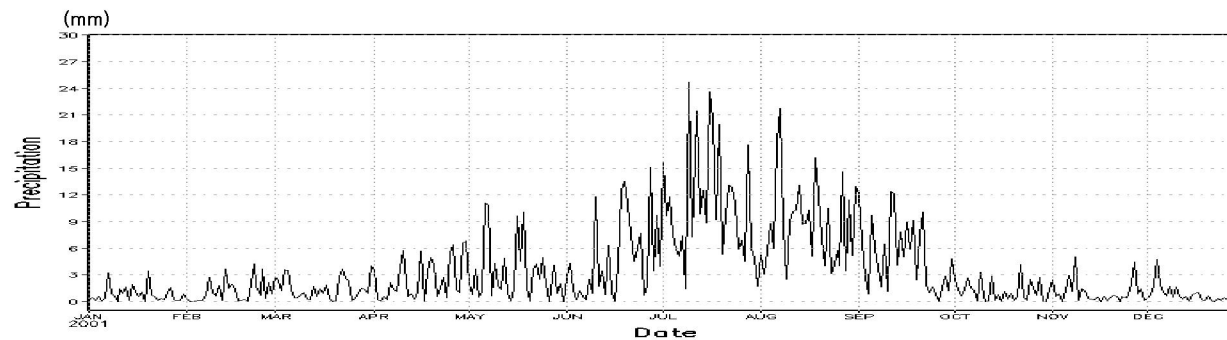
**강수량은 기온보다 계통오차가 더 많이 보정됨!!!**

# Seasonal Cycle (일강수량) (2001~2010)

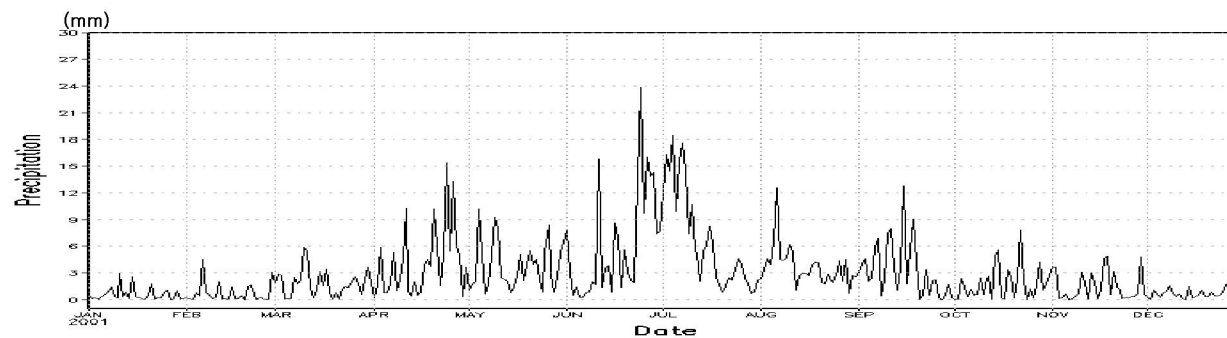
관측



PRIDE



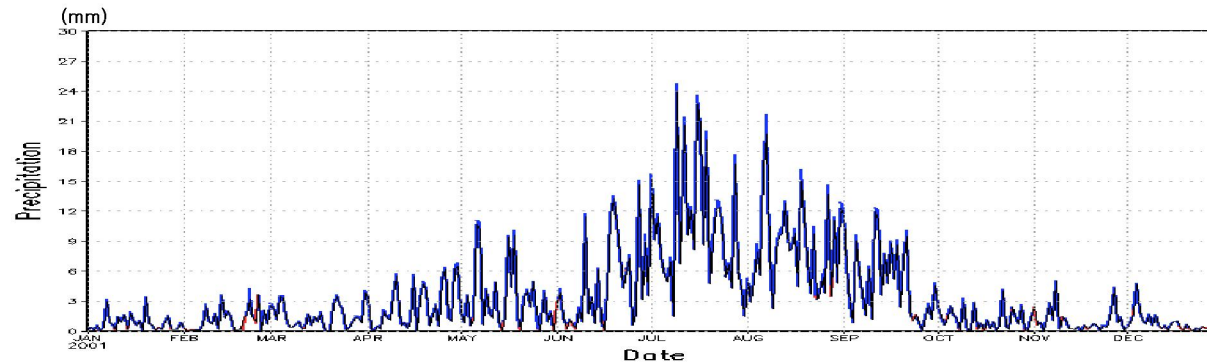
RCM



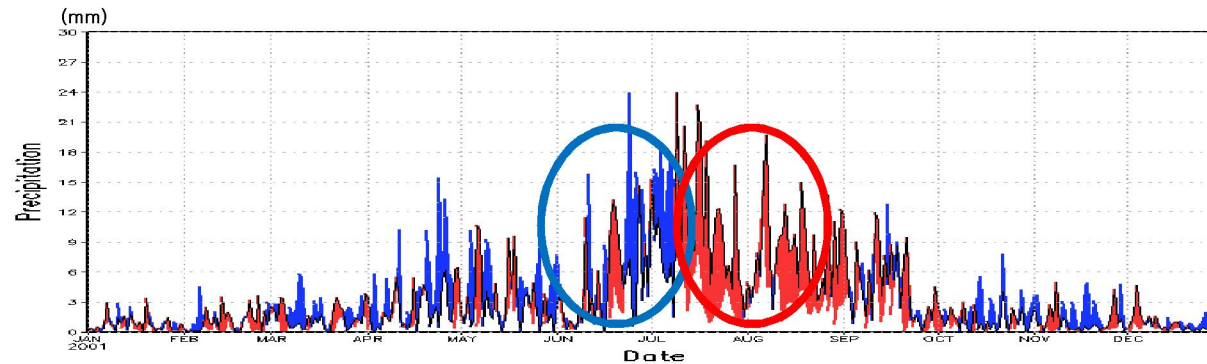
**PRIDE 모델의 계절 사이클이 관측값을 매우 잘 반영!!**

# Seasonal Cycle (일강수량) (2001~2010)

PRIDE



RCM



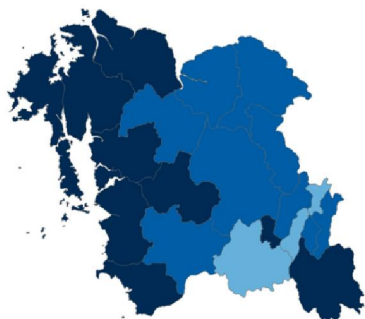
**PRIDE모델은 RCM의 계통오차를 효과적으로 보정함!!**

# 미래 지역기후변화 전망

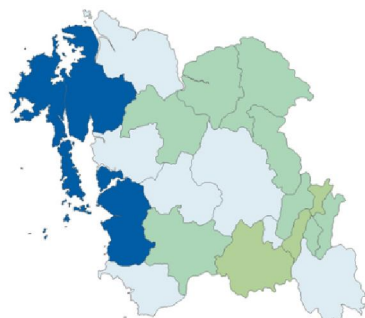
현재	2001 ~ 2010 (2000년대)
전반기	2011 ~ 2040
중반기	2041 ~ 2070
후반기	2071 ~ 2100

# 여름철 일최고기온 (대전충남)

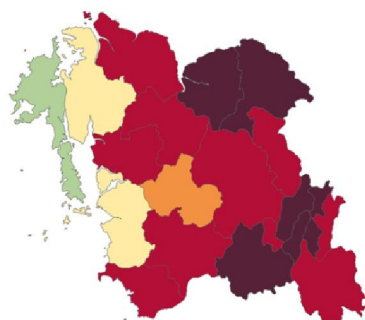
전반기



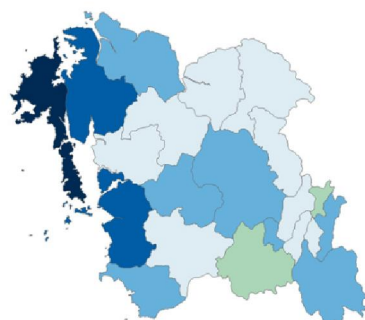
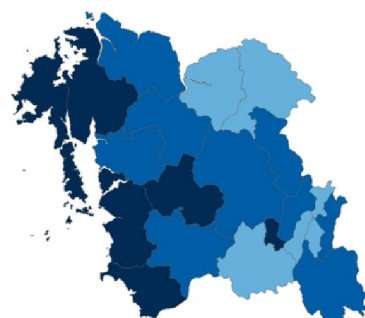
중반기



후반기

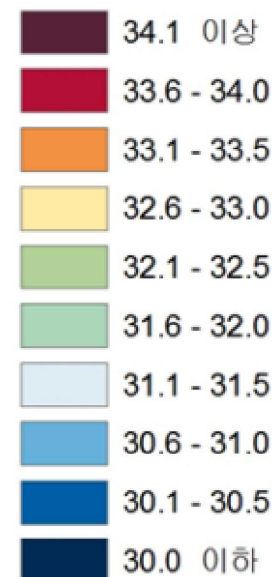


**RCP 8.5**



**RCP 4.5**

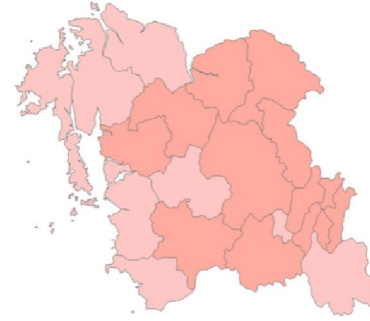
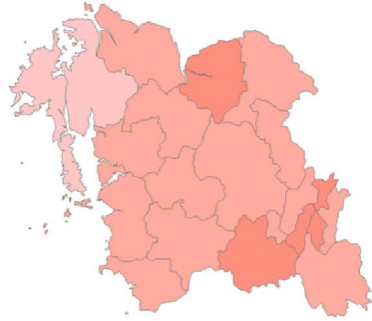
기온(°C)



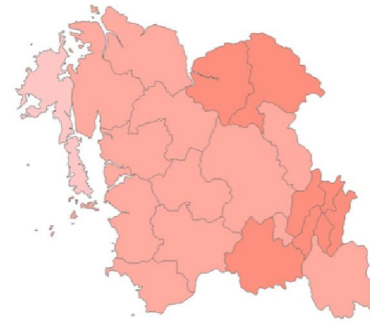
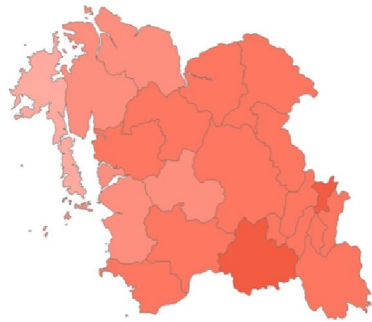
0 10 20 40  
Kilometers

# 폭염일수 (대전충남)

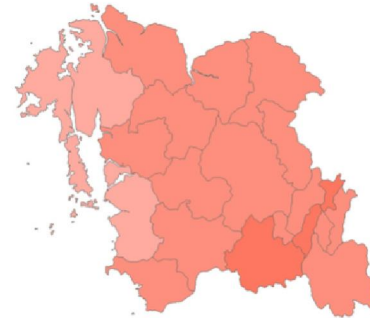
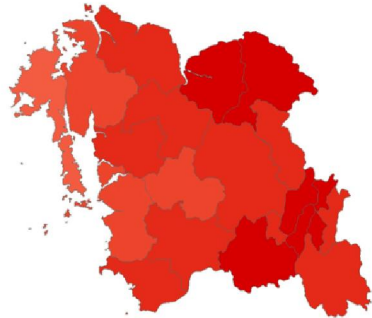
전반기



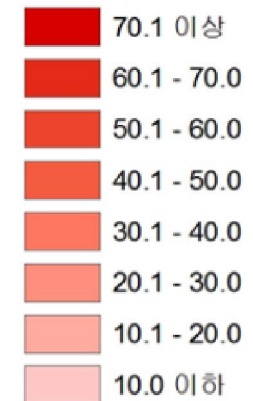
중반기



후반기



일수



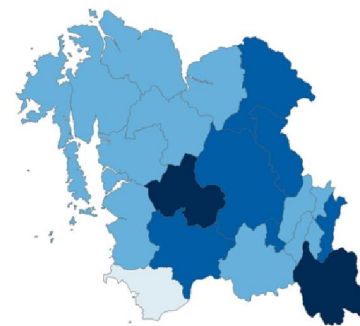
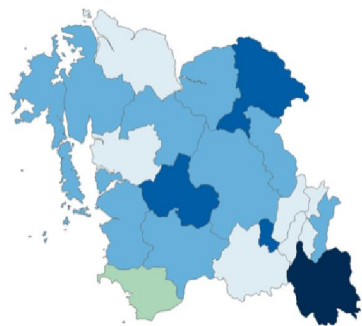
0 15 30 60 Kilometers

RCP 8.5

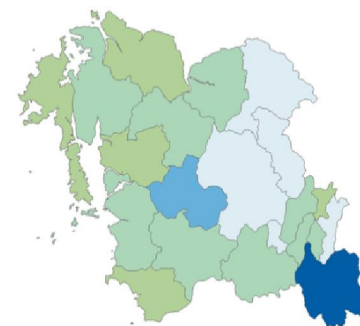
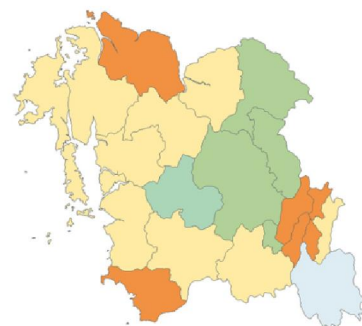
RCP 4.5

# 여름철 일최저기온 (대전충남)

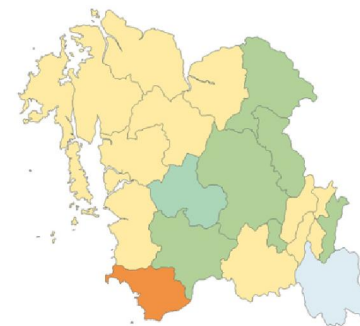
전반기



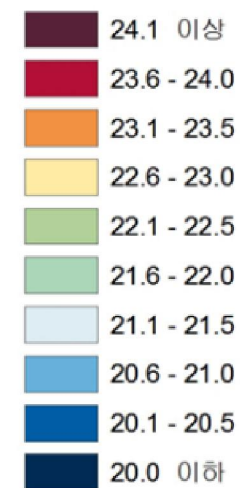
중반기



후반기



기온(℃)



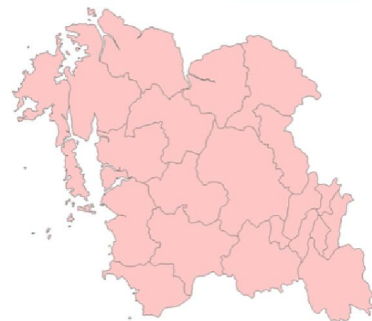
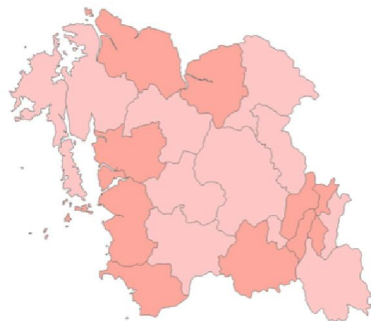
0 10 20 40 Kilometers

RCP 8.5

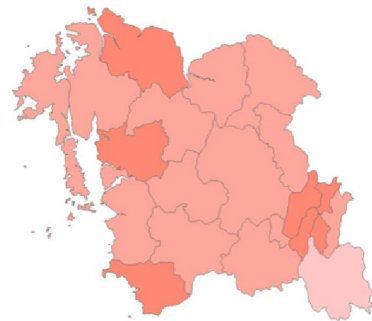
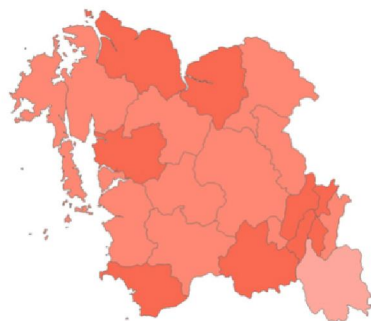
RCP 4.5

# 열대야일수 (대전충남)

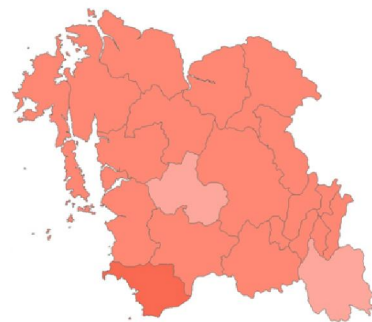
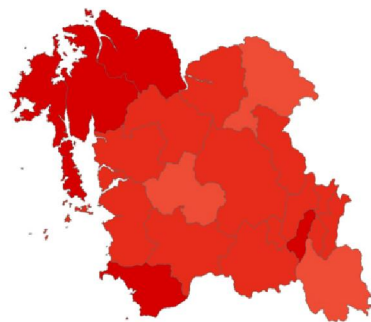
전반기



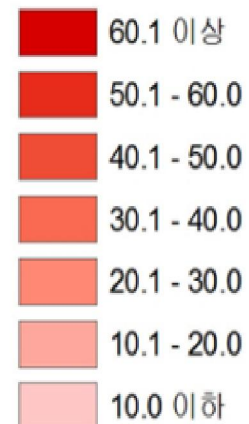
중반기



후반기



일수

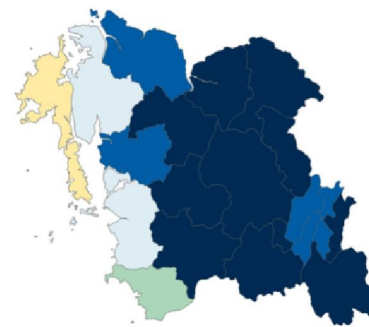
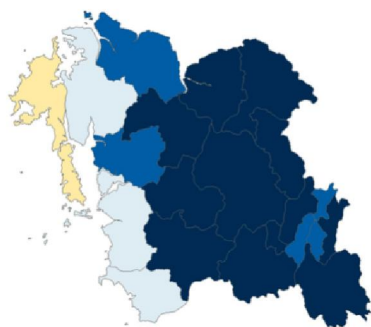


**RCP 8.5**

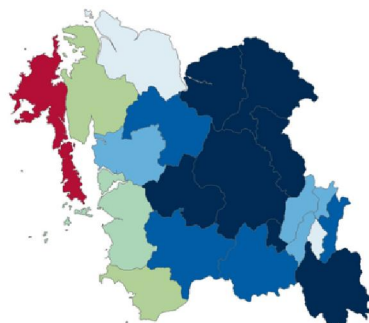
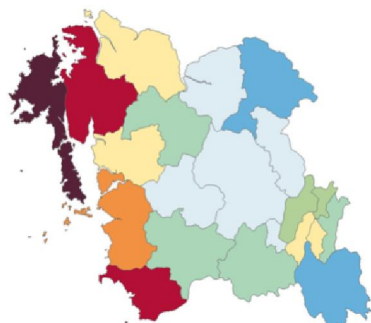
**RCP 4.5**

# 겨울철 일최저기온 (대전충남)

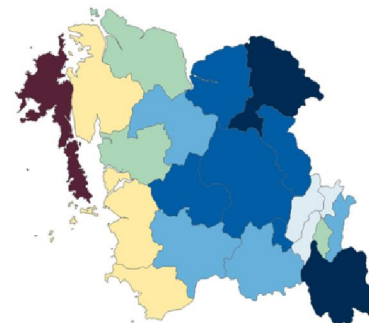
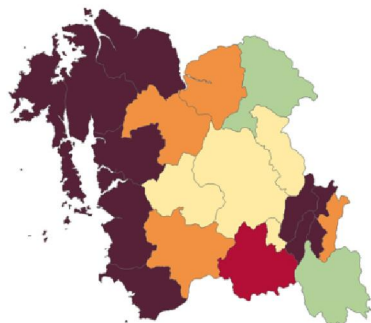
전반기



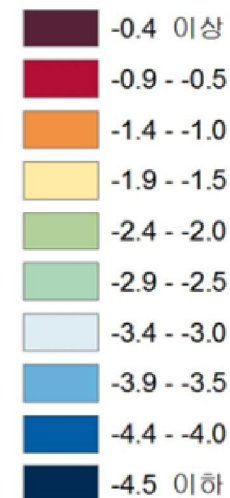
중반기



후반기



기온(℃)



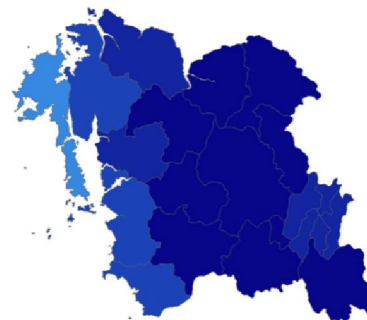
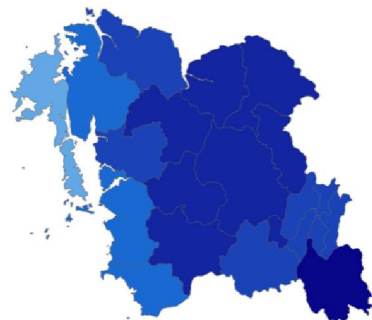
0 10 20 40  
Kilometers

RCP 8.5

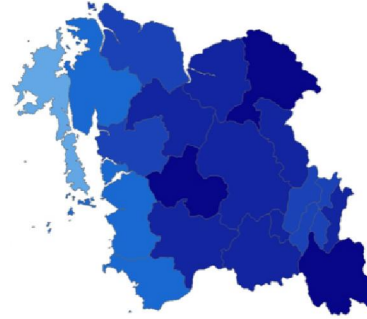
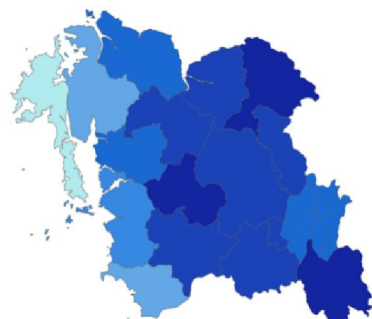
RCP 4.5

# 결빙일수 (대전충남)

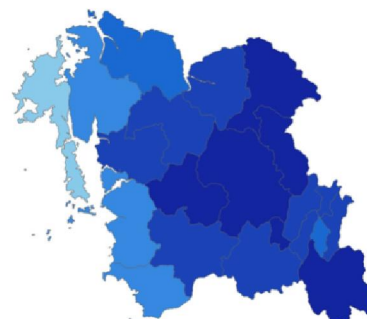
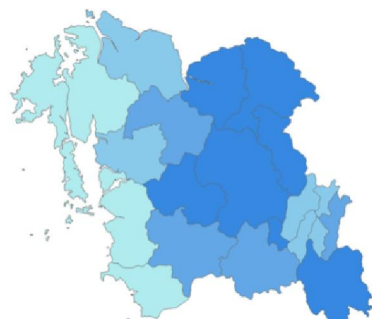
전반기



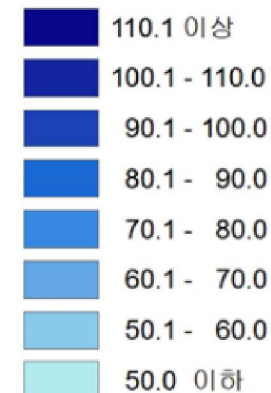
중반기



후반기



일수



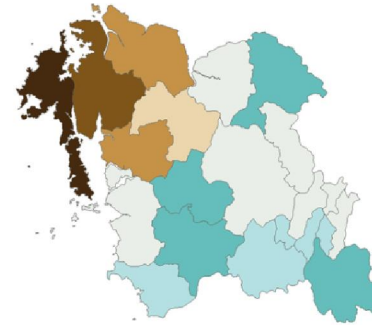
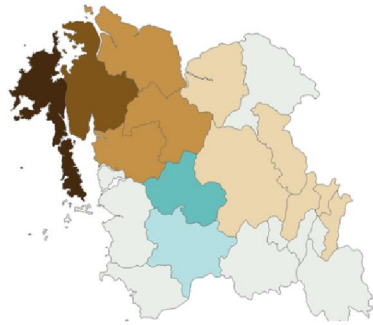
0 15 30 60 Kilometers

RCP 8.5

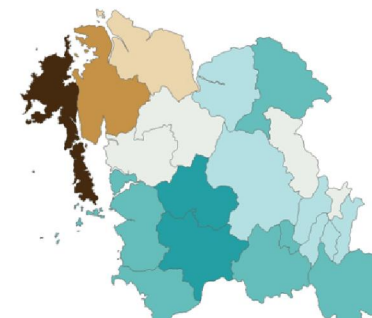
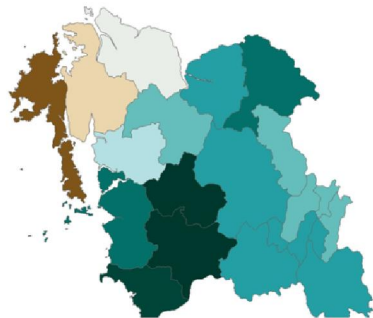
RCP 4.5

# 연강수량 (대전충남)

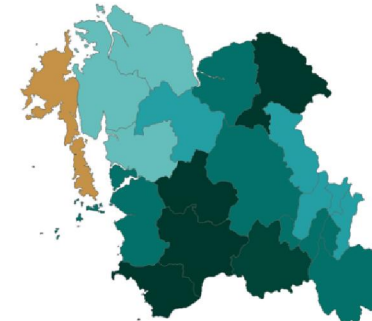
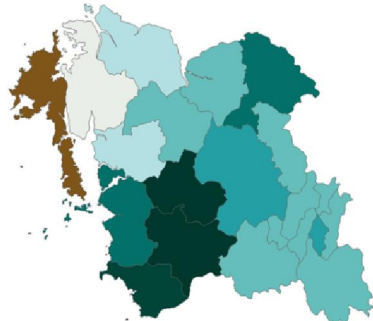
전반기



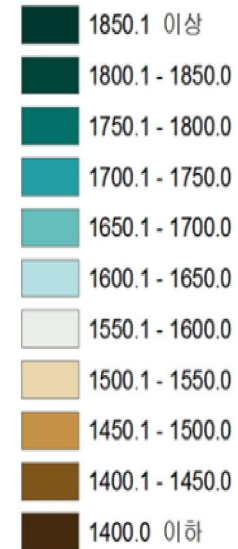
중반기



후반기



강수량(mm)



0 10 20 40  
Kilometers

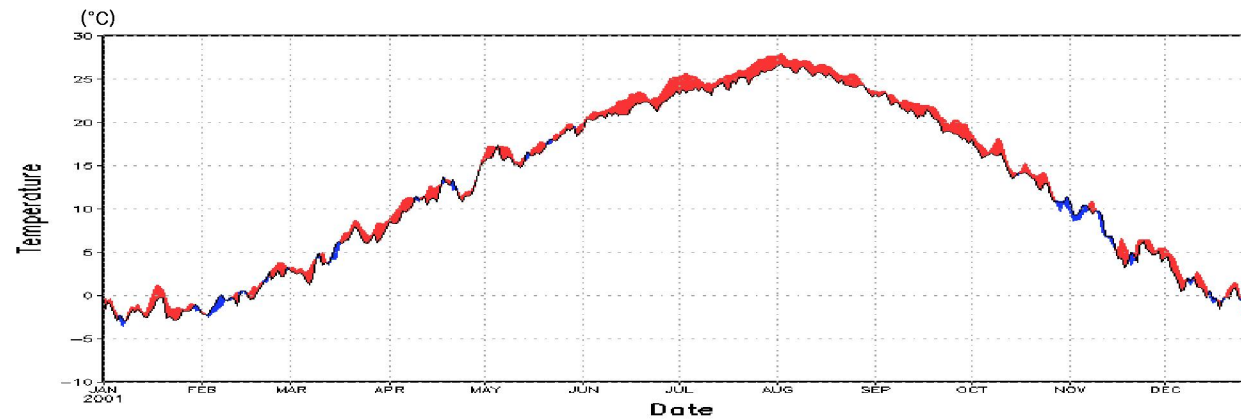
RCP 8.5

RCP 4.5

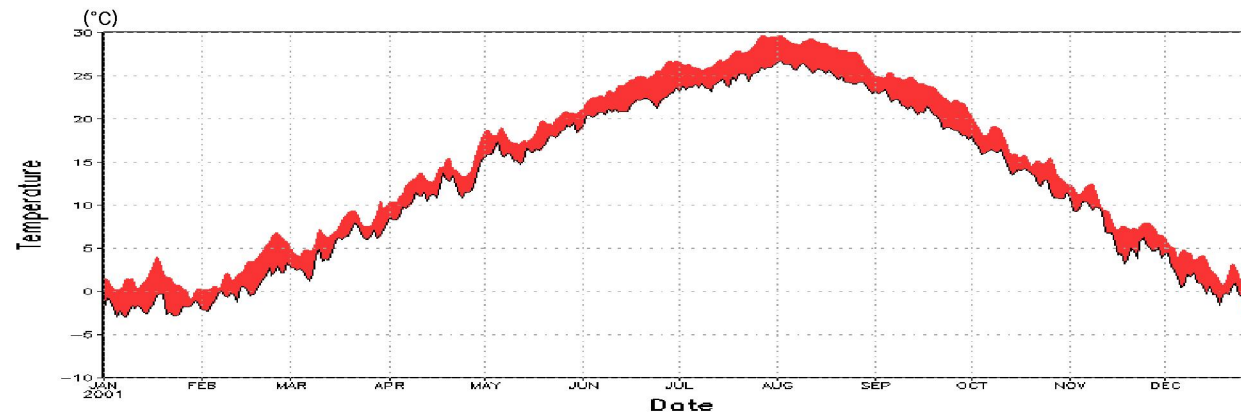
# Seasonal Cycle (일평균기온)

RCP 8.5

전반기  
(관측 대비 차이)



중반기  
(관측 대비 차이)



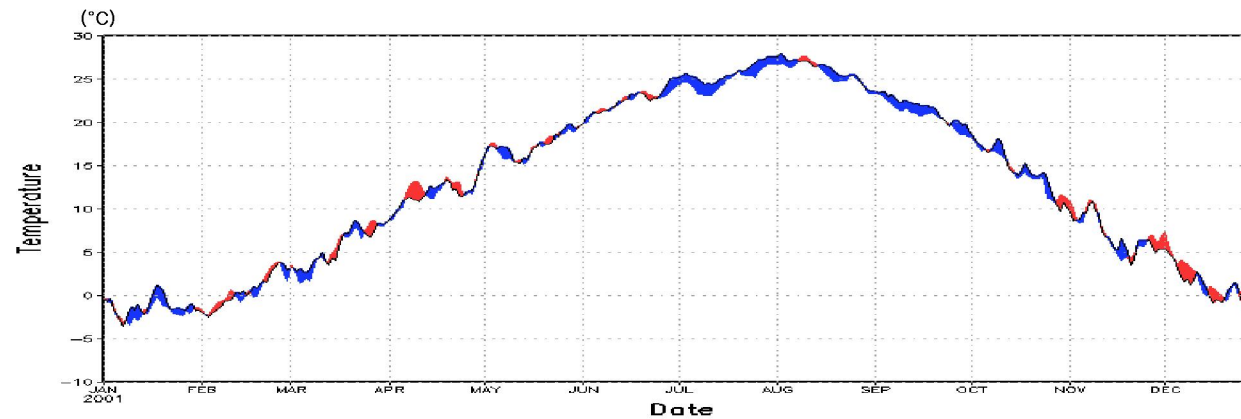
관측값에 비해 중반기 RCP8.5의 평균기온이 2.4°C 상승

# Seasonal Cycle (일평균기온)

**RCP 4.5**

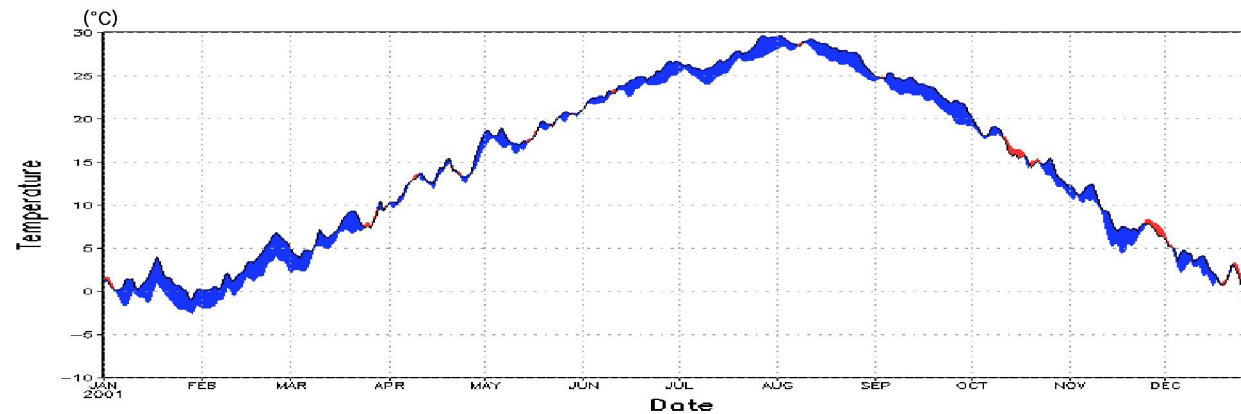
**전반기**

(RCP 8.5 대비 차이)



**중반기**

(RCP8.5 대비 차이)

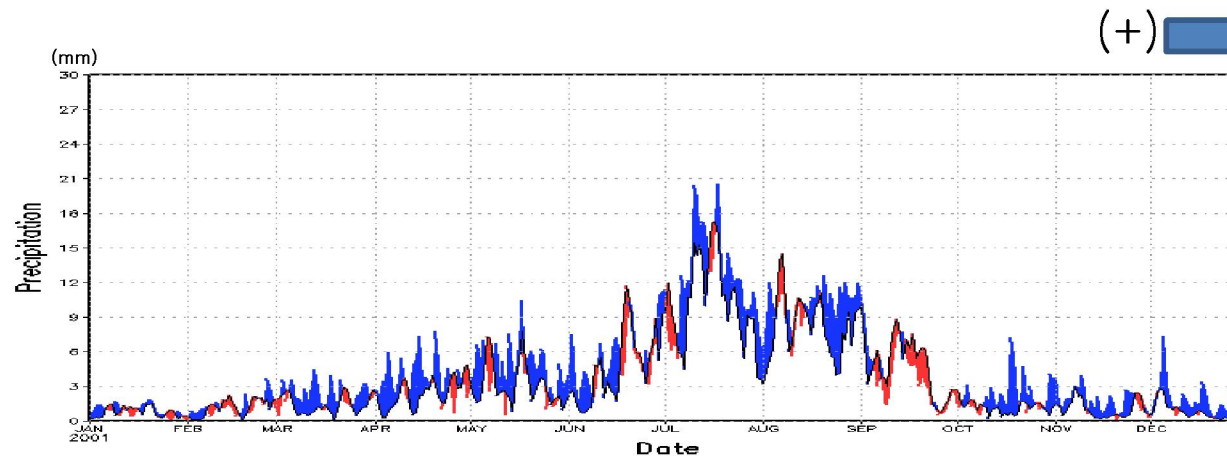


중반기에 RCP8.5 대비 RCP4.5의 평균기온이 1°C 낮은 것으로 전망

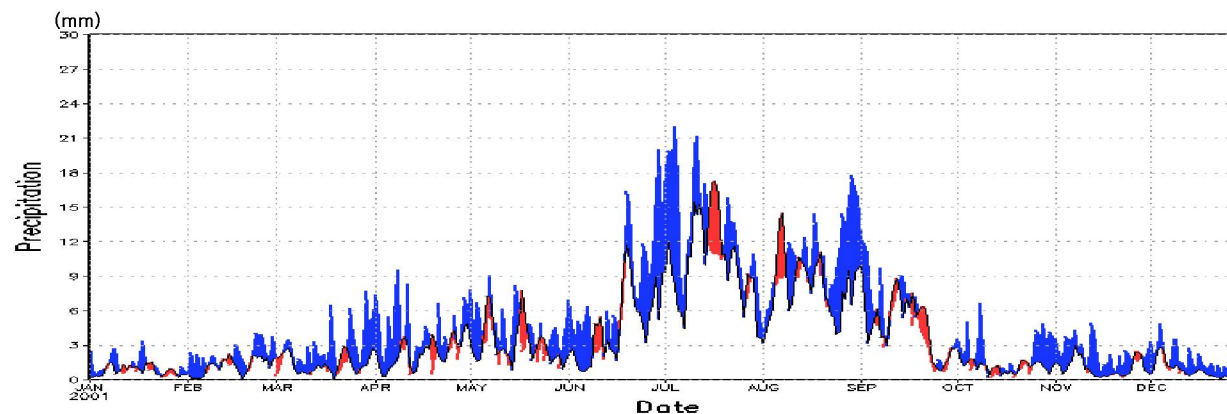
# Seasonal Cycle (일강수량)

RCP 8.5

전반기  
(관측대비 차이)



중반기  
(관측대비 차이)



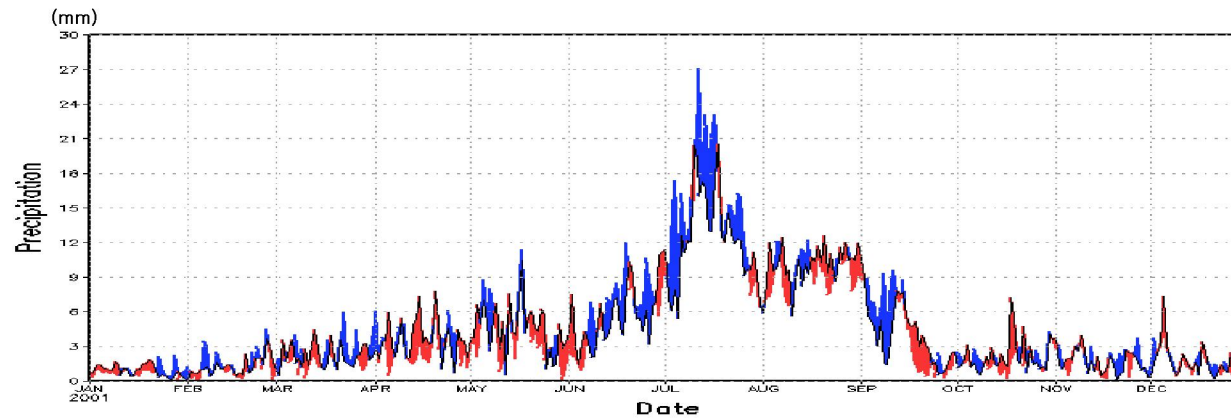
7~9월 강수량이 2000년대 대비 전반기 14%, 중반기 24% 증가할 것으로 전망

# Seasonal Cycle (일강수량)

RCP 4.5

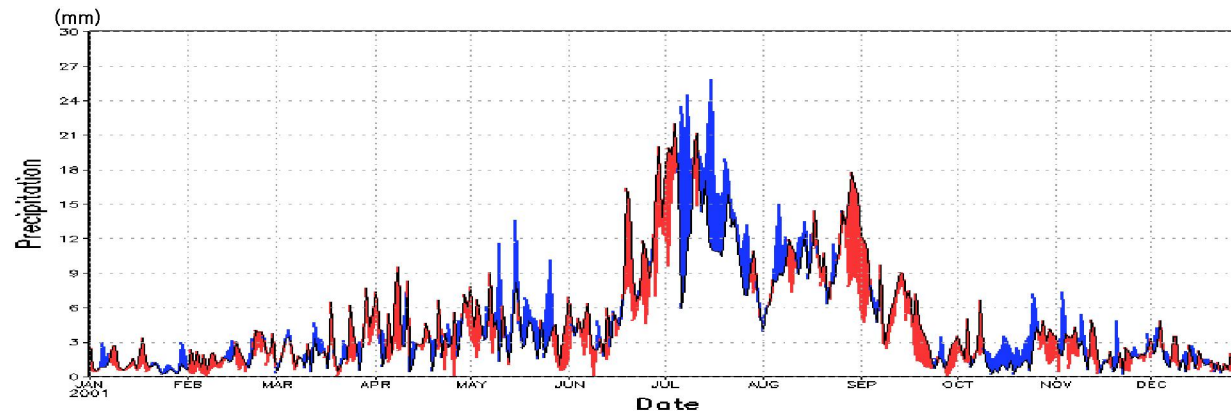
전반기

(RCP8.5 대비 차이)



중반기

(RCP8.5 대비 차이)



7~9월 강수량이 RCP8.5 대비 전반기 9%, 중반기 1% 높은 것으로 전망

# 요약

## 1. 자료 활용시 유의사항

- 2000-2010년: 매년의 특성 분석 가능
- 2011 ~ 2100년
  - 장기간의 경향 파악 중요 (예, linear trend)
  - 현재 대비 미래 10년(30년 등)의 특성 파악 중요  
(편차 분포, PDF 분포)
  - 무강수지속일수(CDD), 강수지속일수(CWD) 보정중임

## 2. 미래 지역기후변화 보고서 (2012년 12월말) 활용

- 관측 기후 특성
- 미래 기후전망 (1km 해상도 기반) 시군구별
- 기후정보 응용과 활용

## 3. 지역기후변화 보고서(2011년) 활용

- 관측 기후 특성
- 미래기후 전망 (10km 해상도 기반)



2012

# 국가 기후변화 시나리오 Workshop