南京信息工程大学
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Additional risk in extreme climate in China from 1.5℃ to 2℃ global warming levels

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2018.08
银川

Outline

- Introduction
- Data and methods
- Threshold crossing times of 1.5 ℃ and 2 ℃
- Changes in temperature and precipitation extremes
- Changes in the probability of extreme climate
- Summary

Introduction

- 巴黎协定—全球升温控制在较工业化前2 ℃内，力争限制到1.5 ℃。
- 0.5 ℃增温差异，中国极端气候变化如何？变化敏感区？RCP影响？

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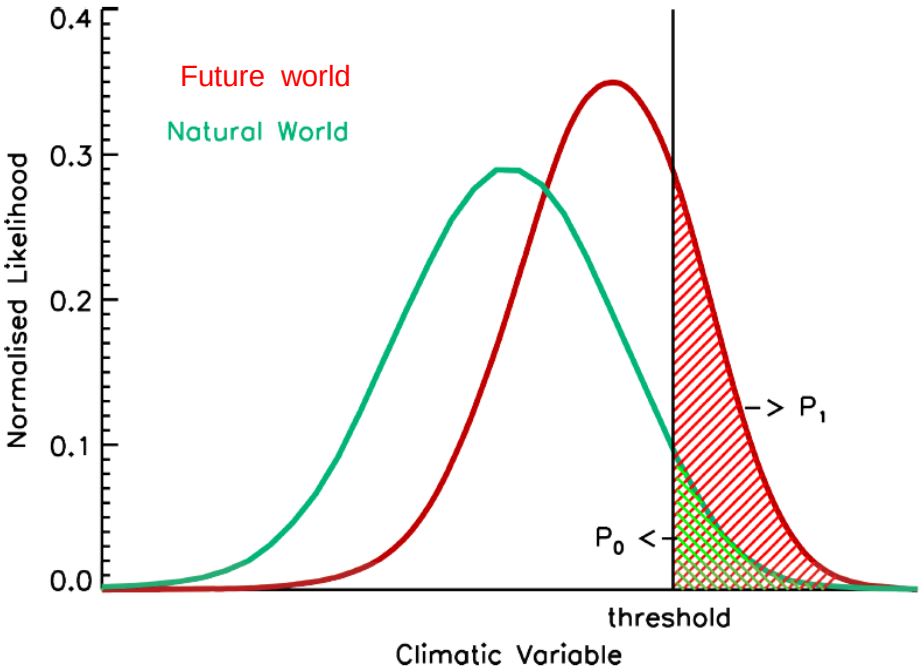
Model data

CMIP5模式，Histroical，RCP2.6，RCP4.5和RCP8.5下21个模式逐日最高（低）和逐日降水数据，

Methods

- 温度：8个ETCCDI极端温度指数 TXx TXn TNx TNn WSDI CSDI FD SU
- 降水：基于GEV拟合的重现期（20年，50年，100年)极端降水

Probability Ratio



$$PR = \frac{P_1}{P_0}$$

P_0表示超过参考期（历史时期）内某一阈值的概率，P_1表示增温1.5 ℃或2℃下超过某一阈值的概率。

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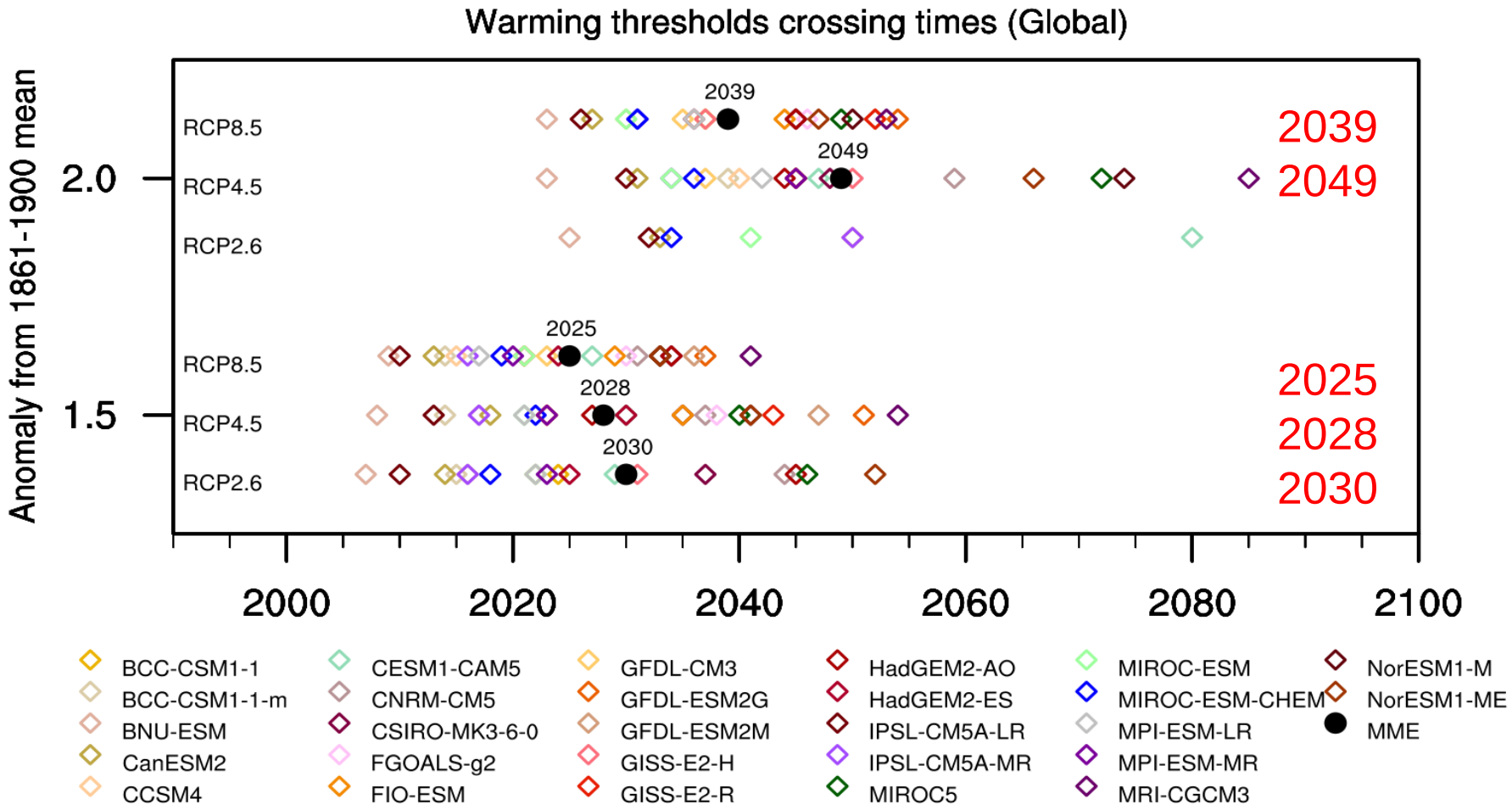
- Threshold crossing times of 1.5 ℃ and 2 ℃



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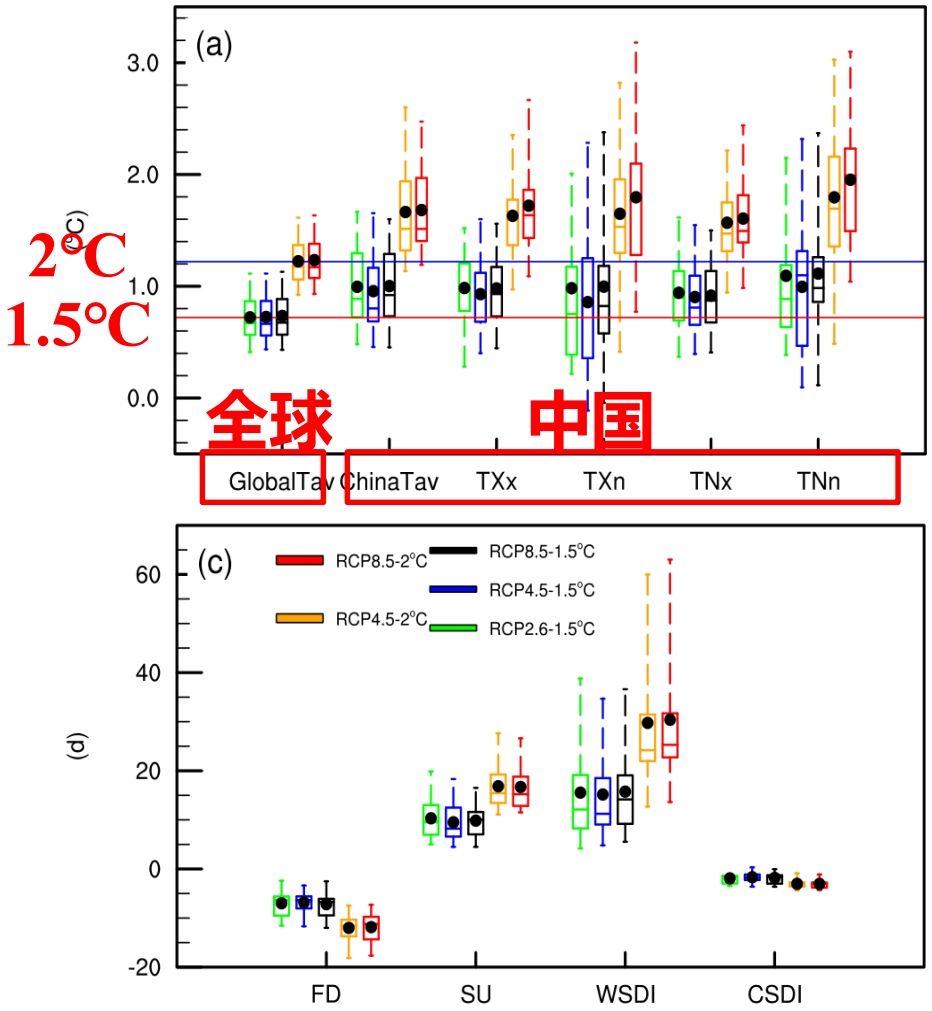
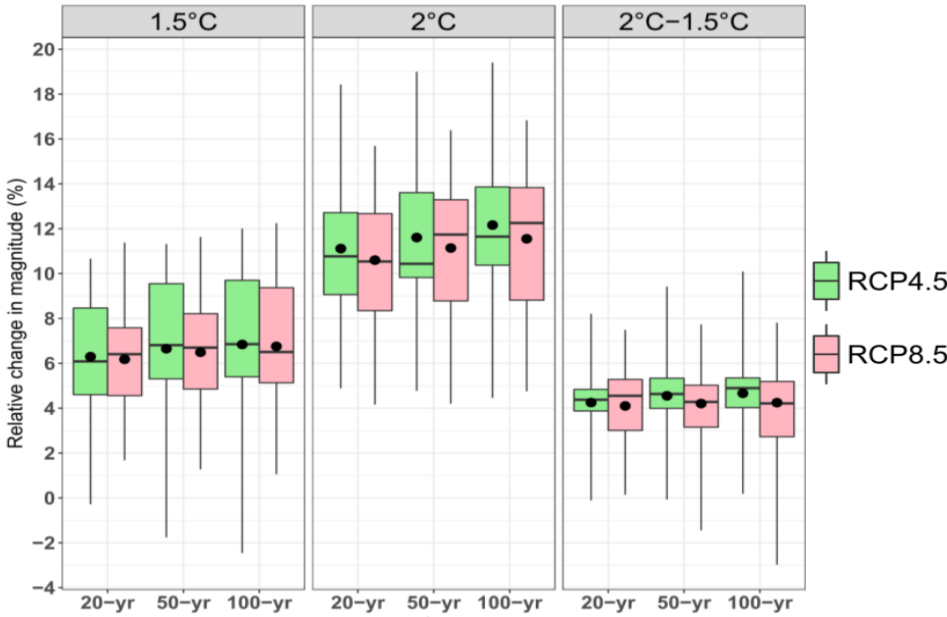
Extreme temperature

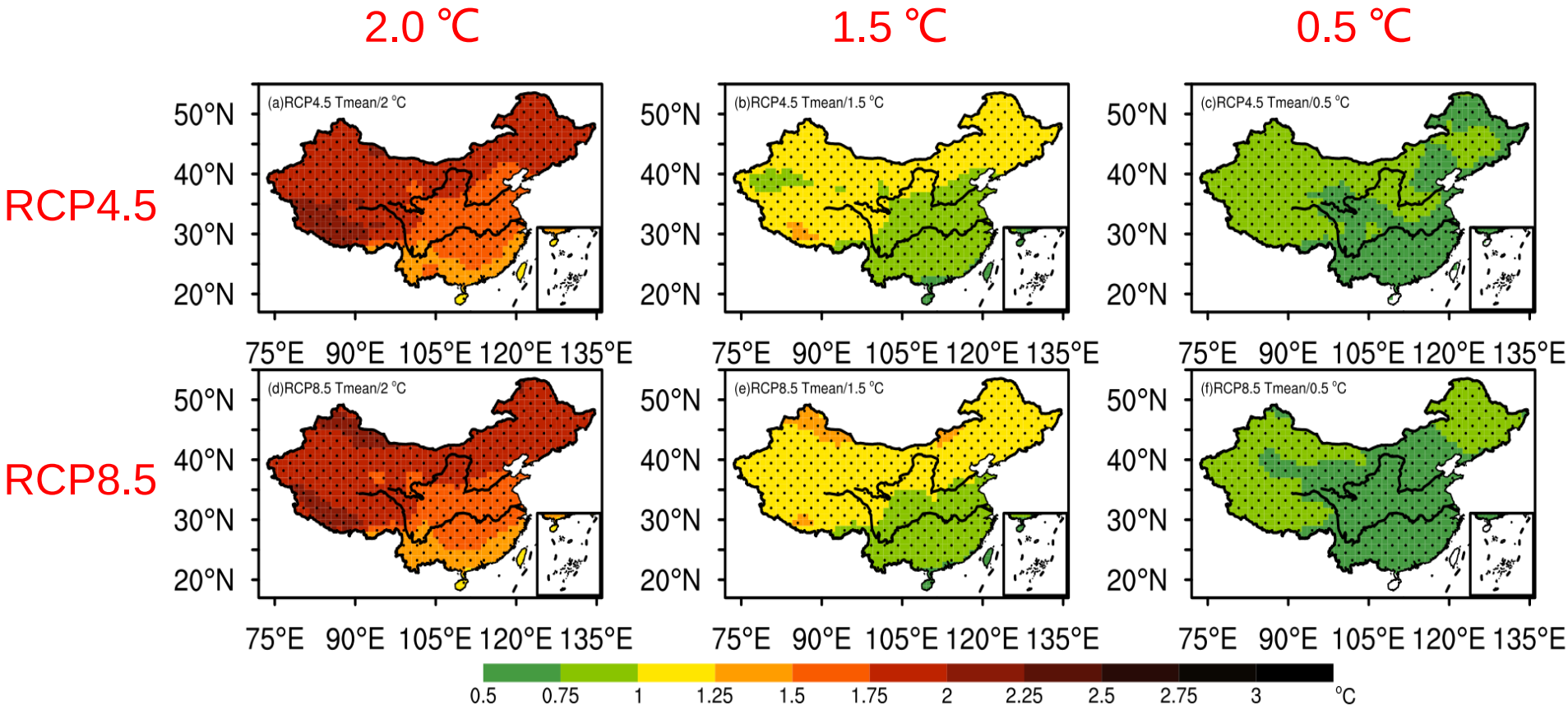


Extreme precipitation



- Relative to 1986-2005 reference period.

Mean temperature

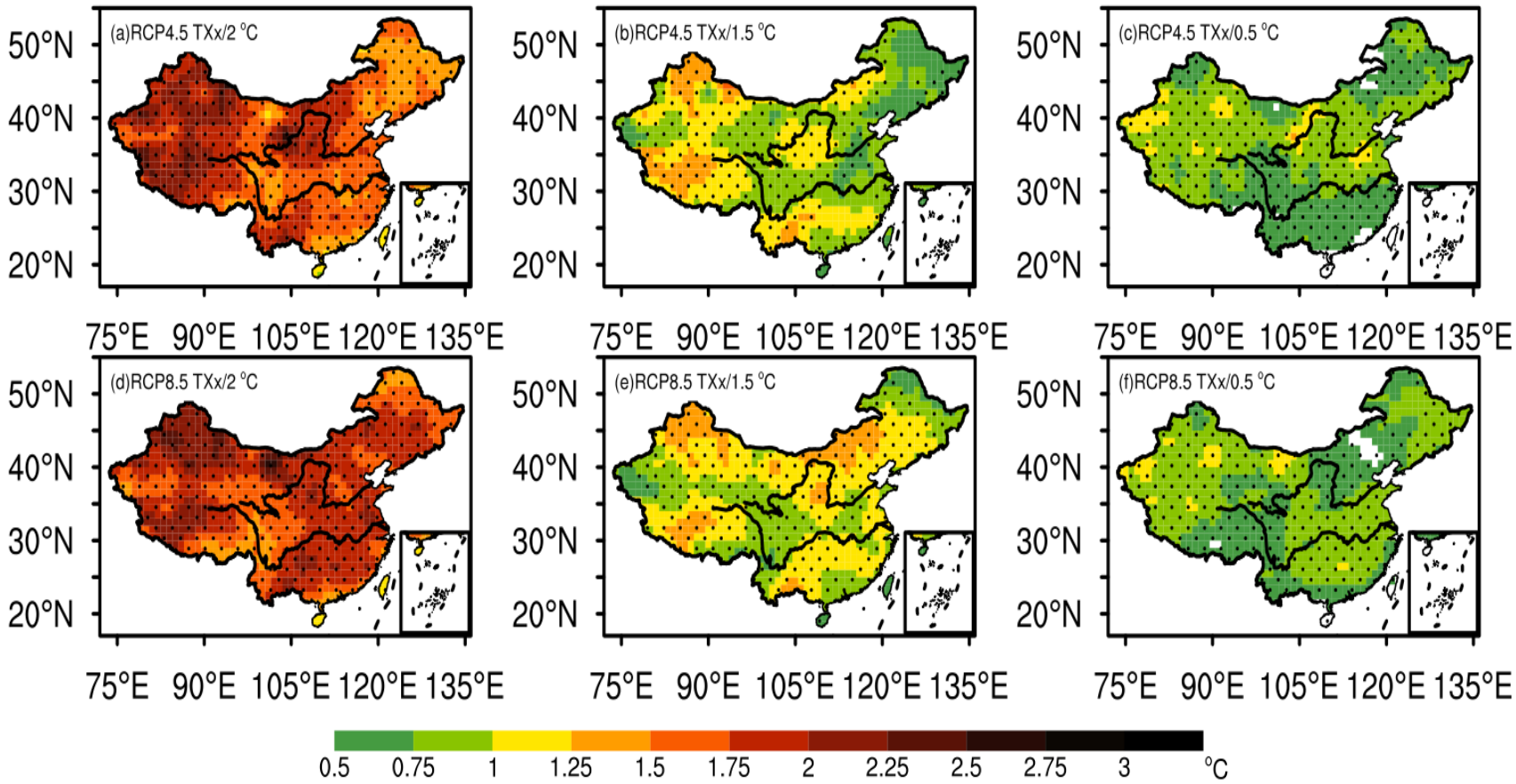


TXx (Annual maximum daily maximum temperature)

2.0 ℃ 1.5 ℃ 0.5 ℃

RCP4.5

RCP8.5

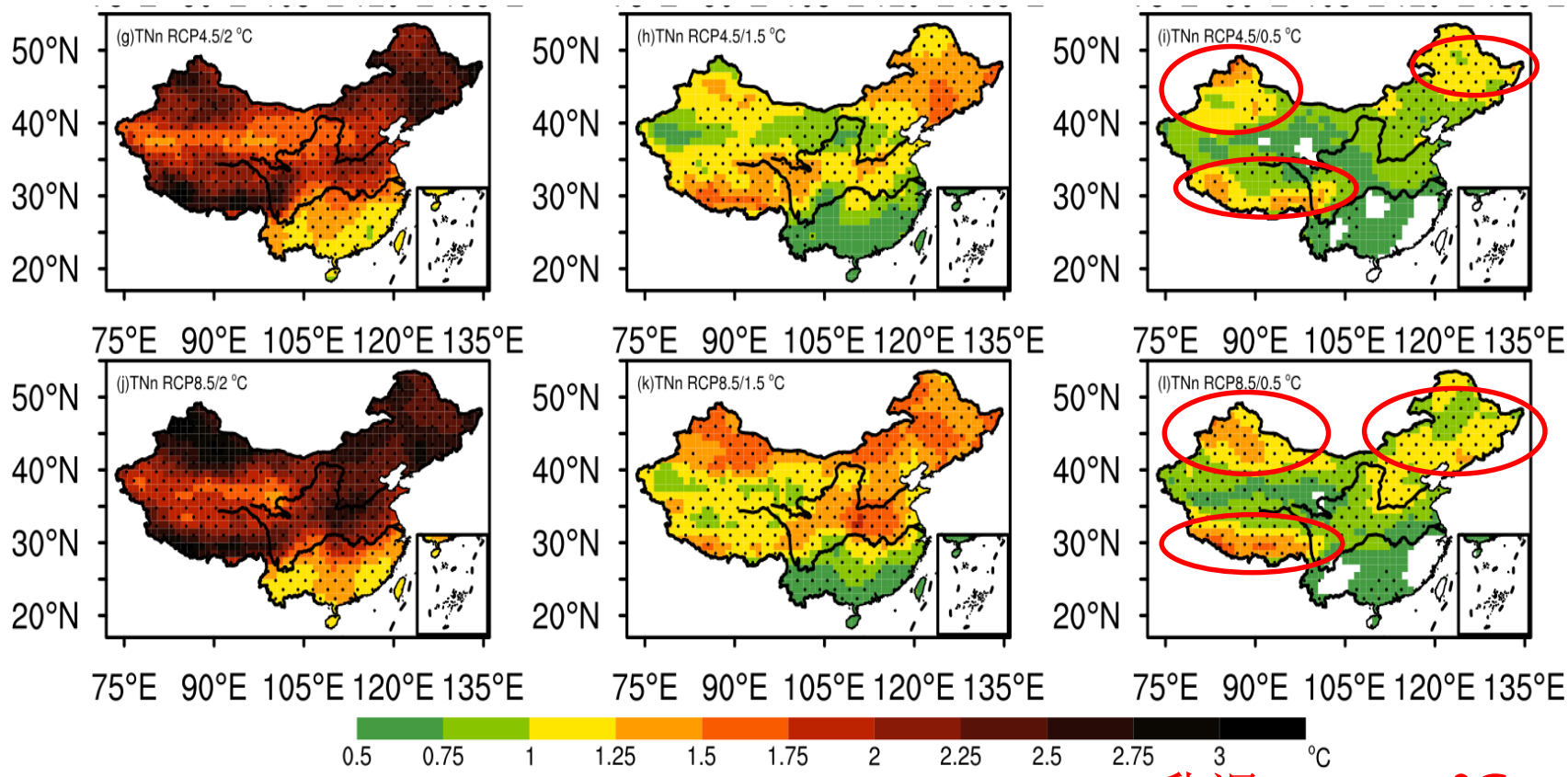


TNn (Annual minimum daily minimum temperature)

2.0 ℃ 1.5 ℃ 0.5 ℃

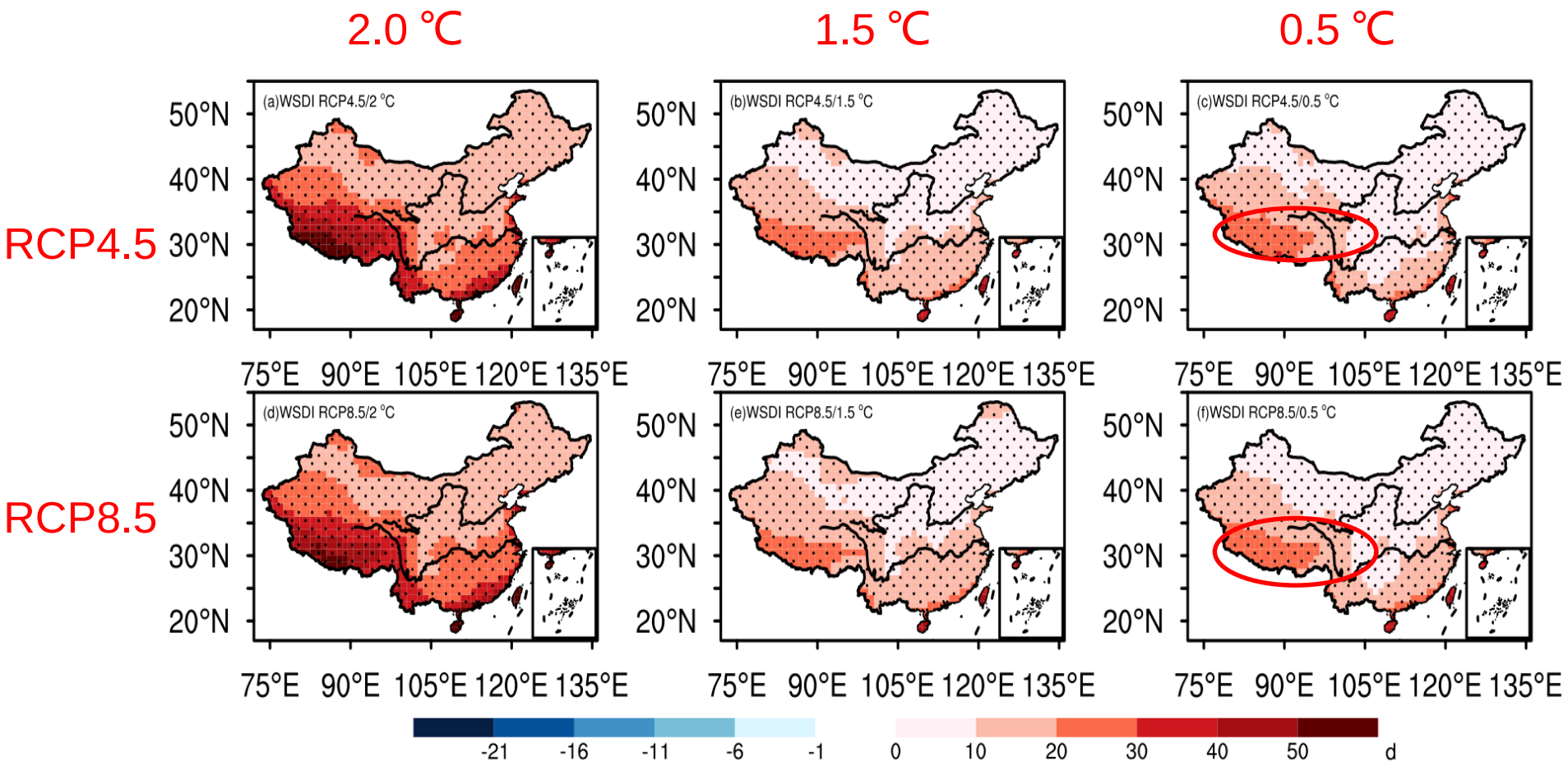
RCP4.5

RCP8.5



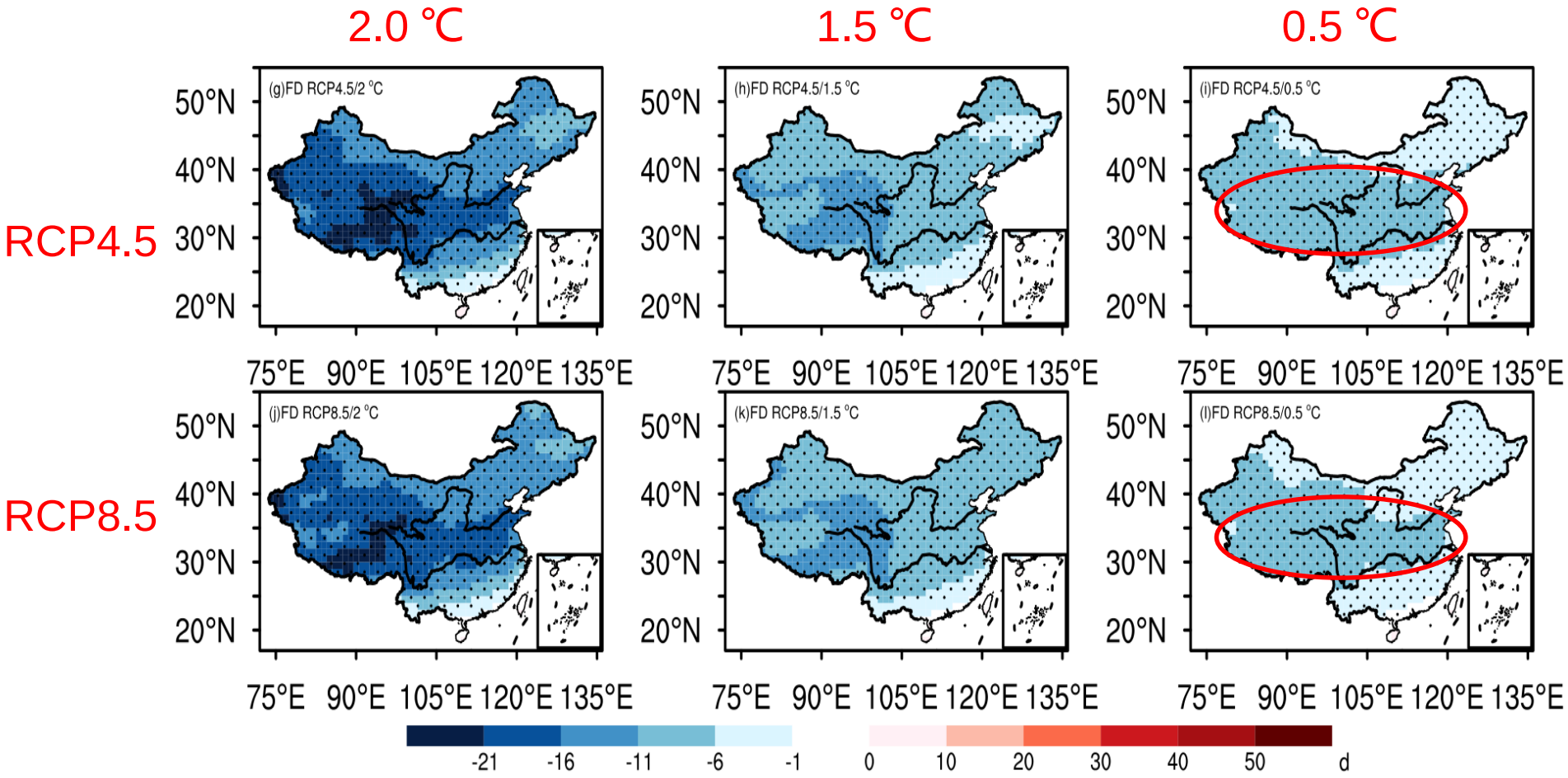
升温>1-1.5 ℃

WSDI (Warm spell duration)



增加大约10-20天

FD (Frost days)



减少大约11天

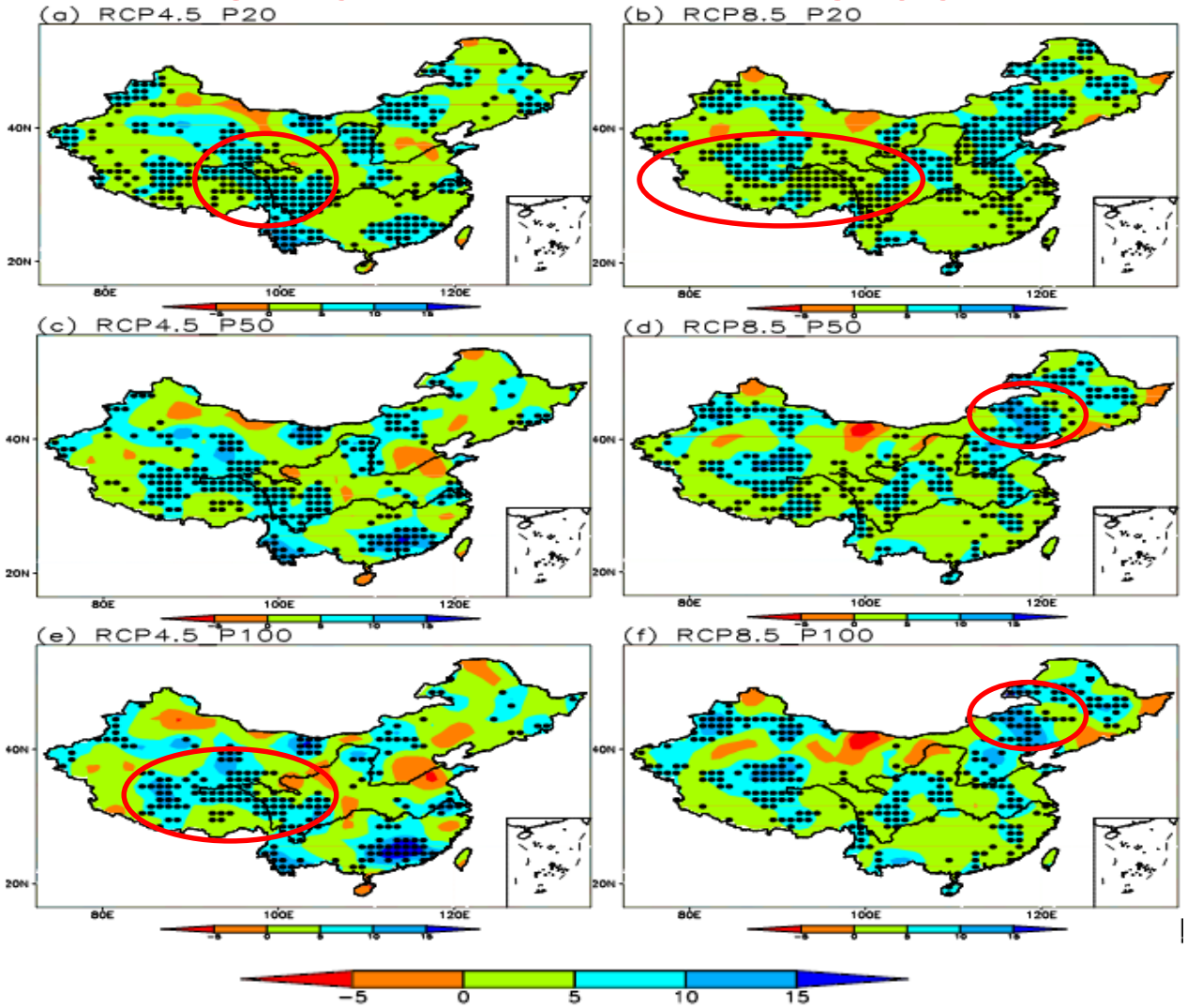
Return period

RCP4.5 RCP8.5

20-year

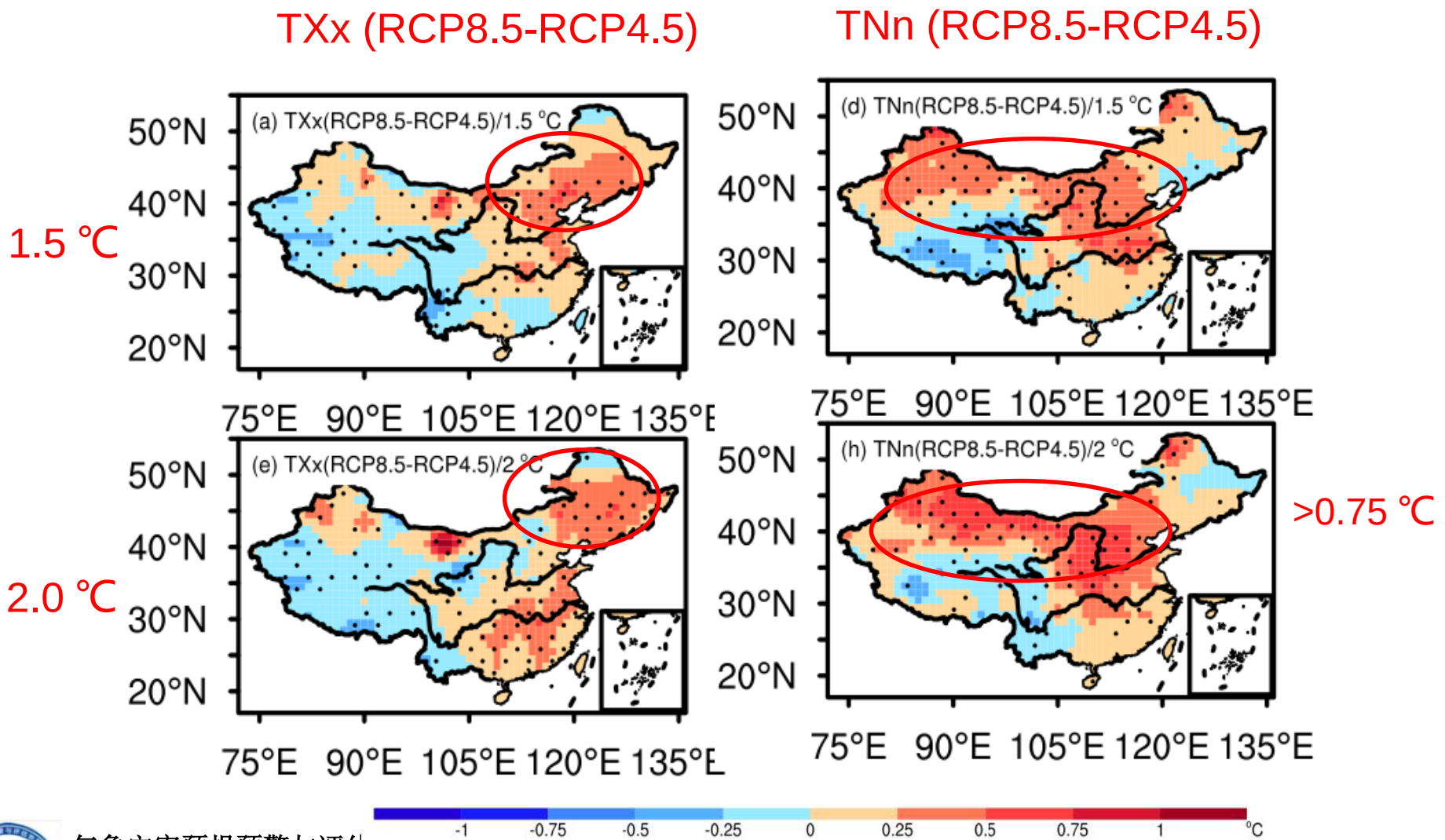
50-year

100-year



增加
10%

Comparisons of the temperature extremes between different RCP scenarios



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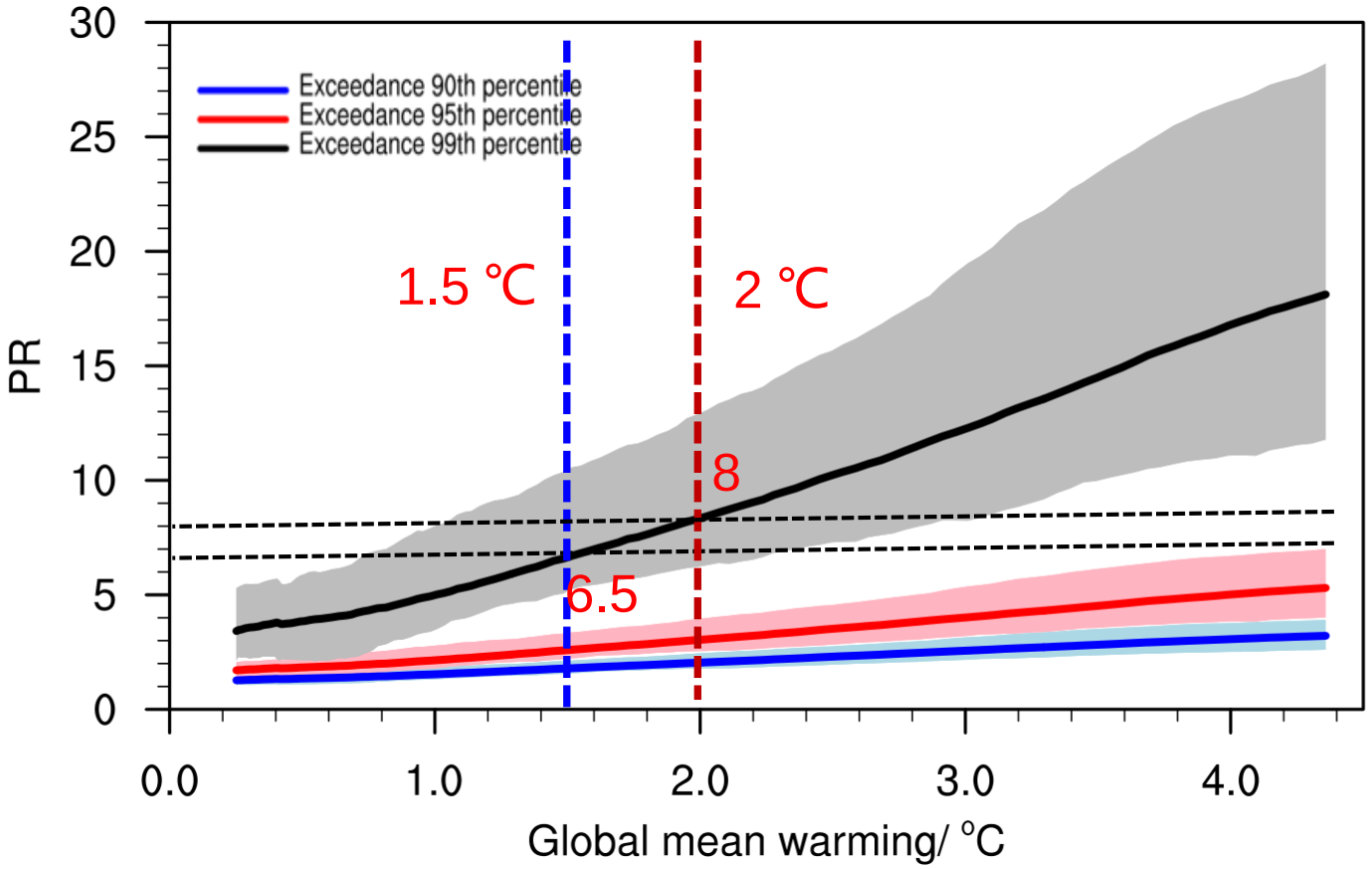
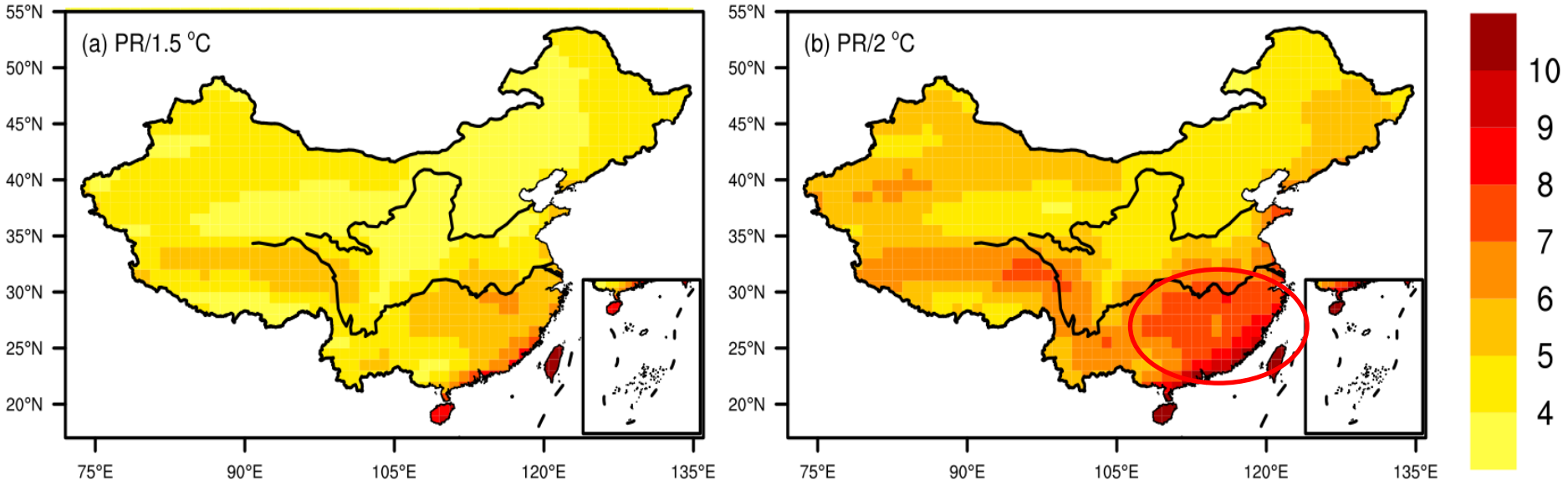
- Changes in the probability of extreme maximum temperature

Probability Ratio

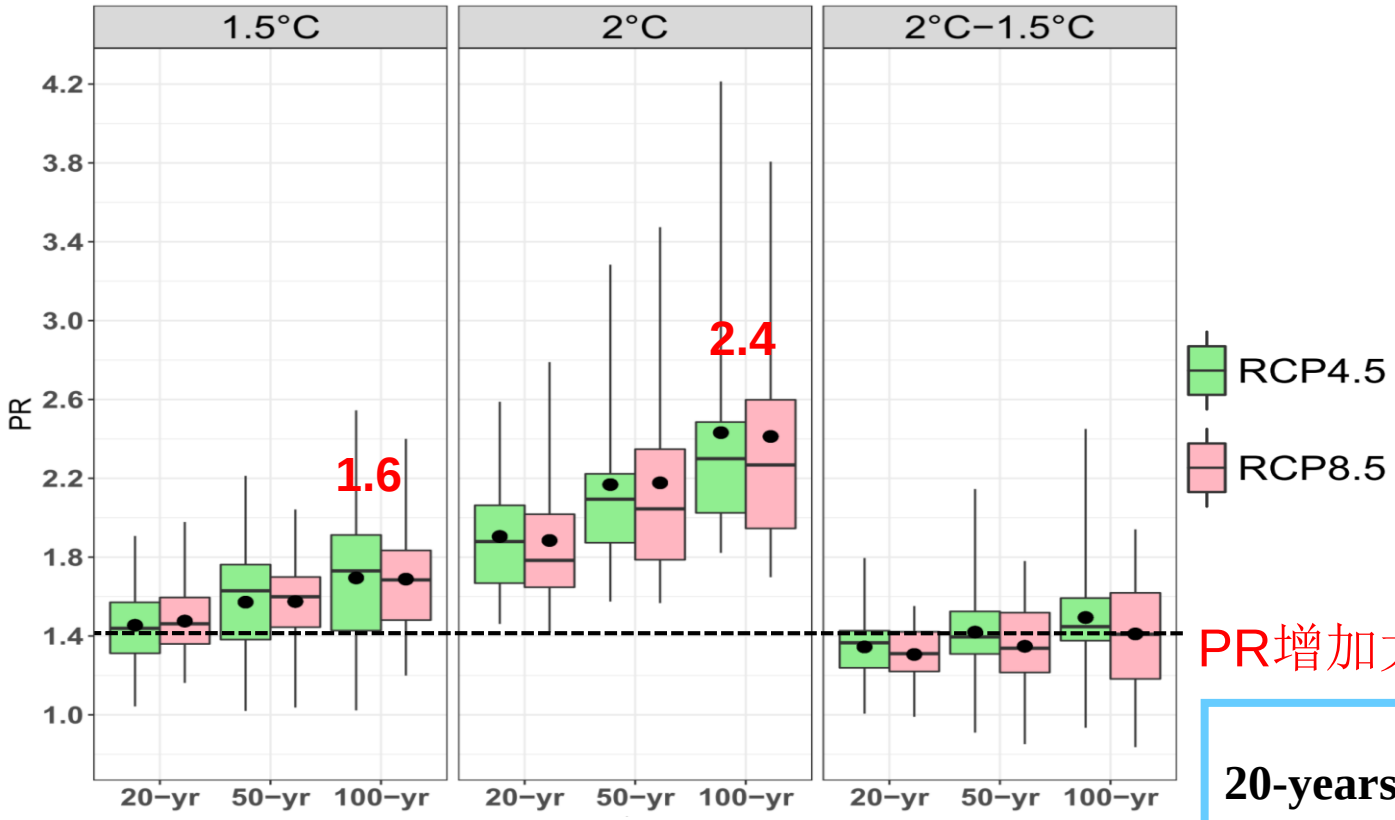


Distribution of PR under 1.5 ℃ and 2.0 ℃ global warming



PR增加7倍以上

- Changes in the probability of extreme precipitation



PR增加大约1.4倍

20-years: 1.4 → 15 years

50-years: 1.4 → 36 years

100-years: 1.4 → 72 years

RCP4.5

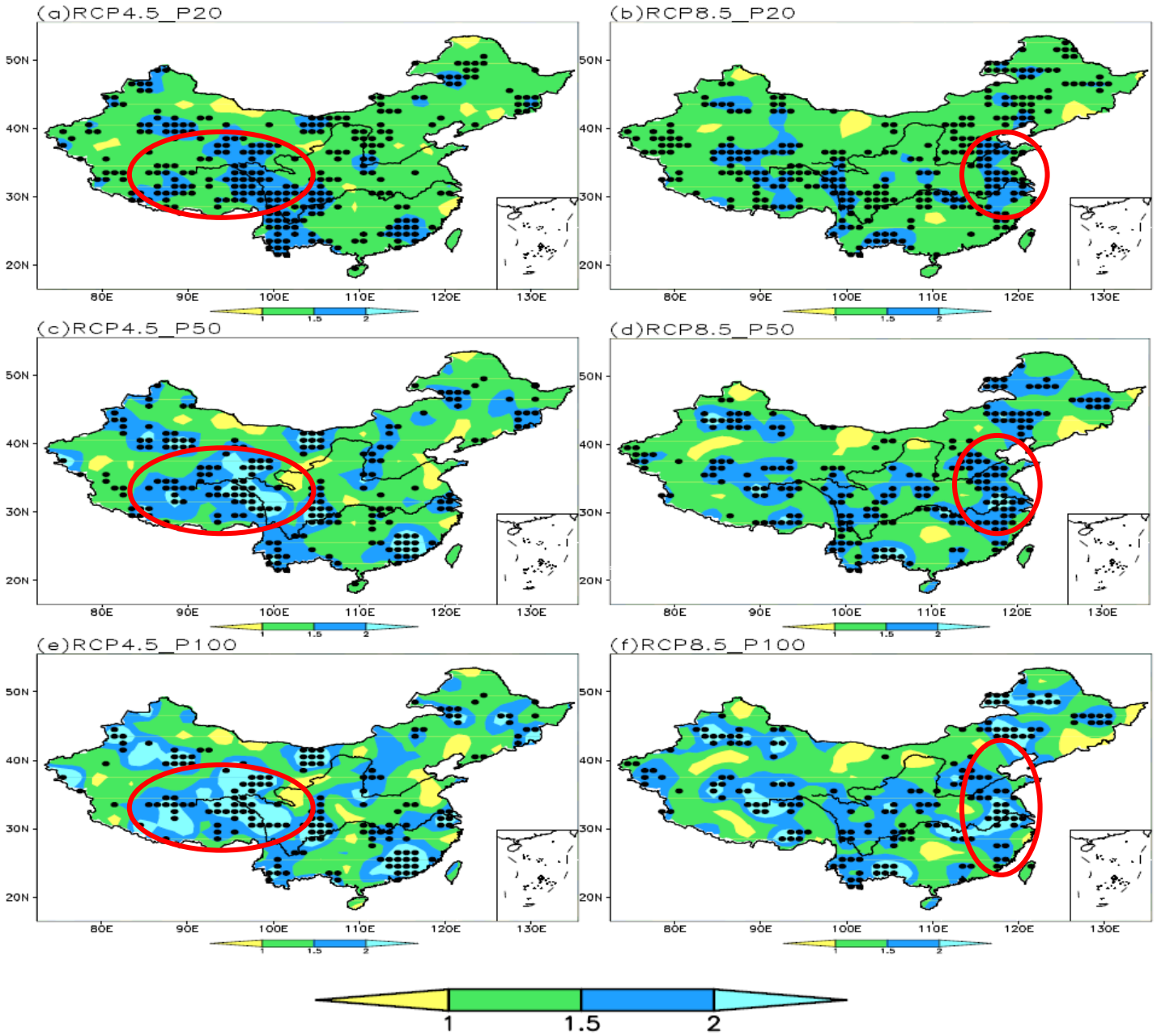
RCP8.5

20-year

50-year

100-year

>1.5



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Summary

- 0.5 ˚C升温对中国地区极端温度和降水有显著的影响：
  - 西北，东北和青藏高原地区TXn和TNn的变化将会是全球温度变化的2倍以上（>1 ˚C ）。
  - 极端降水将会增加4%。
- 区域平均极端温度和降水不依赖于情景，但是在局部地区不同情景间极端温度存在差异。
  - 西北和华北，RCP8.5较RCP4.5极端温度变化更强。
- 随着全球升温，中国地区极端温度和极端降水的风险呈增加的趋势：
  - 1.5和2 ˚C下，中国地区经历百年一遇高温事件的风险较自然强迫下分别增加了大约7倍和9倍。
  - 百年一遇的强降水风险则分别增加了1.6倍和2.4倍。
  - 全球升温幅度越大，极端事件越罕见，预估的不确定性越大。

Thanks for your attention !