

# Downscaling Global Weather Forecast Outputs Using ANN for Flood Prediction

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## Study Area:

Central Vietnam(flood is the most common climate-related disaster). Wet seasons(from September to December, annually).

## Results:

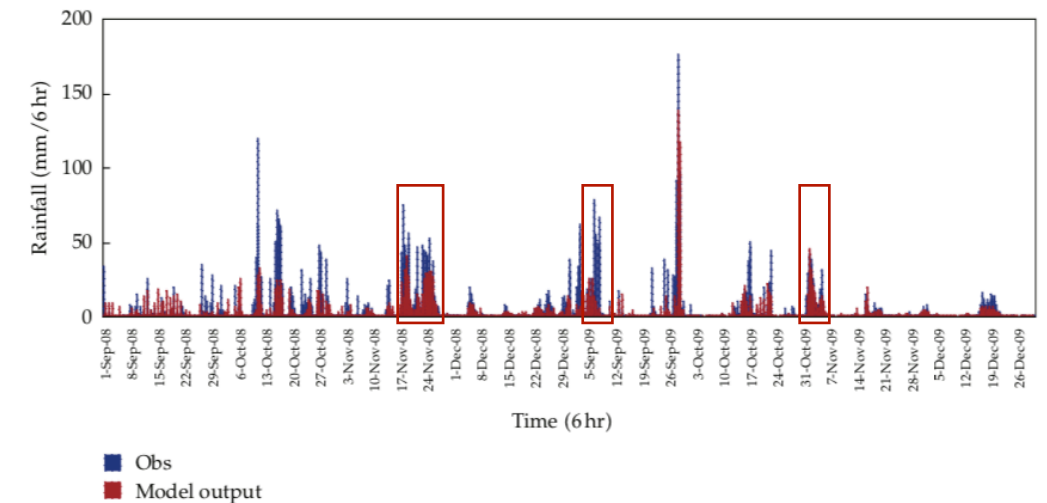


Figure 3: Time series of observed rainfall and those derived from the model outputs for wet seasons, 2008 and 2009.

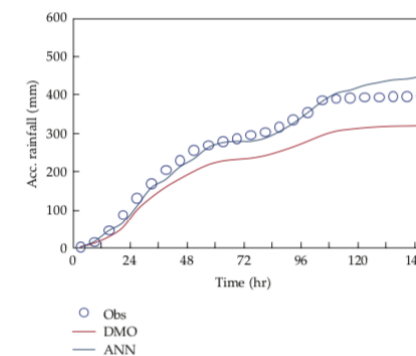


Figure 6: Time series of observed and forecasted hyetographs for the validated storm event on Nov. 1st-7th, 2009.

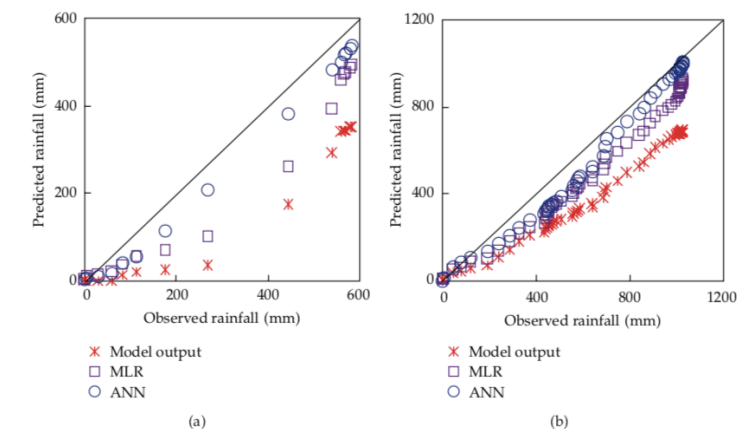


Figure 4: Comparison of accumulative rainfall between observation and prediction obtained from model output and downscale using MLR and ANN for single storm event (a) on Sep. 26-30th, 2009 and continuous storm event (b) on Nov. 17th-27th, 2008.

## Conclusions:

- 使用人工神经网络(MLP)的统计降尺度方法可以较成功的预报降水
- 该方法特别适用于观测数据稀缺且没有高精度天气预报模型的国家

## Method:

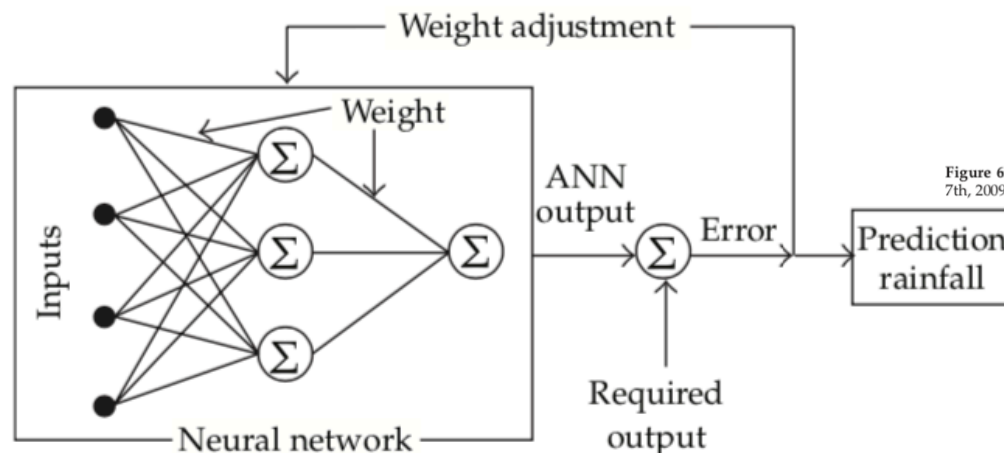


Figure 2: ANN architecture with back-propagation algorithm.

**Data:** Global NWP Models(50km x 50km) operational at Japan Meteorological Agency, with spatial resolution of 0.5° and 60 vertical layers, 9 rain gages(**Output**). **Input:** (i) 700hPa气压 (ii) 850hPa气压 (iii) 地表降水. (2008-2009 Sep-Dec. )

# Report

2020.3.22

張慕琪

# Methods

## 实验设计:

1. 使用新的Bias correction公式;
2. 画Beijing单点Tmax和Tmin的1/7月 time series;
3. 画全国所有点Tmax和Tmin的1/7月 maps;
4. \*画全国所有点Tmax和Tmin的1/7月 time series.

时间: Train & validation (=historical)

数据: CCSM, GMFD, ANN(before BC) , ANN(after BC)

变量:

·Temperature:

1. Maps(differences): yr=1960, mon=1/7;
2. Time series

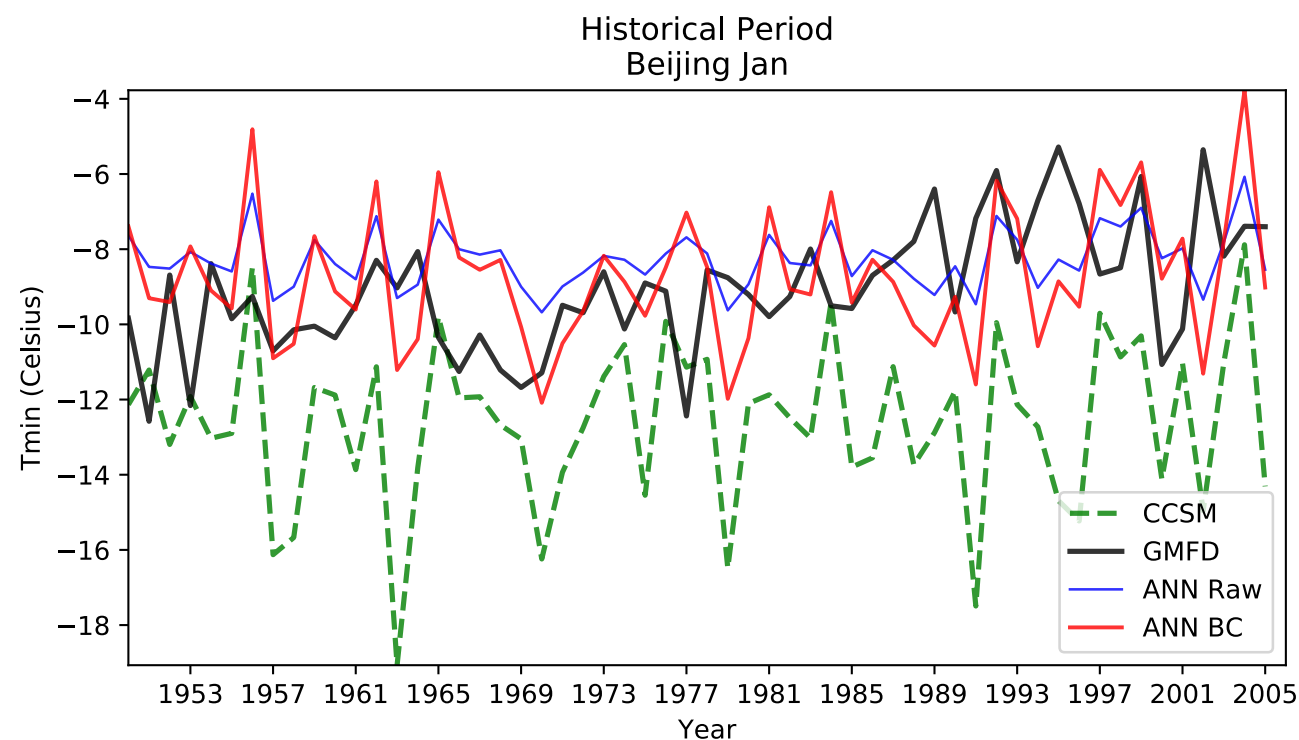
# Results

ts

Beijing

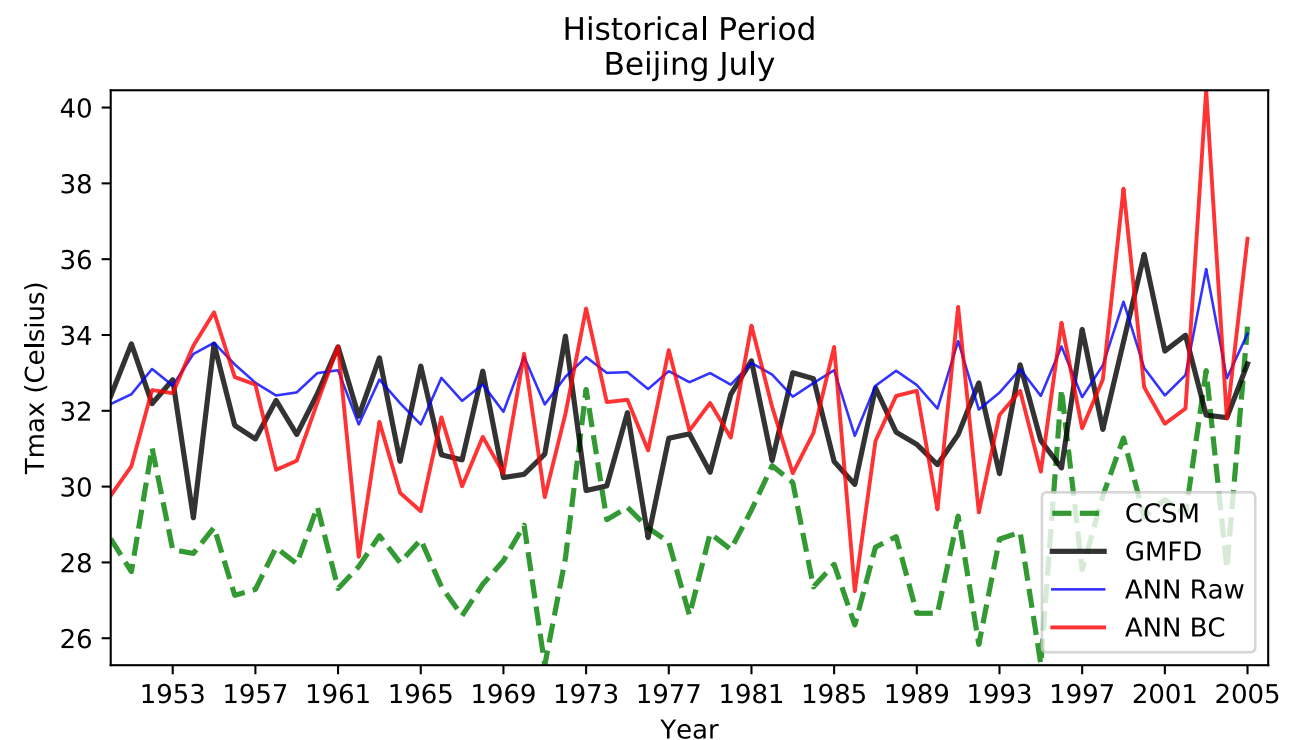
## Tmin

## Tmax



mean\_ccsm = -12.599457  
mean\_ground = -9.066935  
mean\_ann\_raw = -8.267509  
mean\_ann\_bc = -8.720985

std\_ccsm = 2.1791046  
std\_ground = 1.6685536  
std\_ann\_raw = 0.76728755  
std\_ann\_bc = 1.7830557

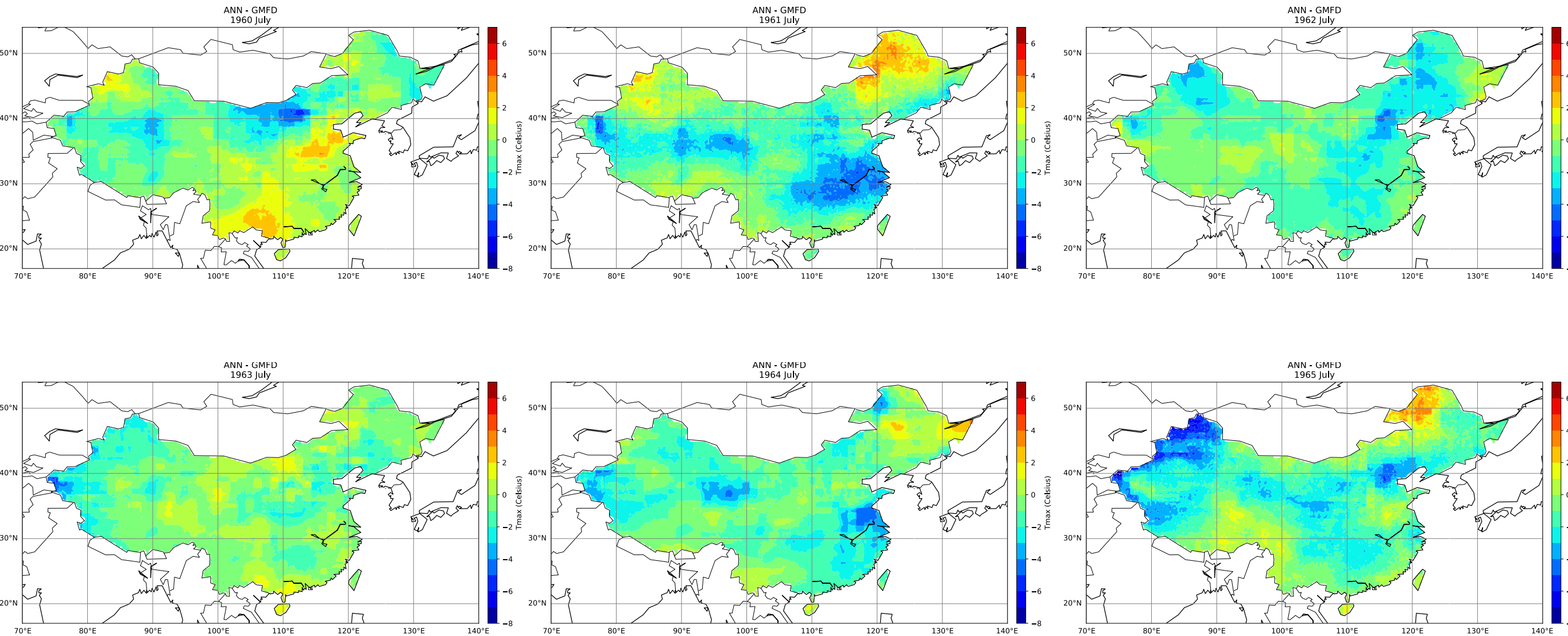


mean\_ccsm = 28.612423  
mean\_ground = 31.921953  
mean\_ann\_raw = 32.856594  
mean\_ann\_bc = 32.10389

std\_ccsm = 1.7578304  
std\_ground = 1.4520789  
std\_ann\_raw = 0.7223801  
std\_ann\_bc = 2.1987932

# Results

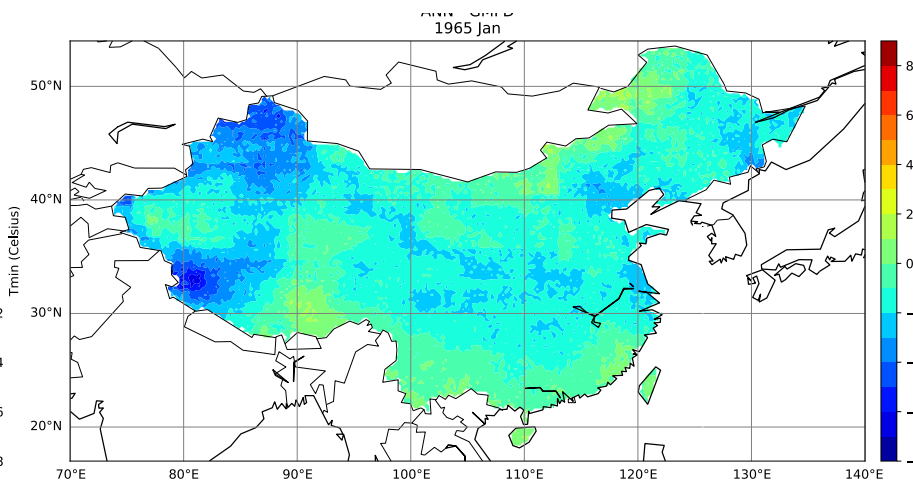
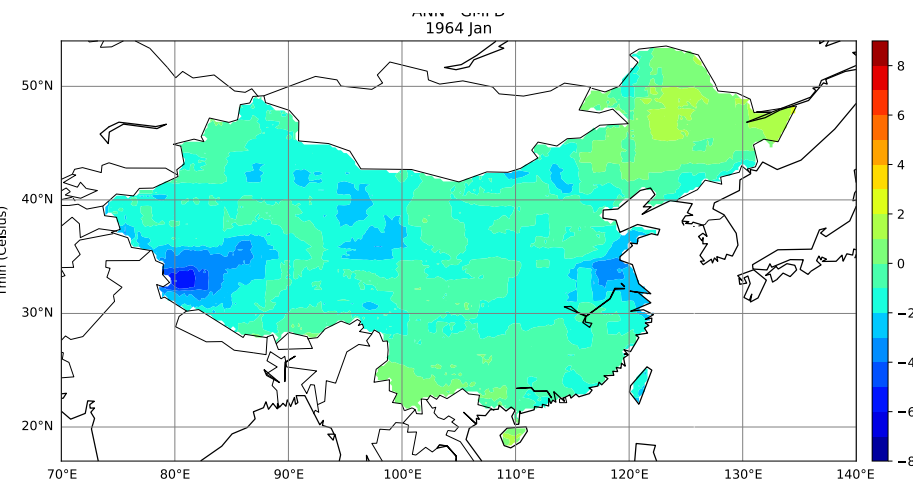
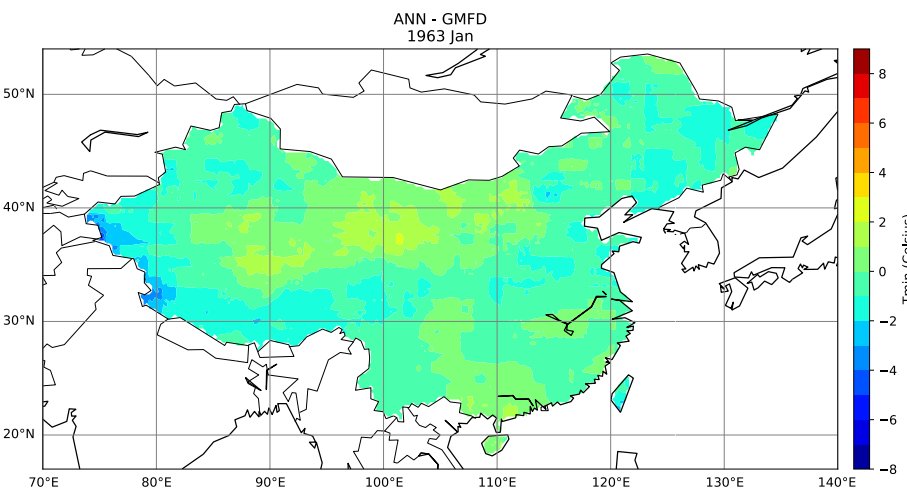
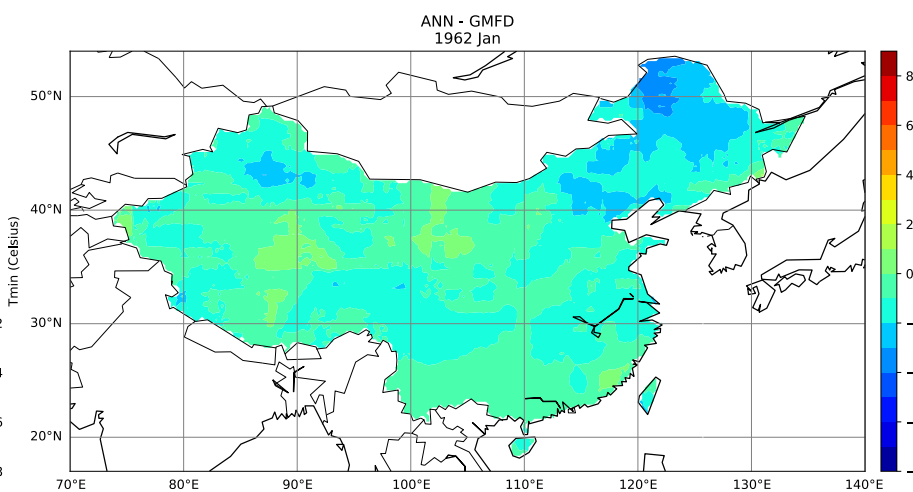
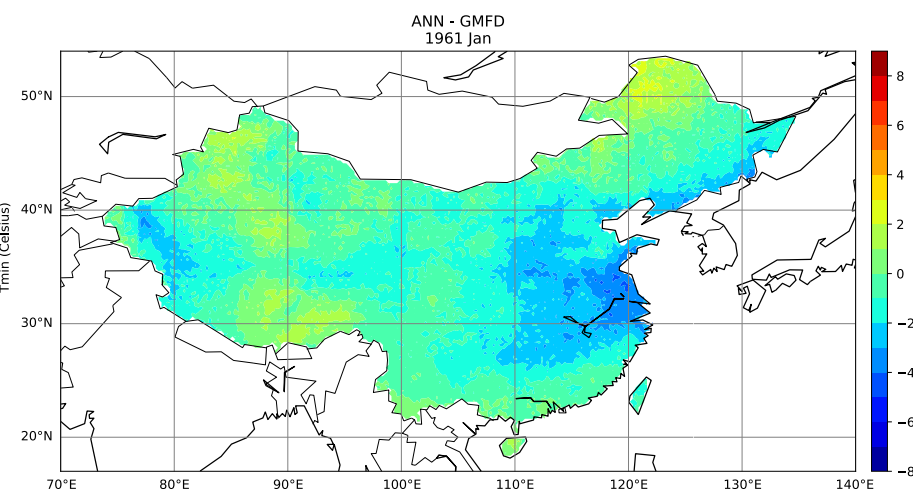
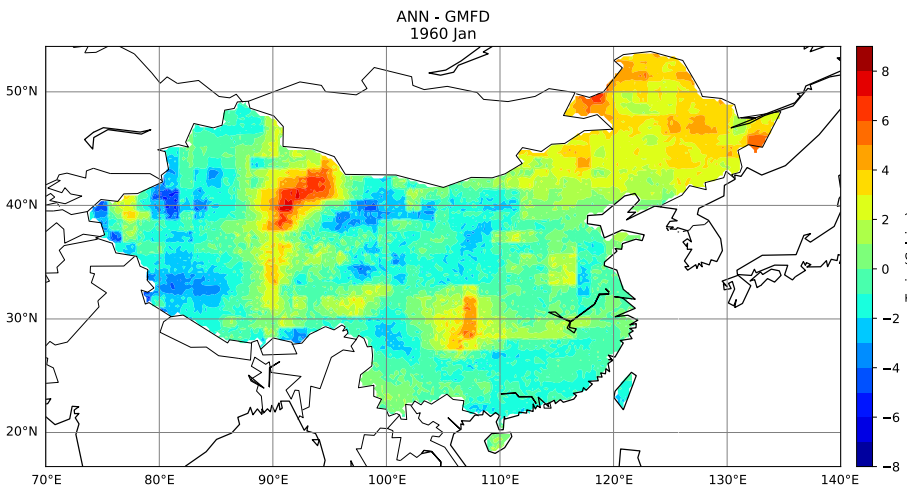
## Maps(before BC) China Tmax





# Results

## Maps(before BC) China Tmin

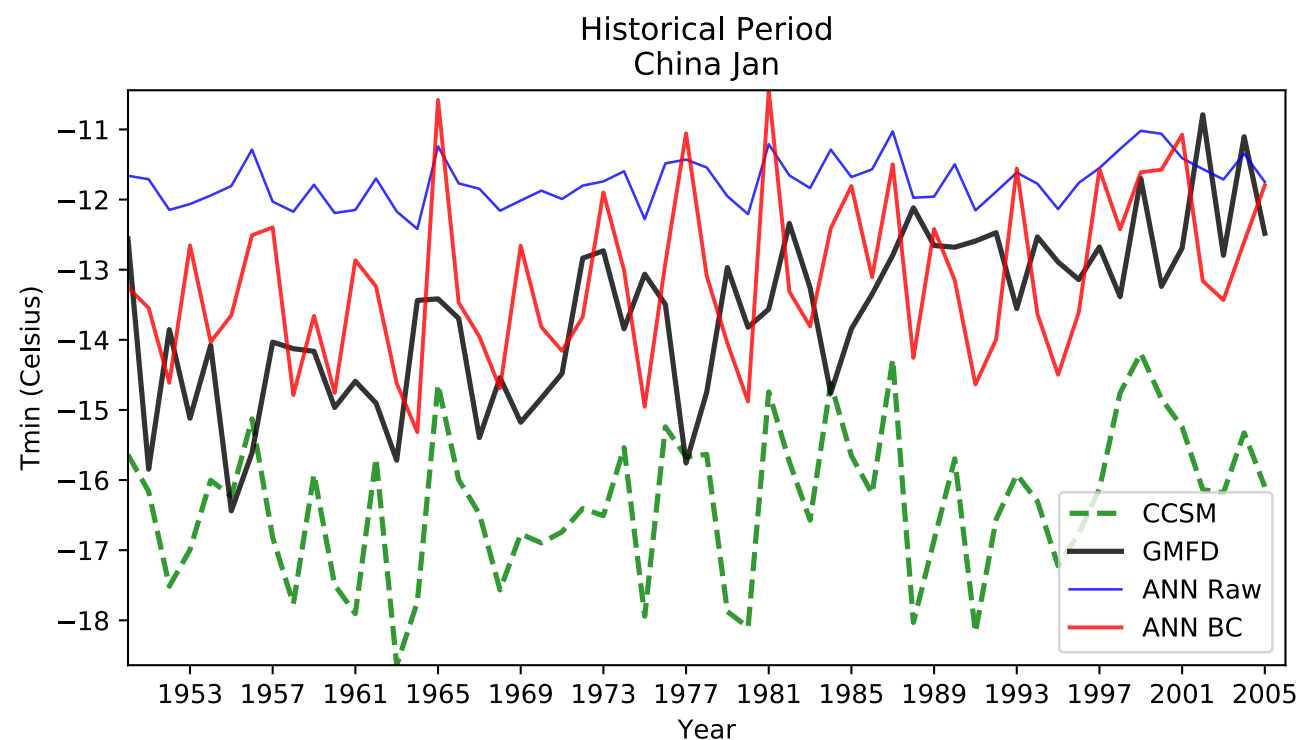


# Results

ts

China

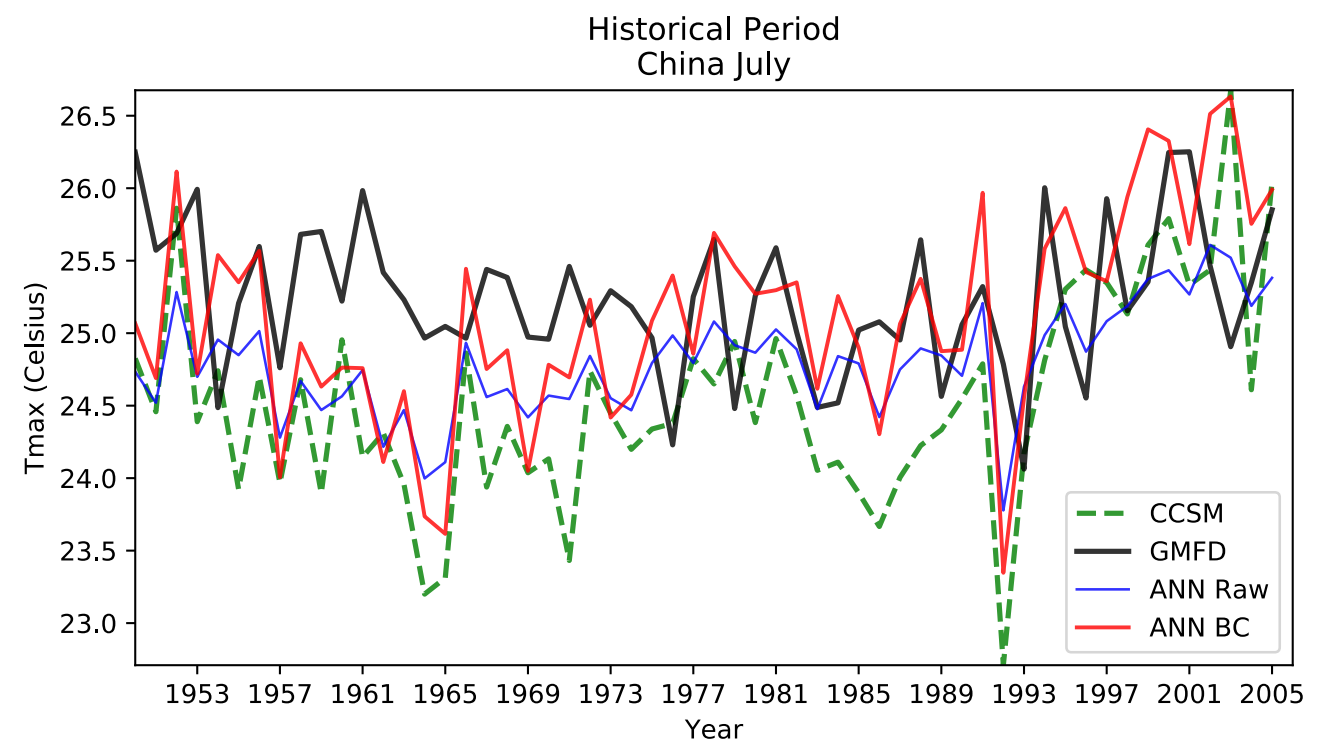
## Tmin



mean\_ccsm = -16.318928  
mean\_ground = -13.636529  
mean\_ann\_raw = -11.74804  
mean\_ann\_bc = -13.145223

std\_ccsm = 1.072079  
std\_ground = 1.2027843  
std\_ann\_raw = 0.334979  
std\_ann\_bc = 1.1847649

## Tmax



mean\_ccsm = 24.545729  
mean\_ground = 25.242002  
mean\_ann\_raw = 24.801483  
mean\_ann\_bc = 25.107101

std\_ccsm = 0.7186829  
std\_ground = 0.4995916  
std\_ann\_raw = 0.37120652  
std\_ann\_bc = 0.7060385

谢谢



# 附录

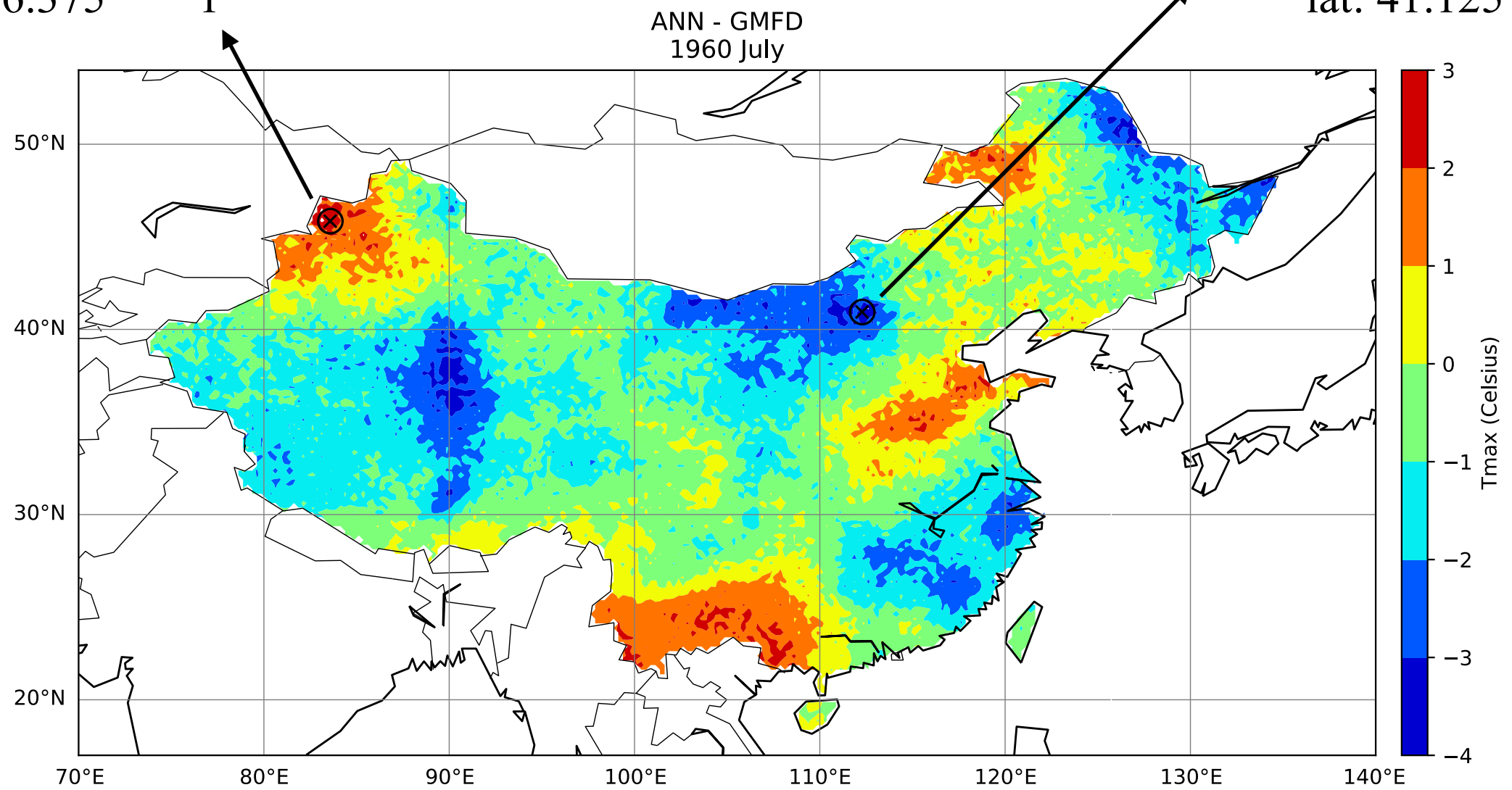
Maps(before BC)

China

Tmax

lon: 83.125  
lat: 46.375

lon: 112.625  
lat: 41.125



# 附录

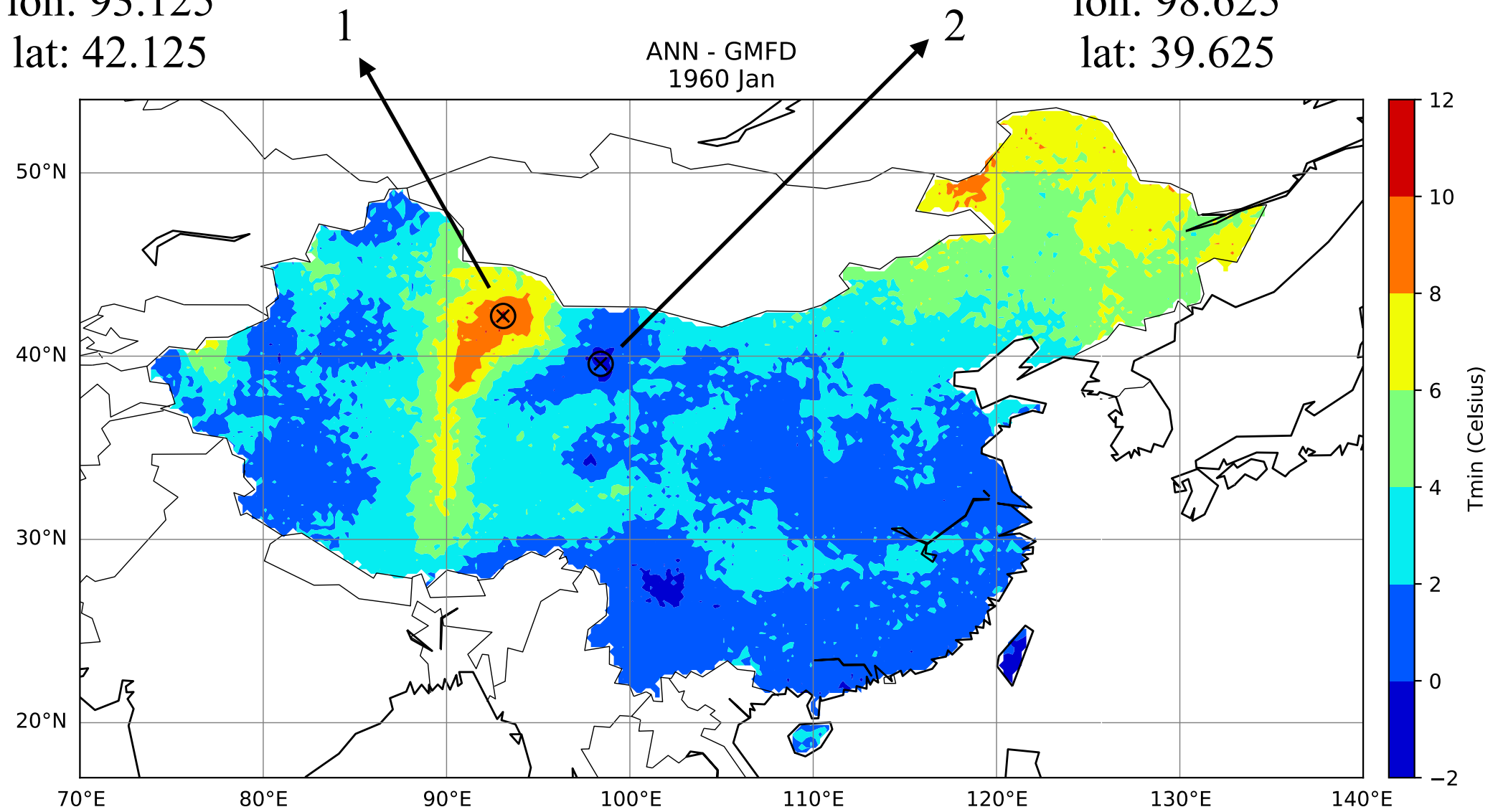
Maps(before BC)

China

Tmin

lon: 93.125  
lat: 42.125

lon: 98.625  
lat: 39.625



# 附录

China

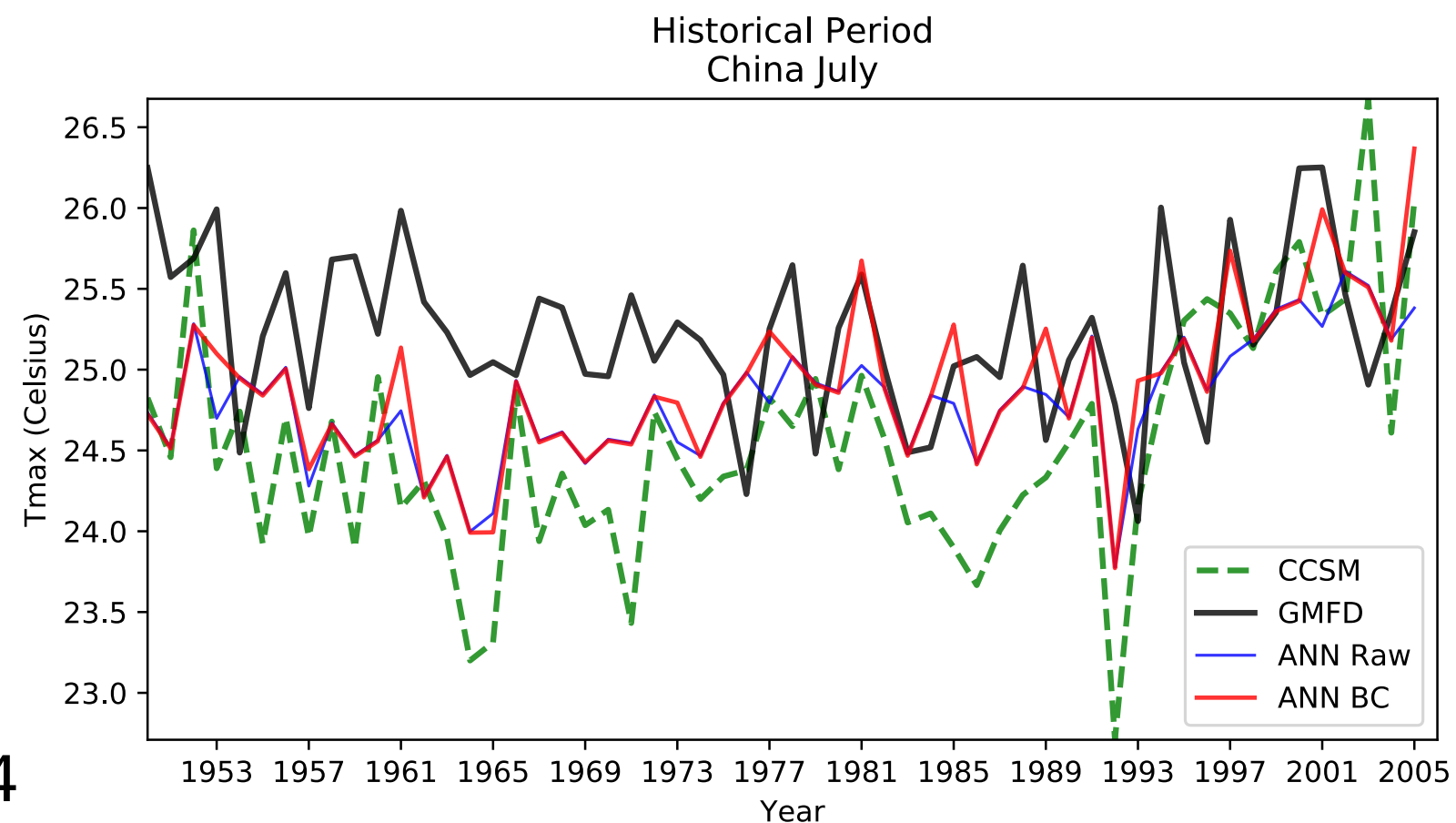
Tmax

## Historical Period

```
mean_ccsm = 24.545729
mean_ground = 25.242002
mean_ann_raw = 24.801483
mean_ann_bc = 24.896358

std_ccsm = 0.7186829
std_ground = 0.4995916
std_ann_raw = 0.37120652
std_ann_bc = 0.47796756

rmse_ccsm = 1.0220927
rmse_ann_raw = 0.69402134
rmse_ann_bc = 0.65698606
```



# 附录

China

Tmin

## Historical Period

mean\_ccsm = -16.318928  
mean\_ground = -13.636529  
mean\_ann\_raw = -11.74804  
**mean\_ann\_bc = -12.231624**

std\_ccsm = 1.072079  
std\_ground = 1.2027843  
std\_ann\_raw = 0.334979  
**std\_ann\_bc = 0.9740444**

rmse\_ccsm = 3.0686014  
rmse\_ann\_raw = 2.2245069  
rmse\_ann\_bc = 2.0080667

