

Effect of Drought on Winter Wheat Yields in North China

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Introduction

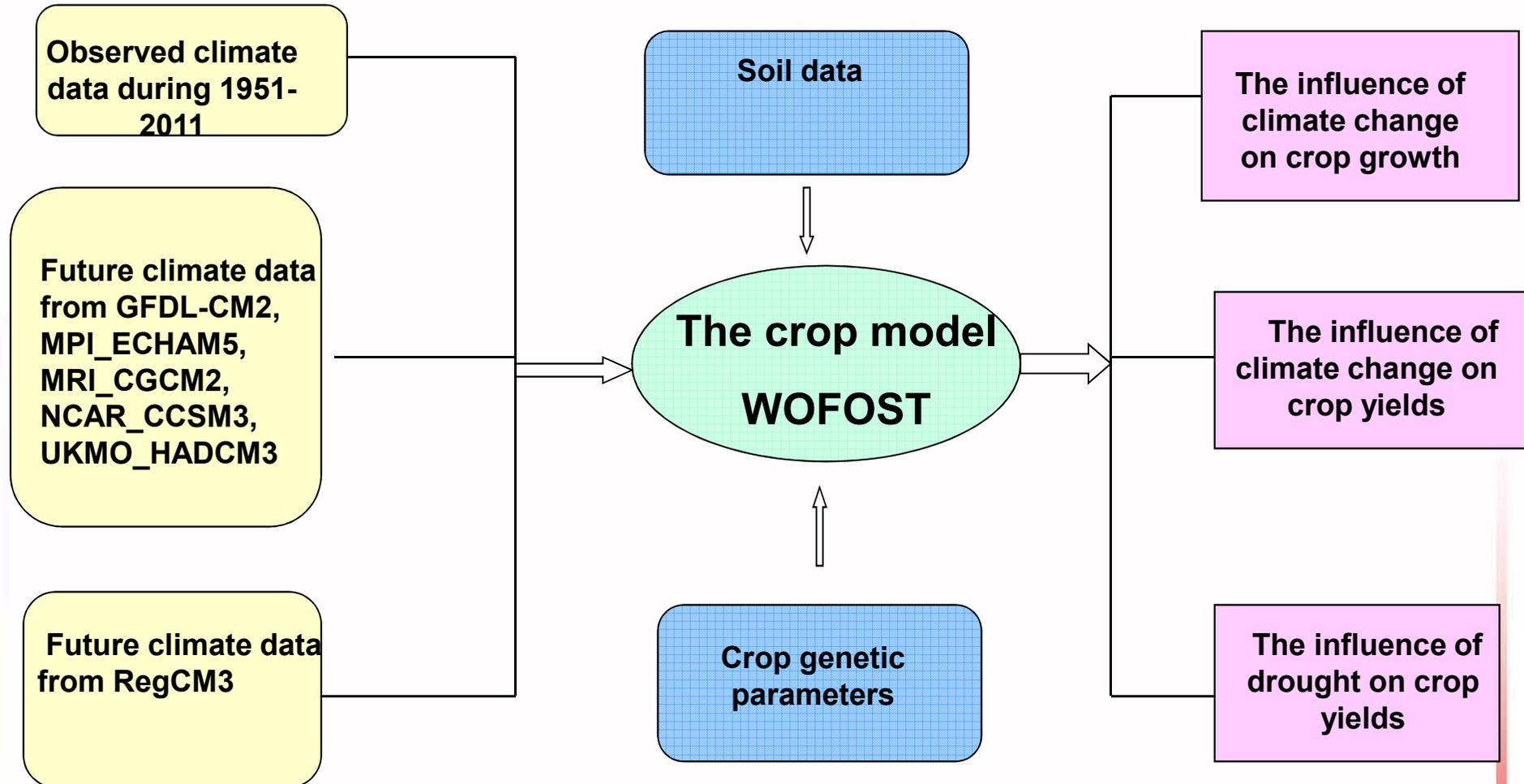
- ◆ At present, 40% of the Earth's land surface is managed for cropland and pasture (Foley et al., 2005). In developing countries, nearly 70% of people live in rural areas where agriculture is the largest supporter of livelihoods. For China, as such large developing country, the total population accounted to 1.3 billion with 72% of them pursuing agriculture, and the cropland was 1.2 billion ha in 2008 (CAY, 2009), until now, agriculture is still the most important industry for China which can supply the food for 1.3 billion populations..



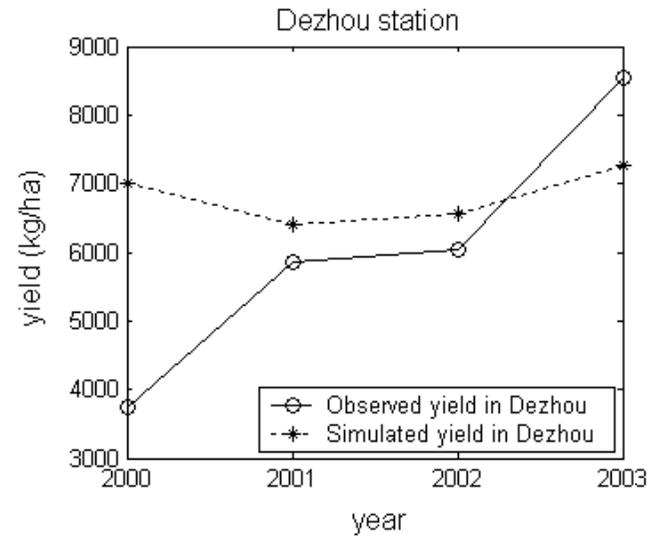
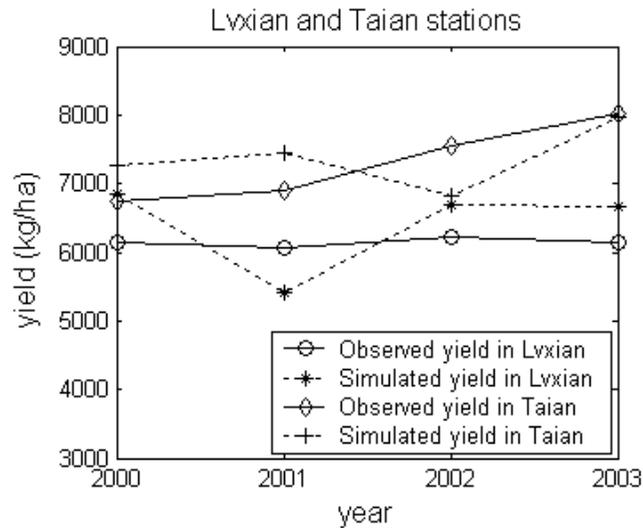
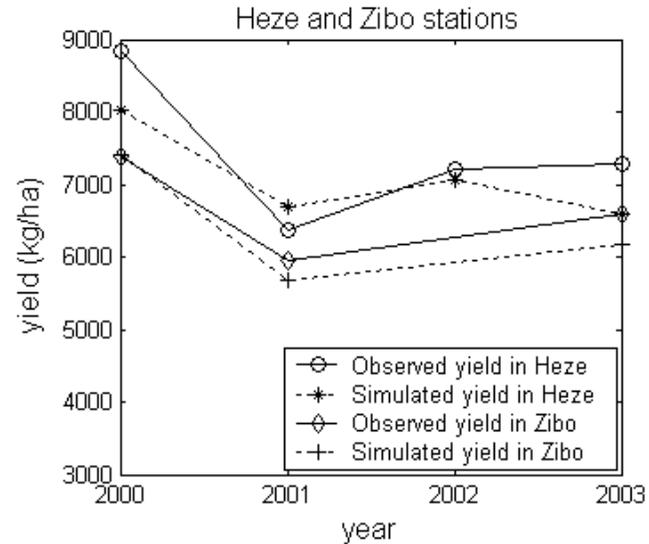
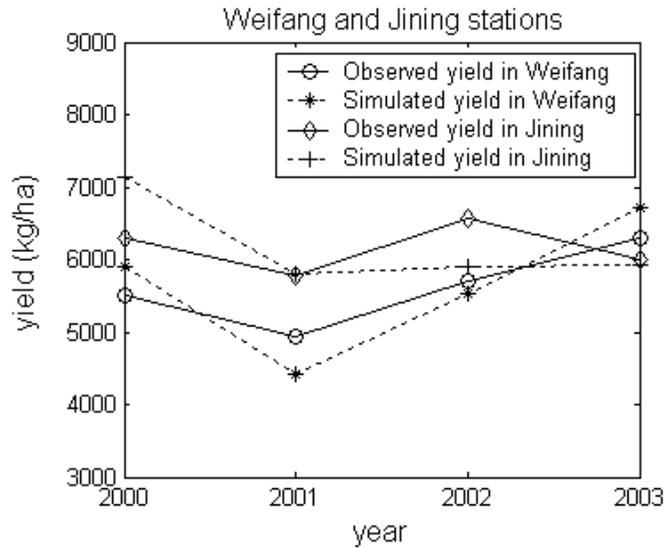
➤ As one of serious natural disasters in the world, drought has been paid much attentions . The North China is facing a severe problem of the shortage of water resources, which can be mainly attributed to the decrease in precipitation from the mid and late 1970s



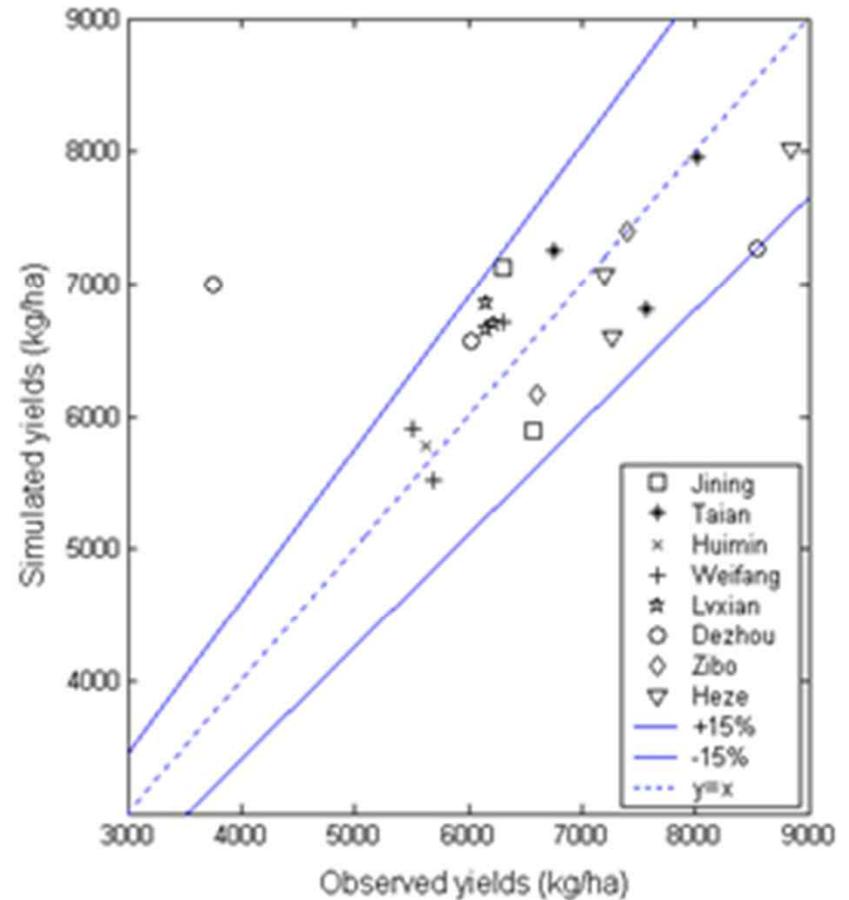
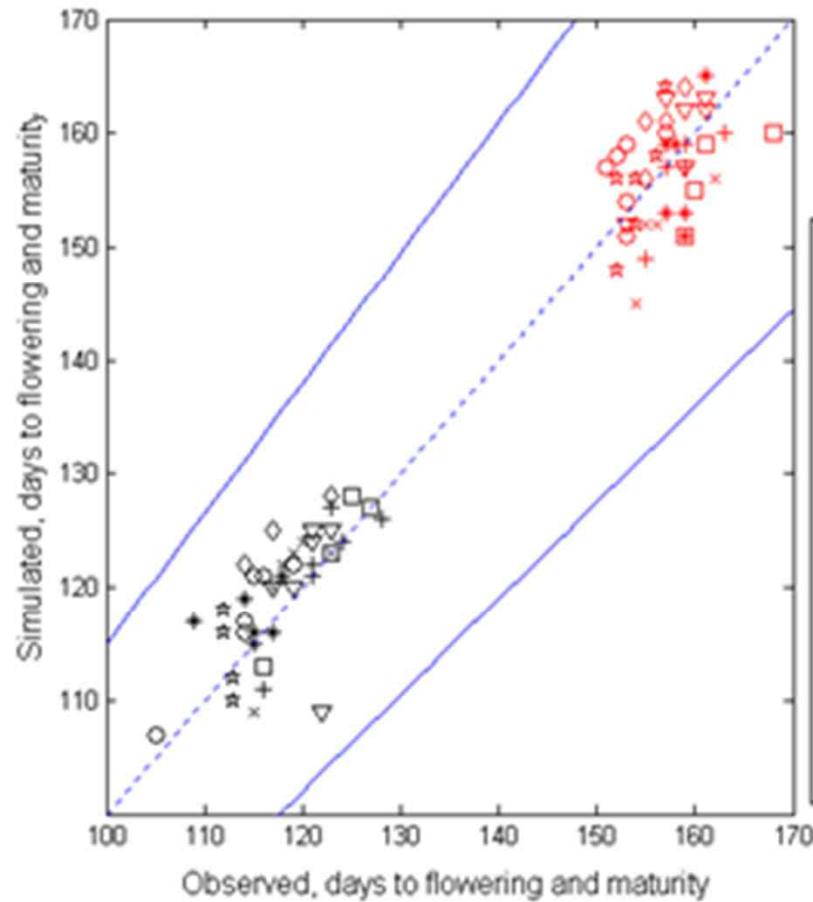
• Assessment Influence of Drought on Agriculture



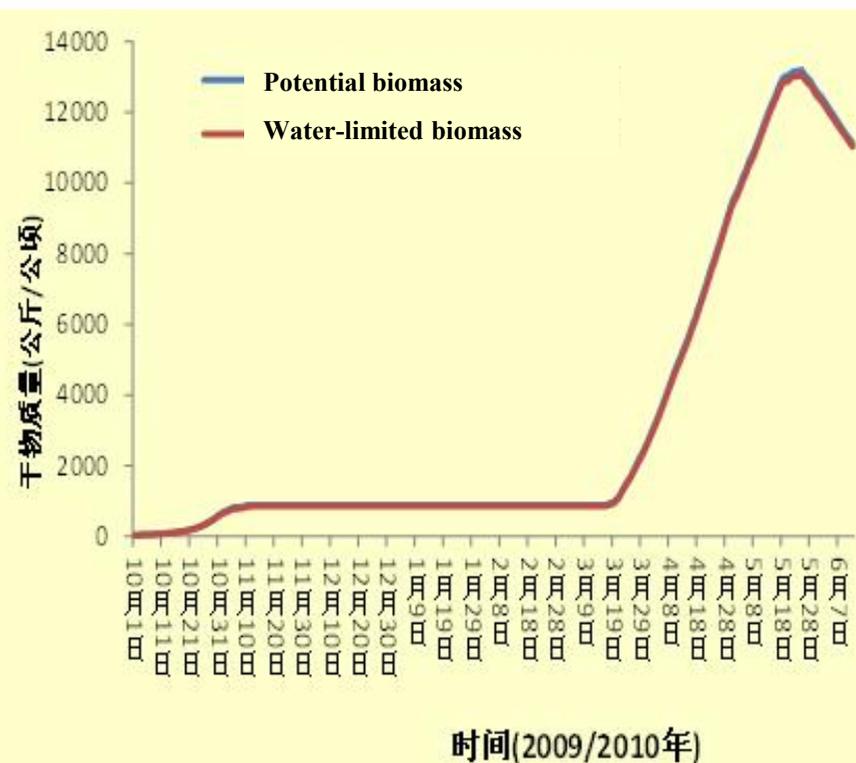
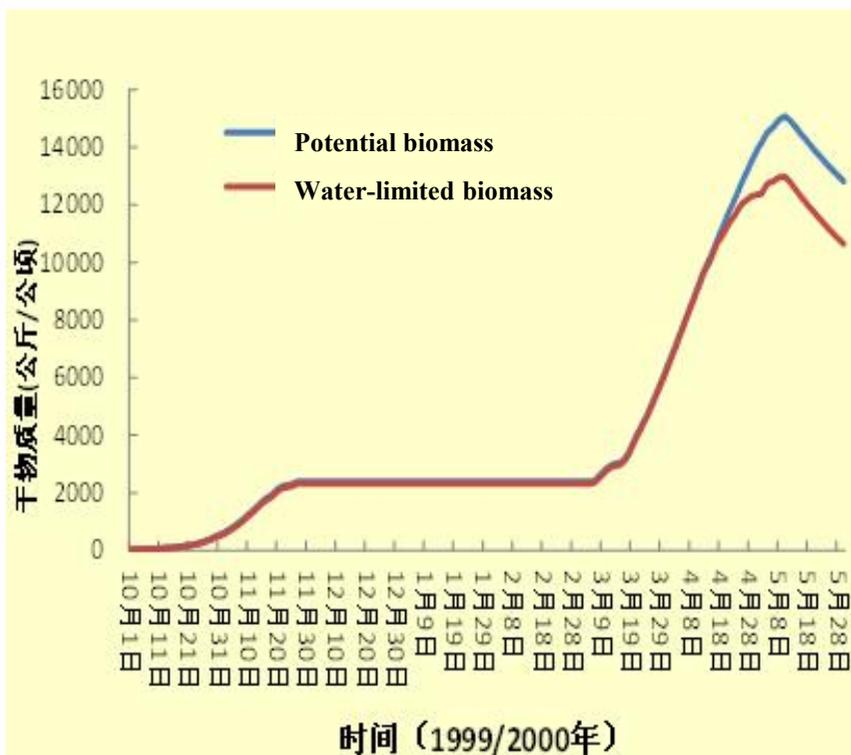
Tuning and validation of the model WOFOST



Tuning and validation of the model

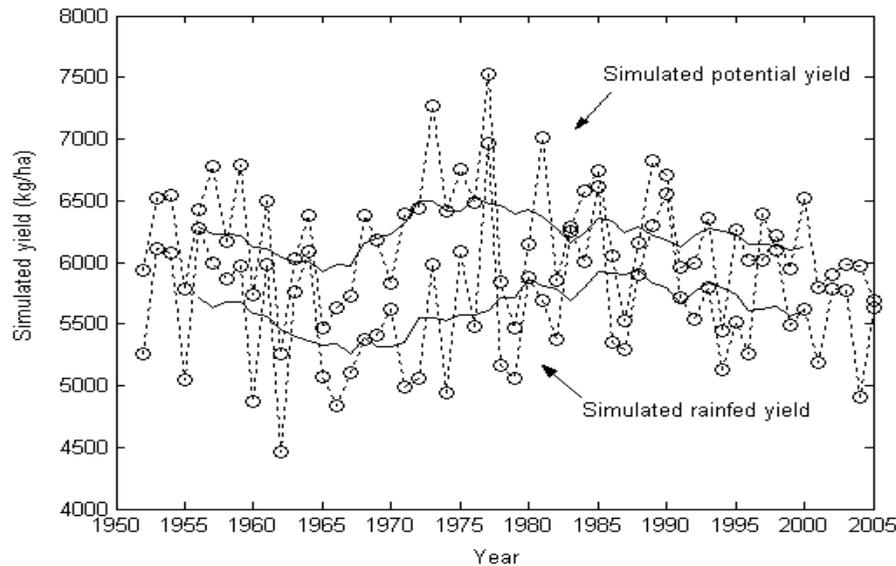


• An example for drought year and normal year

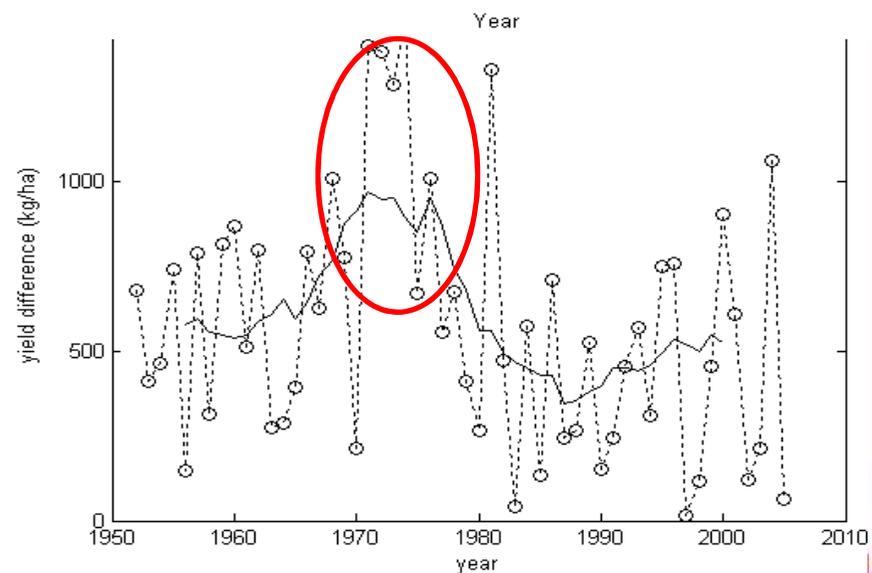


2. Assessment influence of drought on yields

Using observed climate data



In order to separate the role of precipitation change from other climatic variables, the differences between the simulated potential and water limited yields are examined.



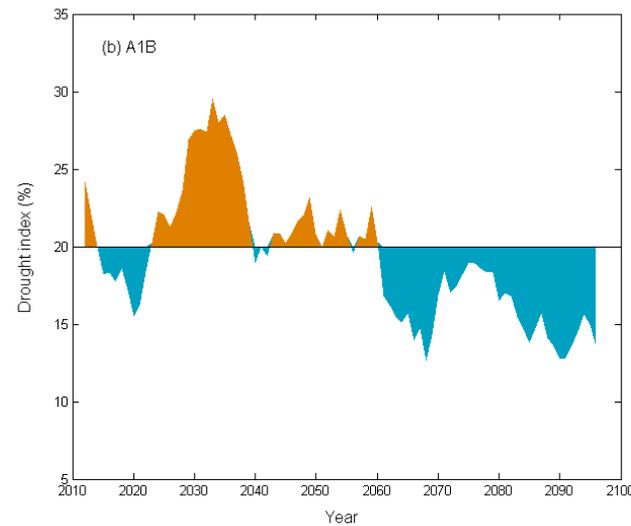
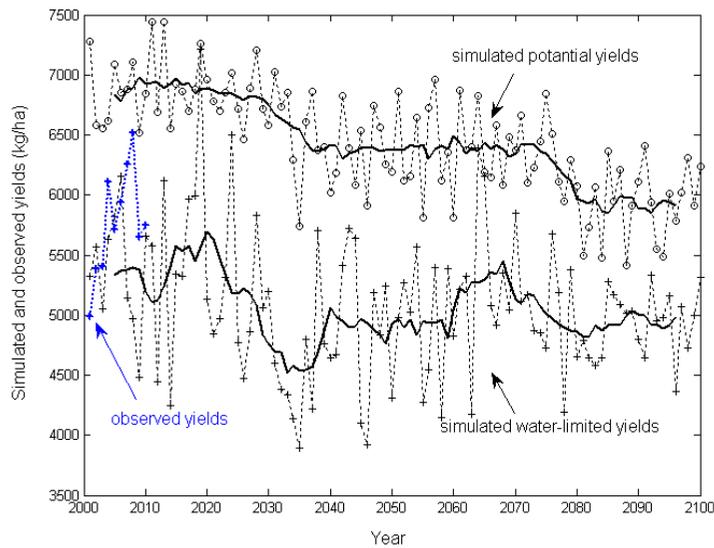
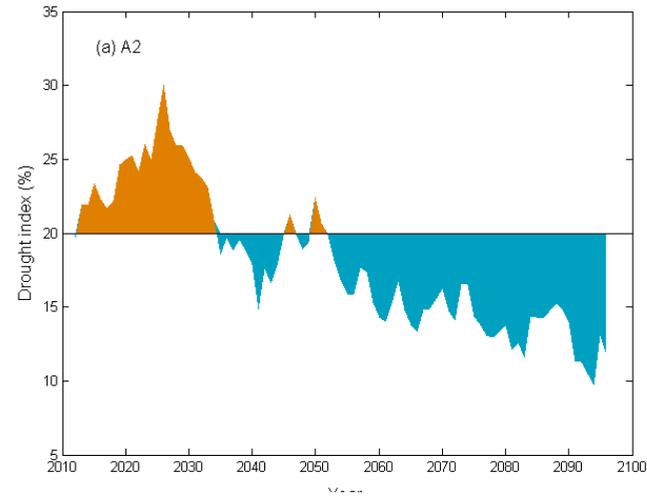
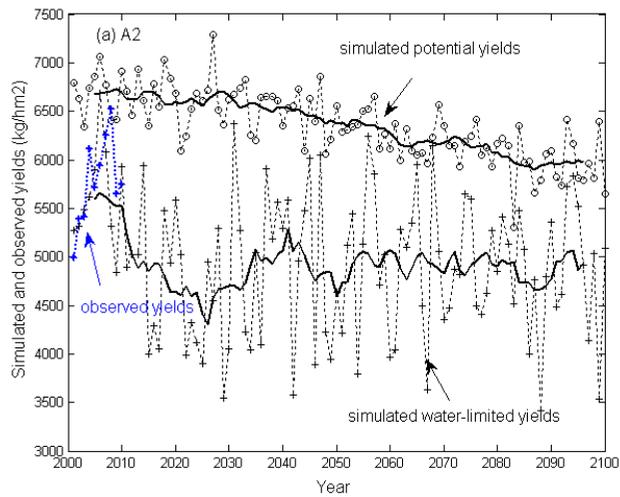
3. Assessment influence of drought on yields Using future climate data from GCMs

The information of five GCMs from IPCC DDC used in this research

Model name	Resolution (number of grids along longitude and latitude)	Simulation period	Country/Institute
GFDL CM2.1	144×90	1861-2100	USA/GFDL
MPI ECHAM5	192×96	1860-2100	Germany/MPI
MRI CGCM	128×64	1901-2100	Japan/MRI
NCAR CCSM3.0	256×128	1870-2100	USA/NCAR
UKMO HADCM3	96×73	1860-2100	UK/UKMO

It is necessary for impact assessment to identify and correct the error. One possible approach of correction is to add difference between the simulated monthly baselines (from 1961 to 1990) and the observed monthly weather data to the simulated future monthly weather data of the corresponding month.



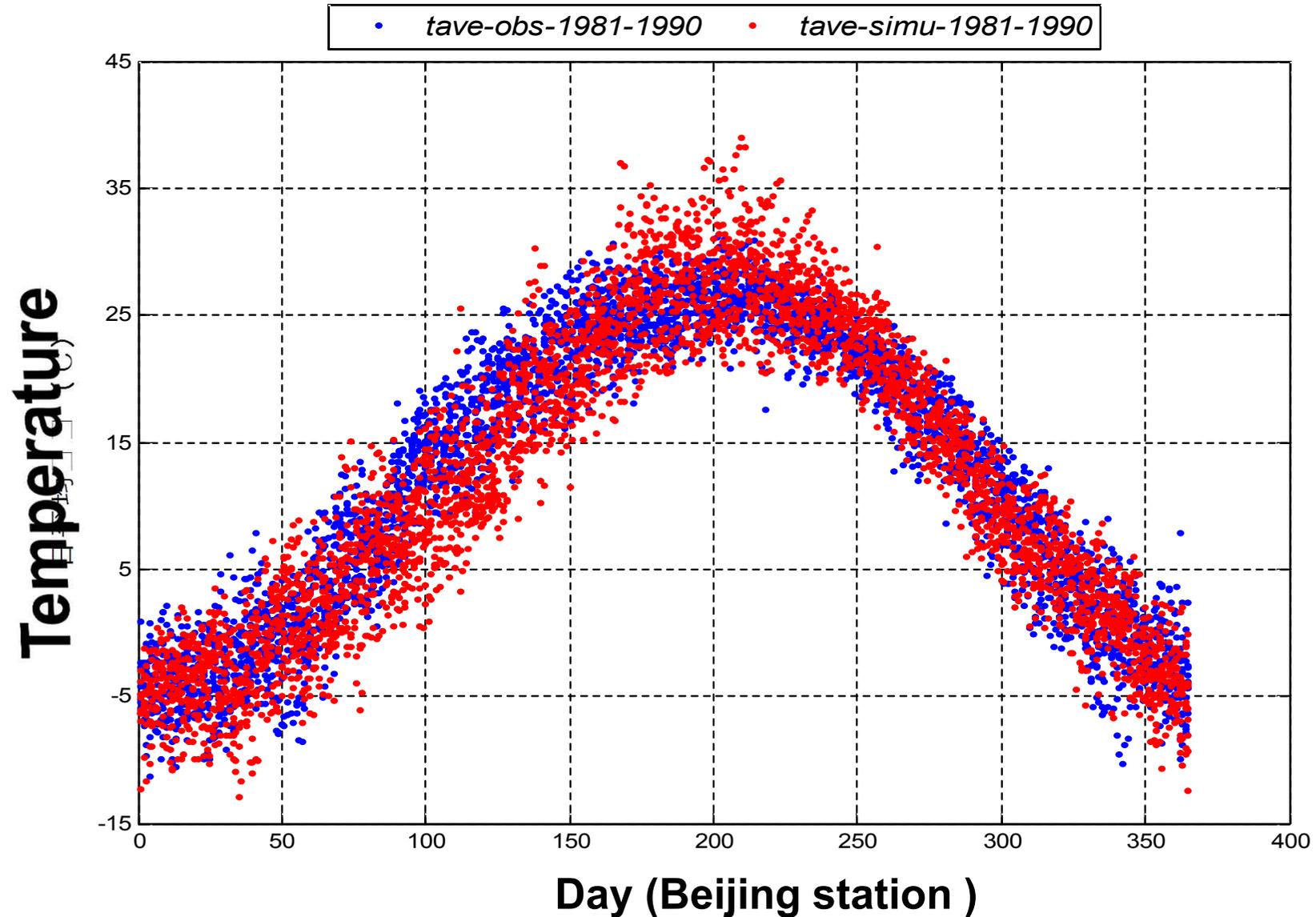


Song Y., Zhao Y., 2012: Effect of Drought on Winter Wheat Yield During 2012-2100 in North China, Acta Meteorologica Sinica

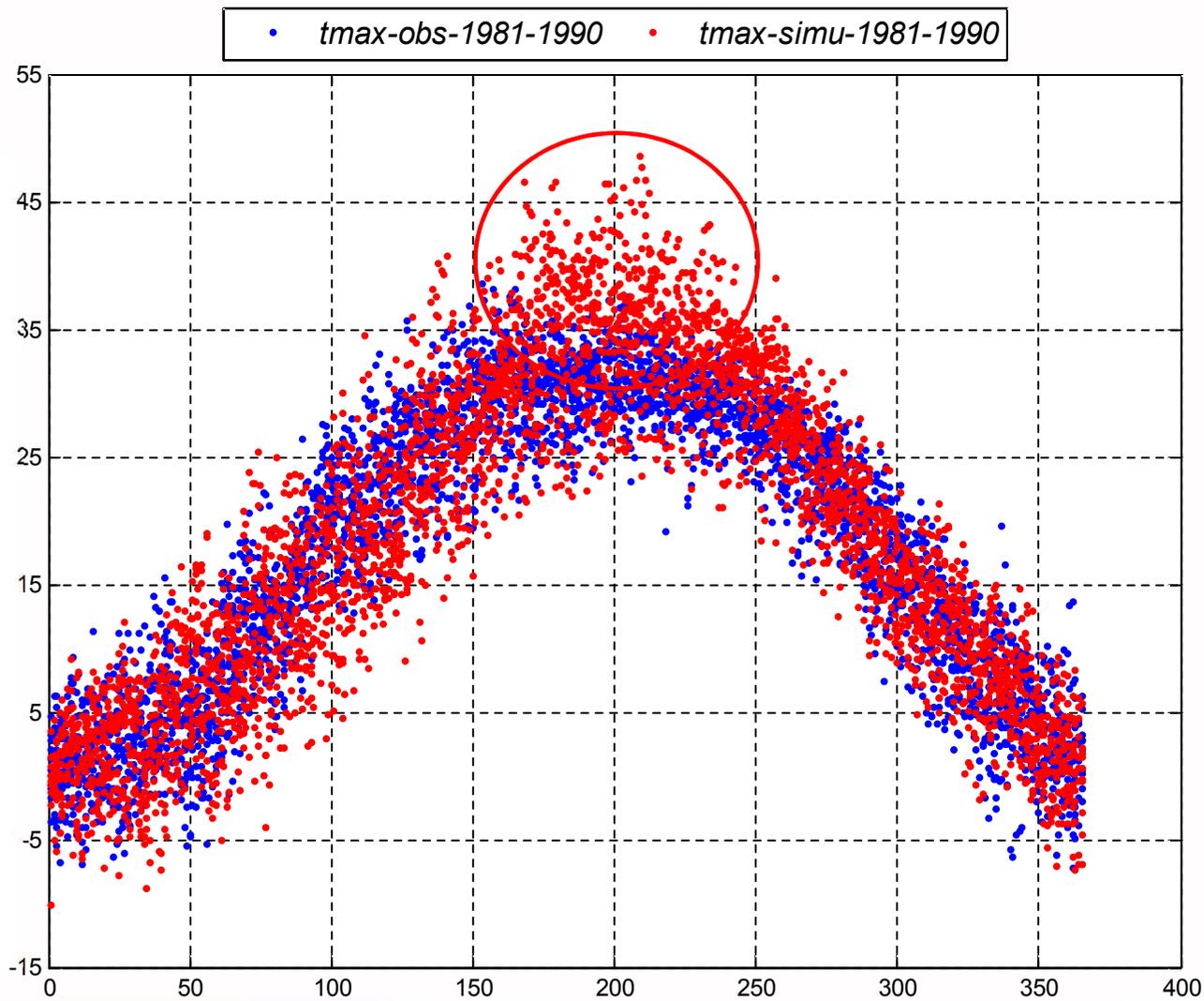


Assessment influence of drought on agriculture

Using future climate data from RegCM3



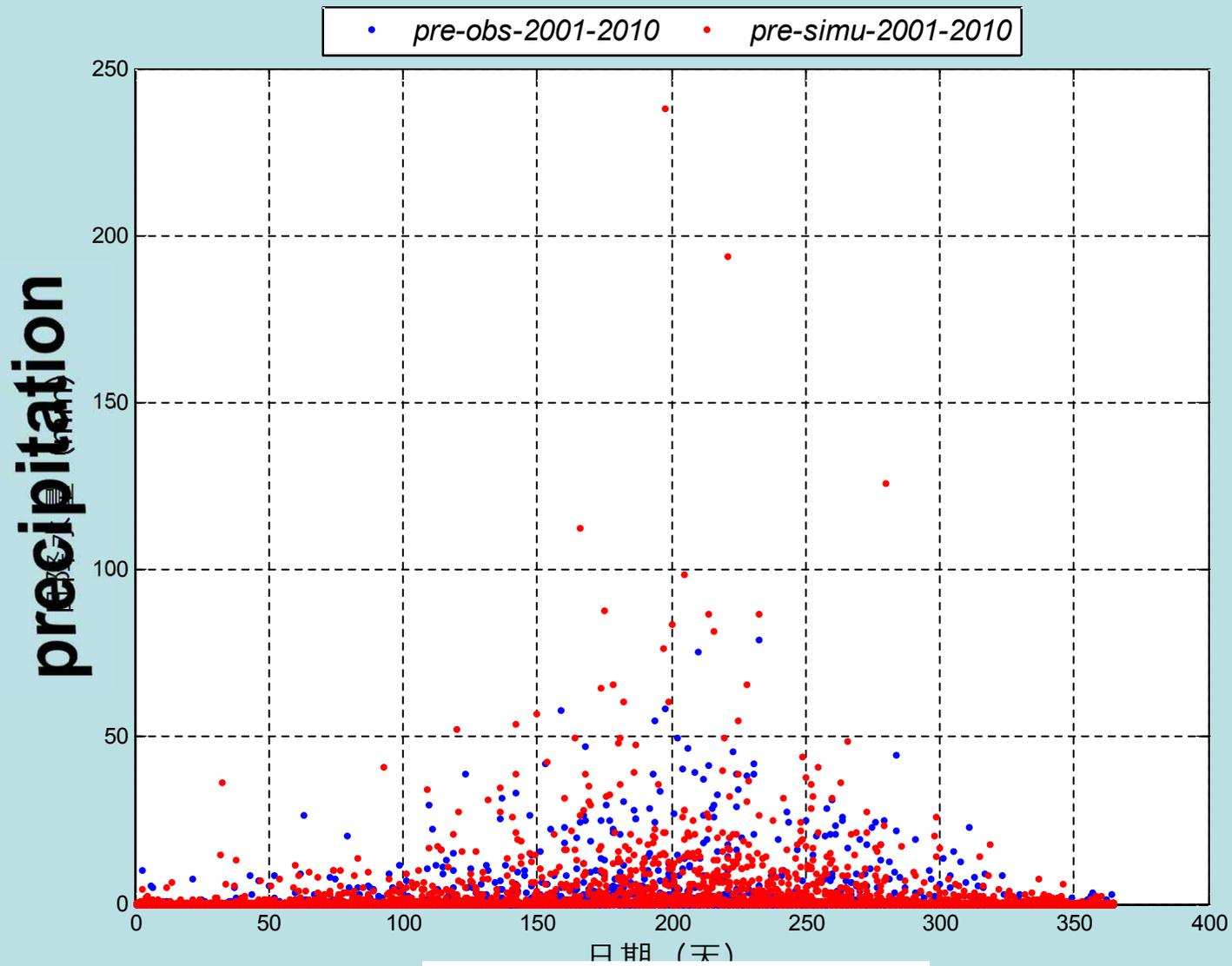
maximum temperature
最高温度



Day (Beijing station)



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Day (Beijing station)



A method to correct the simulated weather data from RCM

For temperature:

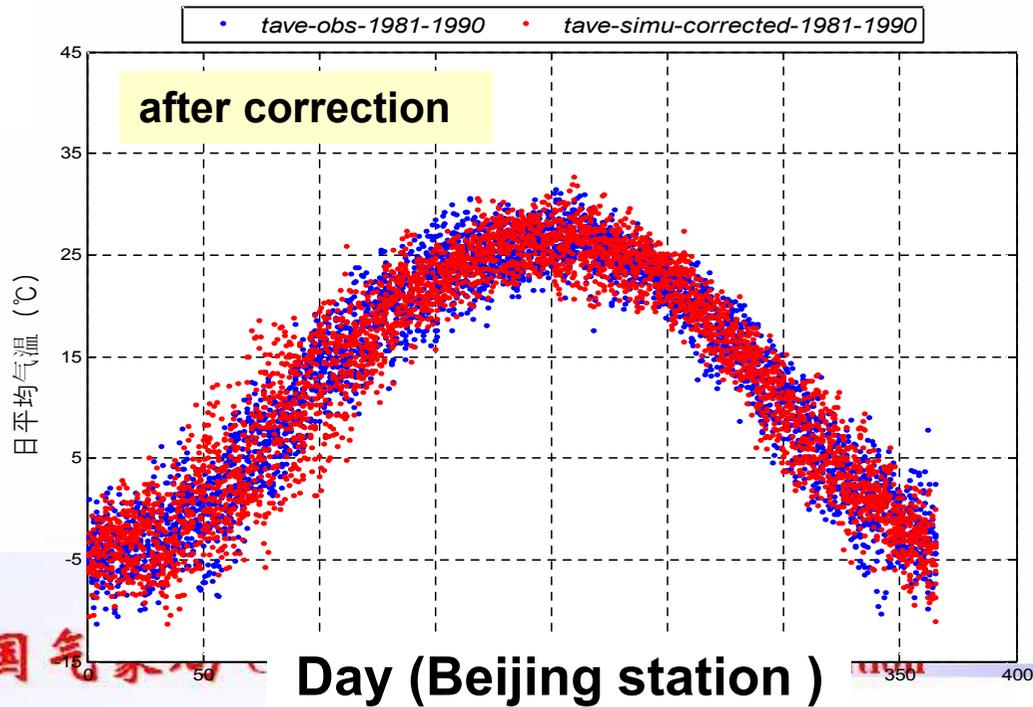
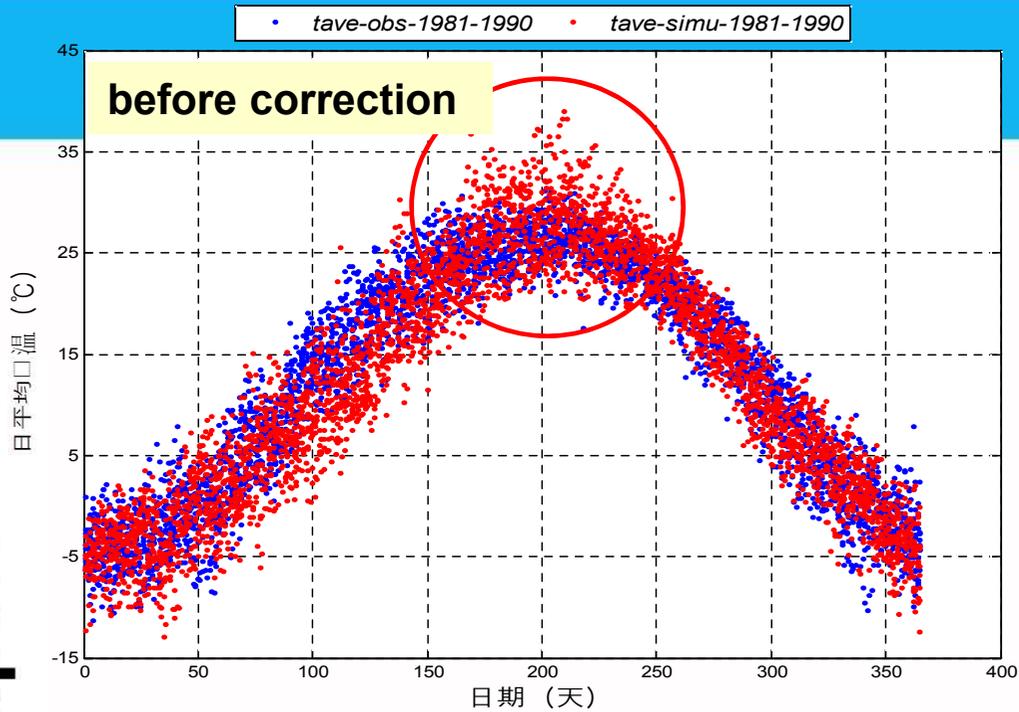
$$\text{Correction}(cf) = M_{binn}^{GCMscenario} + \left(\overline{M_{binn}^{obs}} - \overline{M_{binn}^{GCMbaseline}} \right)$$

For precipitation:

$$\text{Correction}(cf) = M_{binn}^{GCMscenario} * \left(\frac{\overline{M_{binn}^{obs}}}{\overline{M_{binn}^{GCMbaseline}}} \right)$$



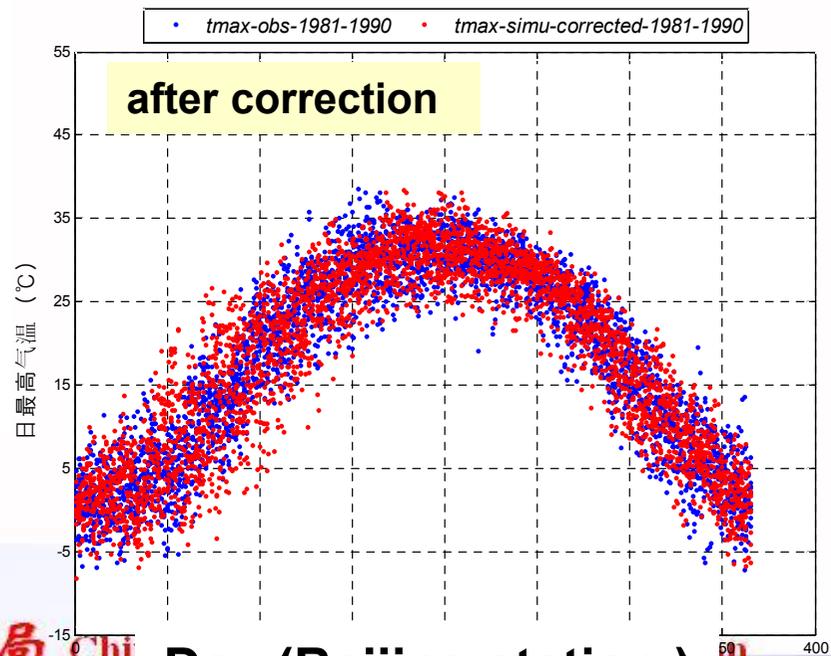
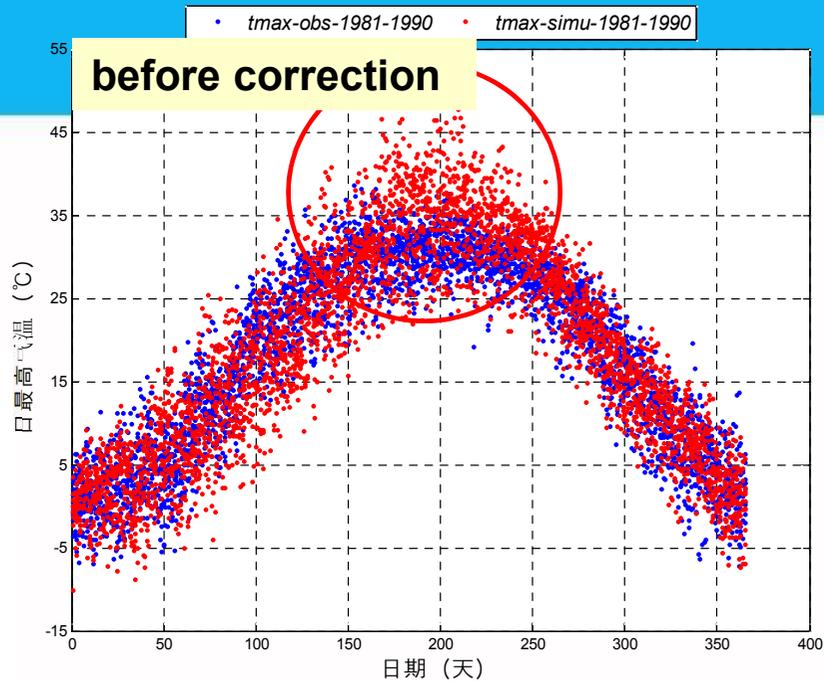
Temperature



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Day (Beijing station)

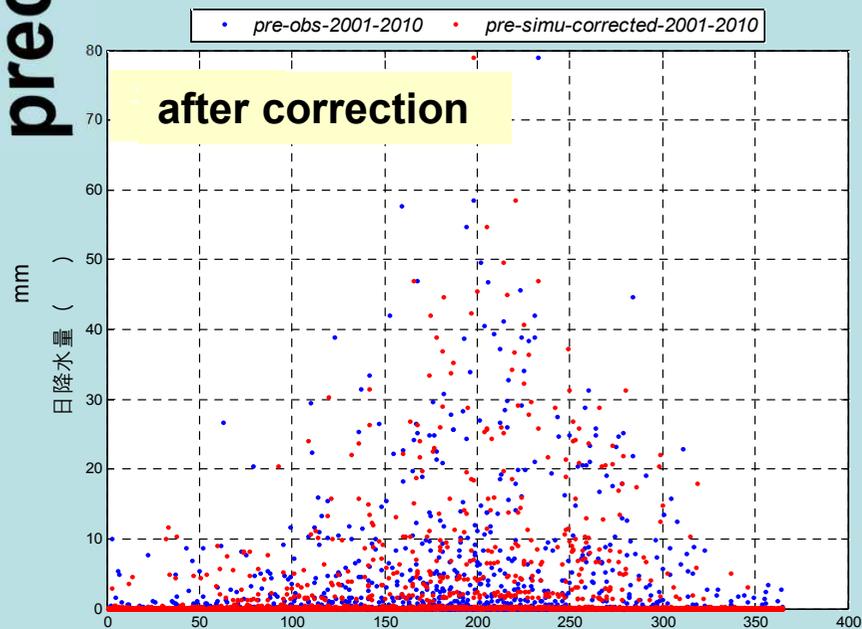
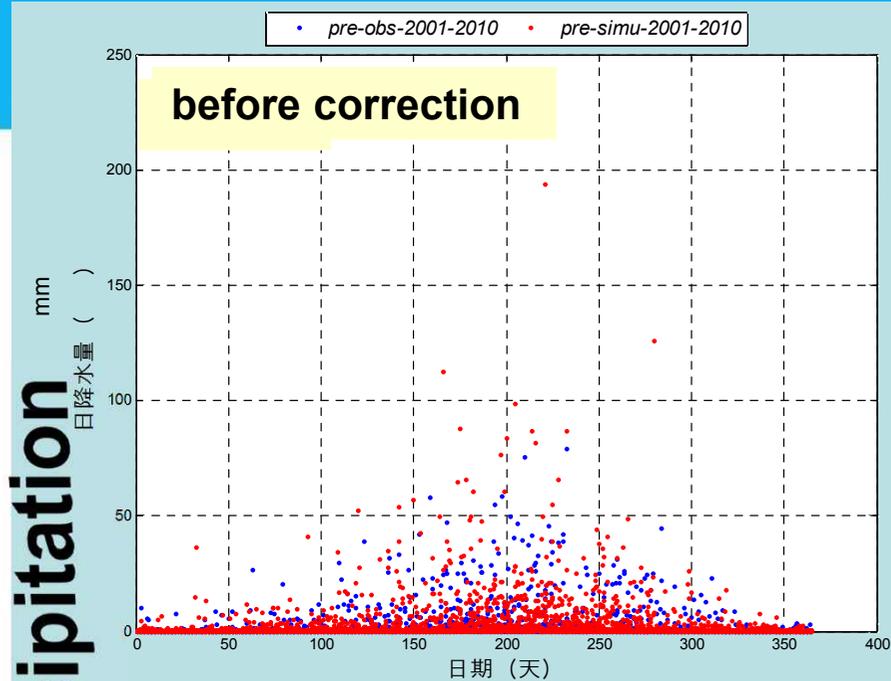
Highest temperature



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Day (Beijing station)

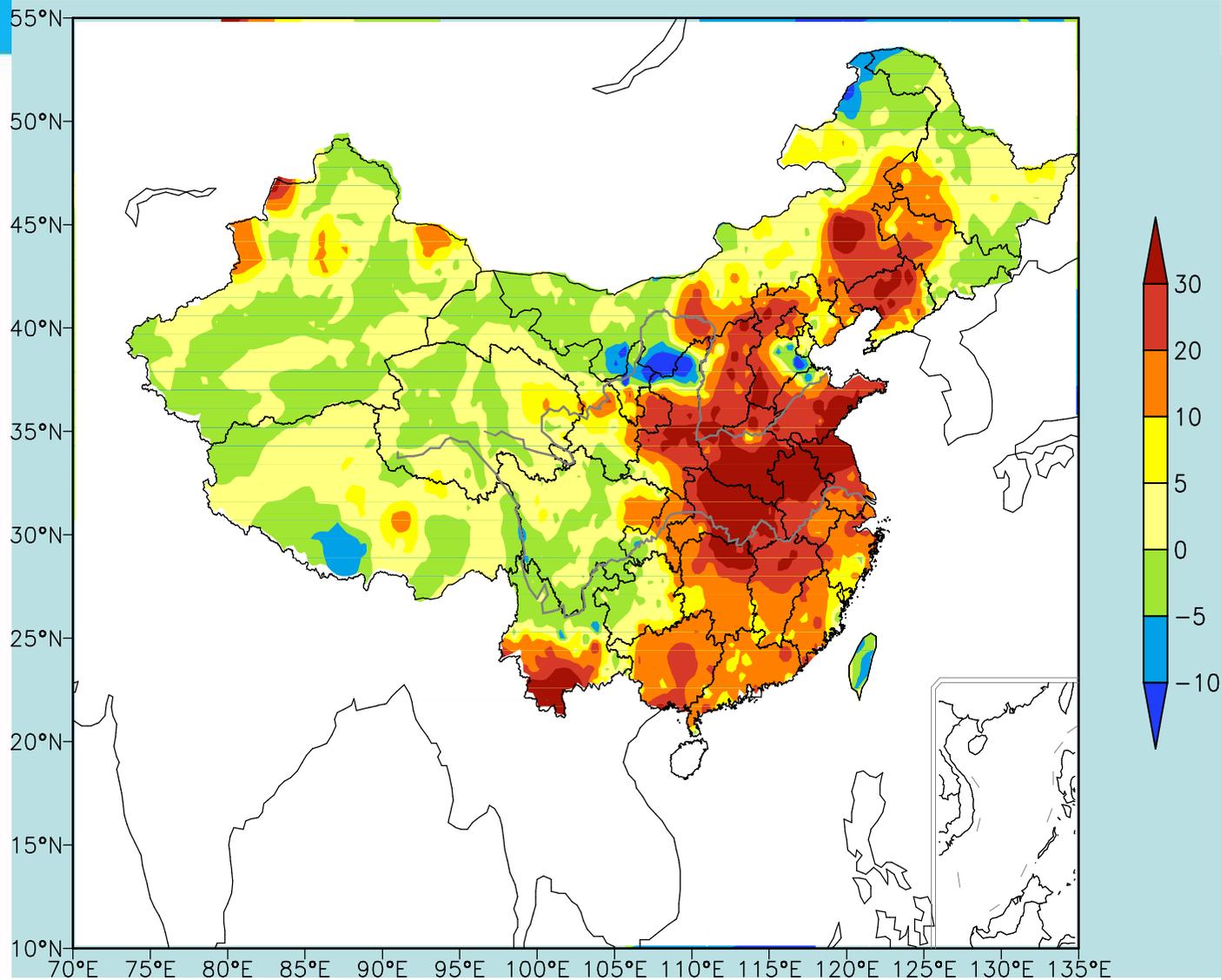
60 400



Day (Beijing station)



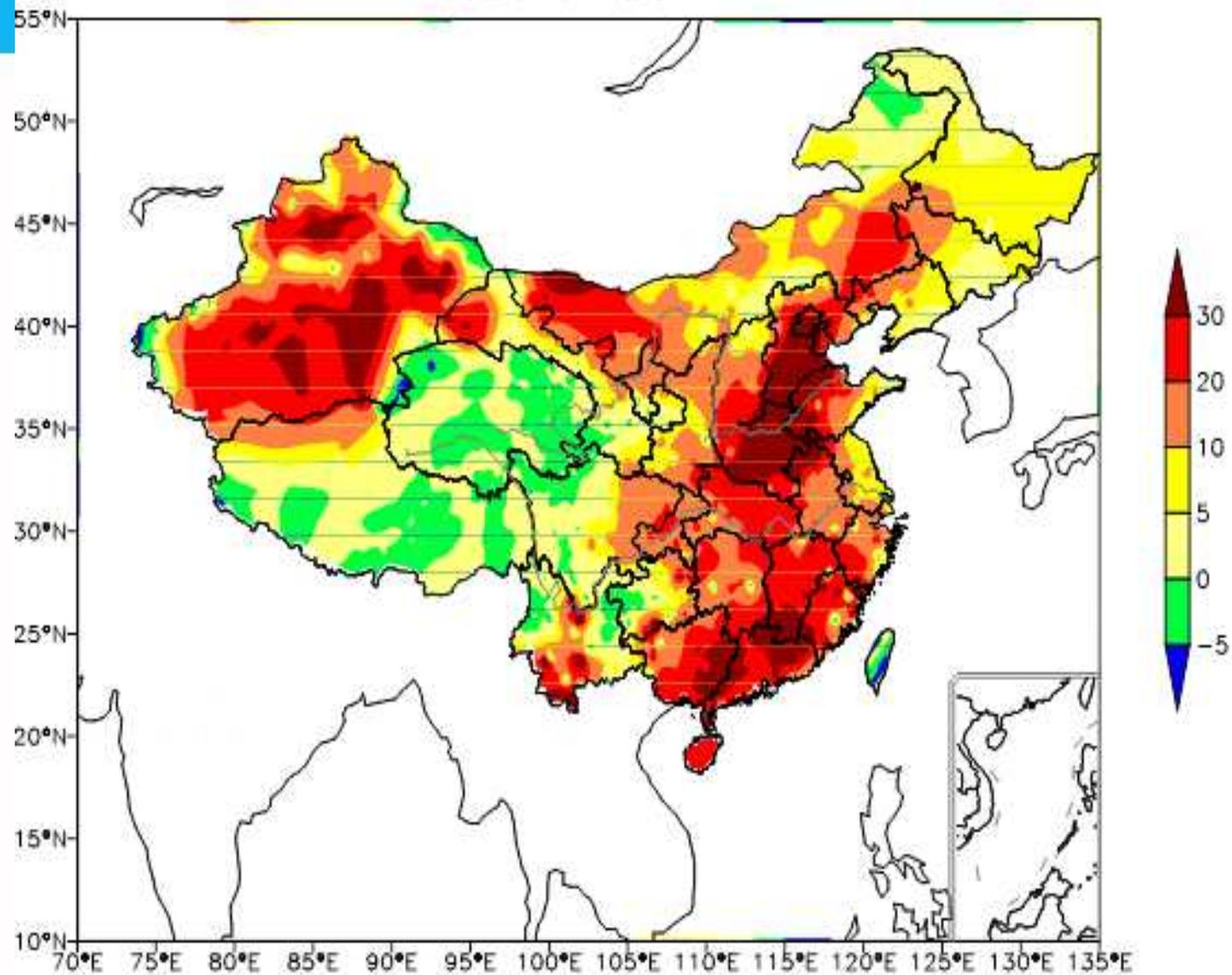
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The trends of drought days in China during 2010–2040 (RegCM3 day/30years)



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The trends of high temperature days in China during 2010–2040 (RegCM3 day/30years)



THANKS!



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