

# Heat Waves in Southern China

LUO Ming

LAU Ngar-Cheung



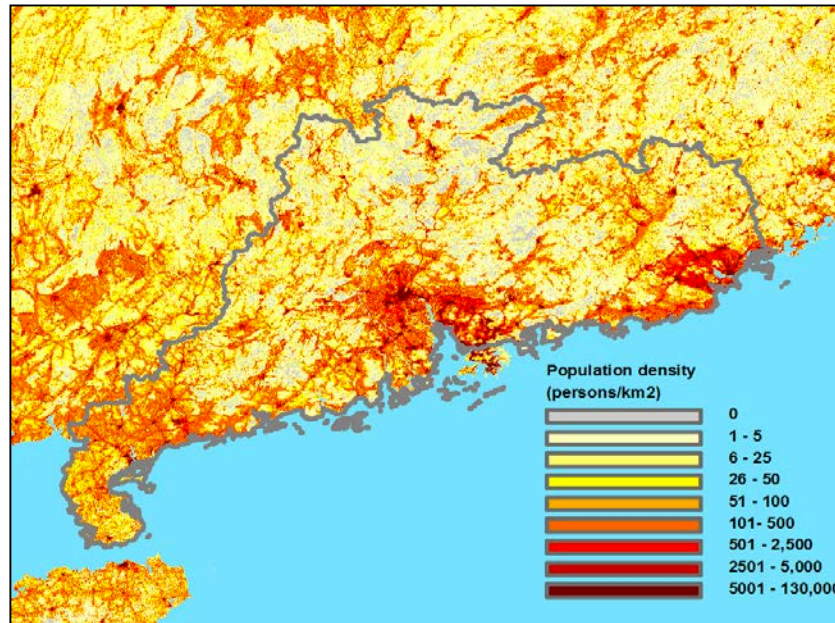
香港中文大學  
The Chinese University of Hong Kong



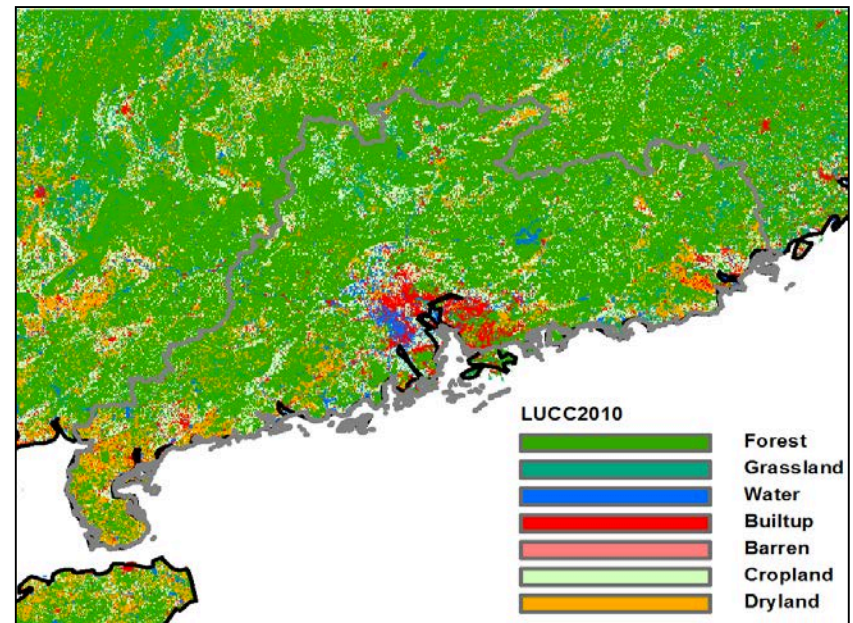
香港中文大學環境、  
能源及可持續發展研究所  
Institute of Environment,  
Energy and Sustainability, CUHK

# Southern China

- Southern China is one of the most densely urbanized and populated regions in the world.

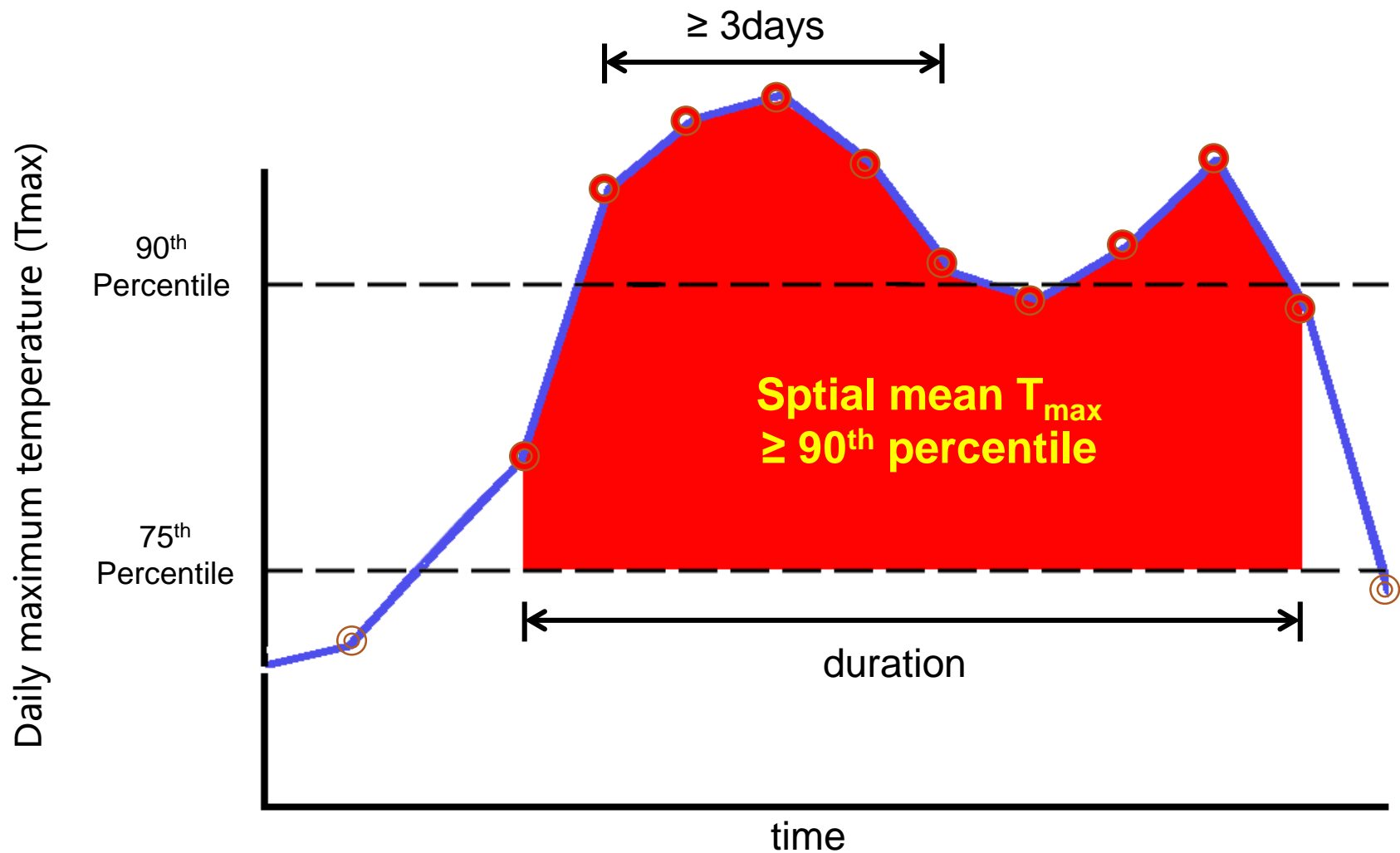


(a) Population density in 2010

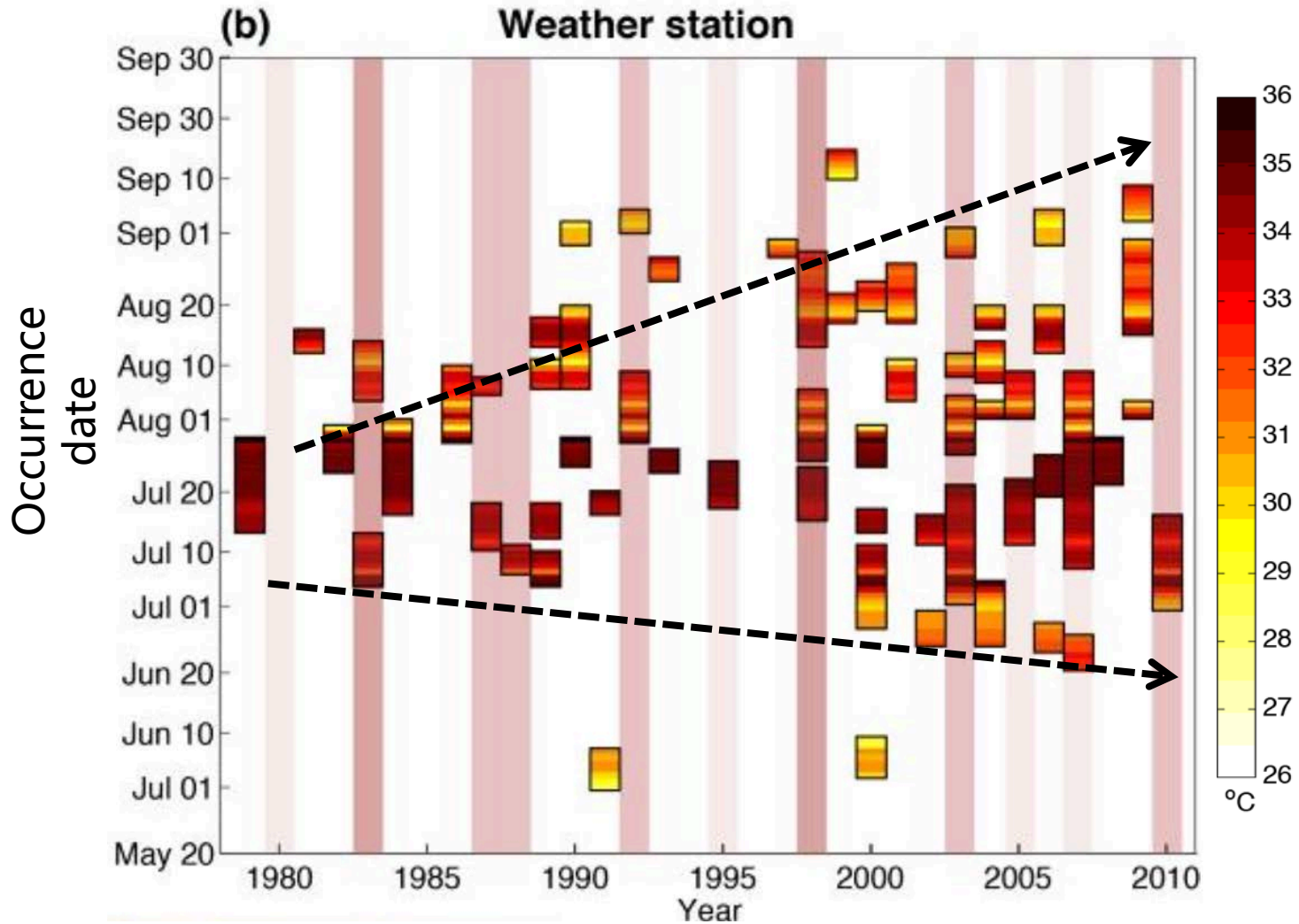


(b) Land use / land cover types

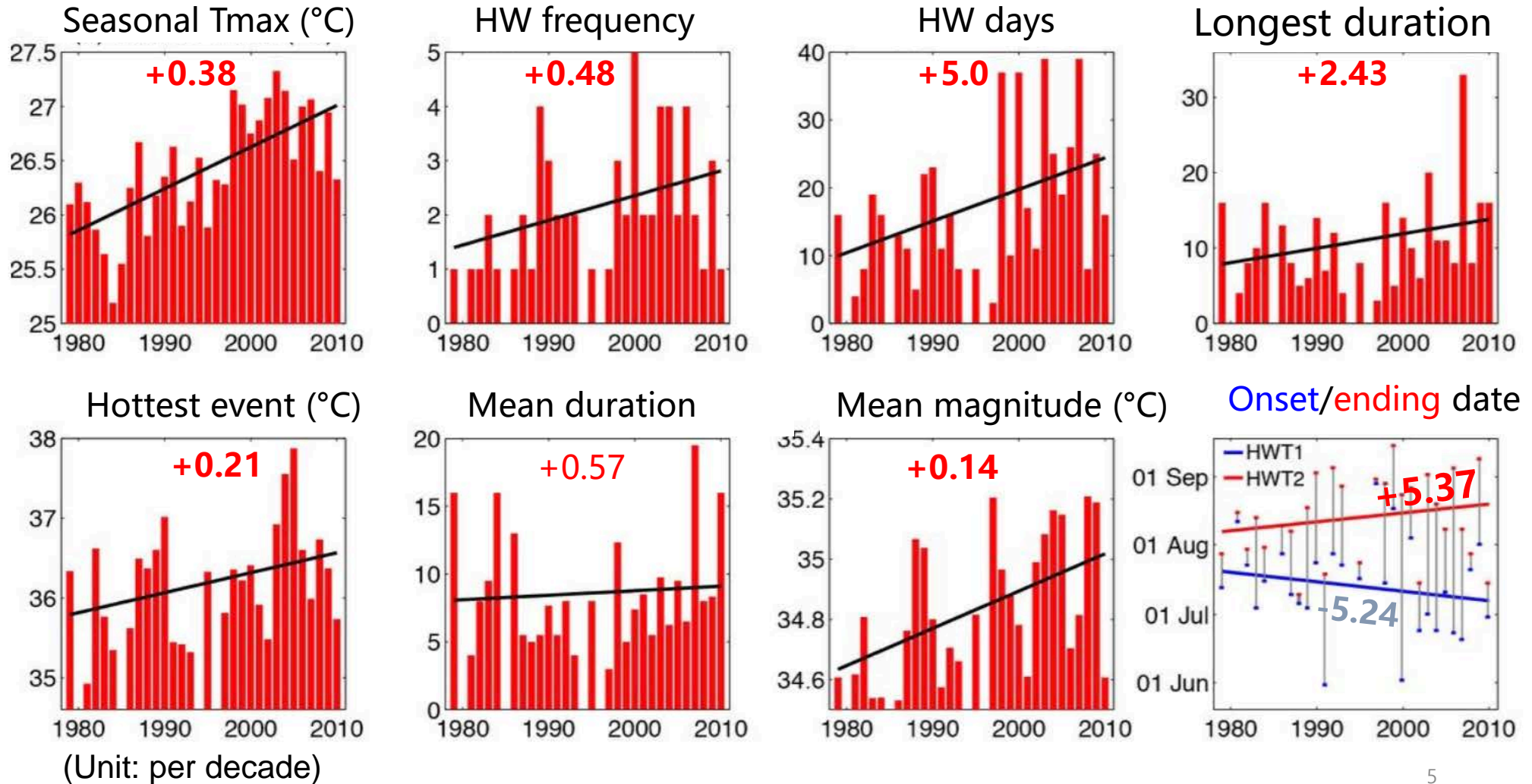
# Definition of heat wave



# Heat wave occurrences (weather station)



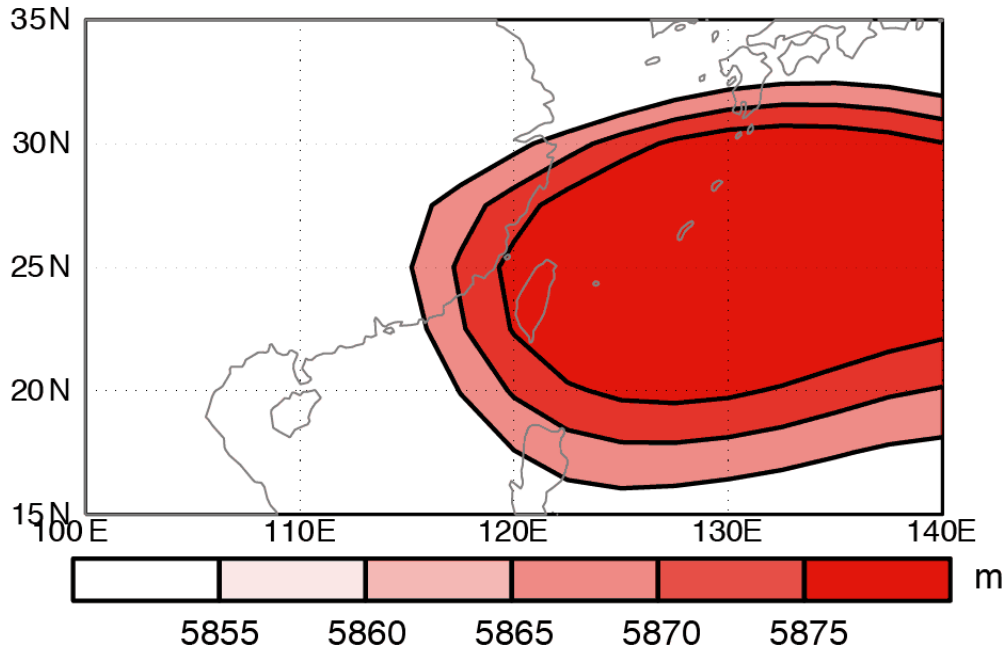
# Long-term trend in various heat wave measures (weather stations)



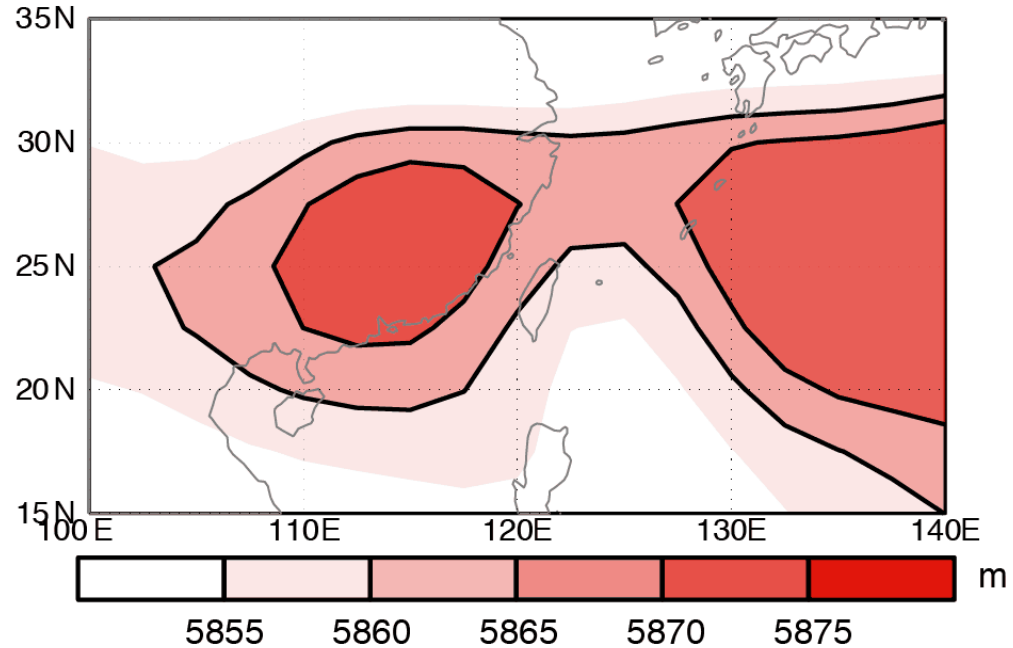


# Movement of the subtropical high

Prior to heat wave  
**Day -3**



After heat wave  
**Day -3**



# Urbanization effects: PRD vs. Non-PRD

	Region	Seasonal Tmax (°C/10a)	HW Frequency (No./10a)	HW days (D/10a)	Longest Event (D/10a)	Hottest Event (°C/10a)	Onset time (D/10a)	Ending time (D/10a)
CFSR Reanalysis	PRD	<b>+0.61</b>	<b>+0.47</b>	<b>+3.00</b>	<b>+1.00</b>	<b>+0.21</b>	<b>-4.81</b>	<b>+9.43</b>
	Non-PRD	<b>+0.54</b>	<b>+0.38</b>	<b>+2.86</b>	<b>+0.69</b>	<i>+0.04</i>	<i>-0.17</i>	<b>+12.1</b>
Weather Stations	PRD	<b>+0.41</b>	<b>+1.00</b>	<b>+7.29</b>	<b>+2.79</b>	<b>+0.26</b>	<b>-6.25</b>	<b>+5.45</b>
	Non-PRD	<b>+0.36</b>	<b>+0.51</b>	<b>+5.00</b>	<b>1.46</b>	<i>0.14</i>	<b>-4.32</b>	<b>+8.71</b>

# Classification of urban and rural stations

## Urban stations:

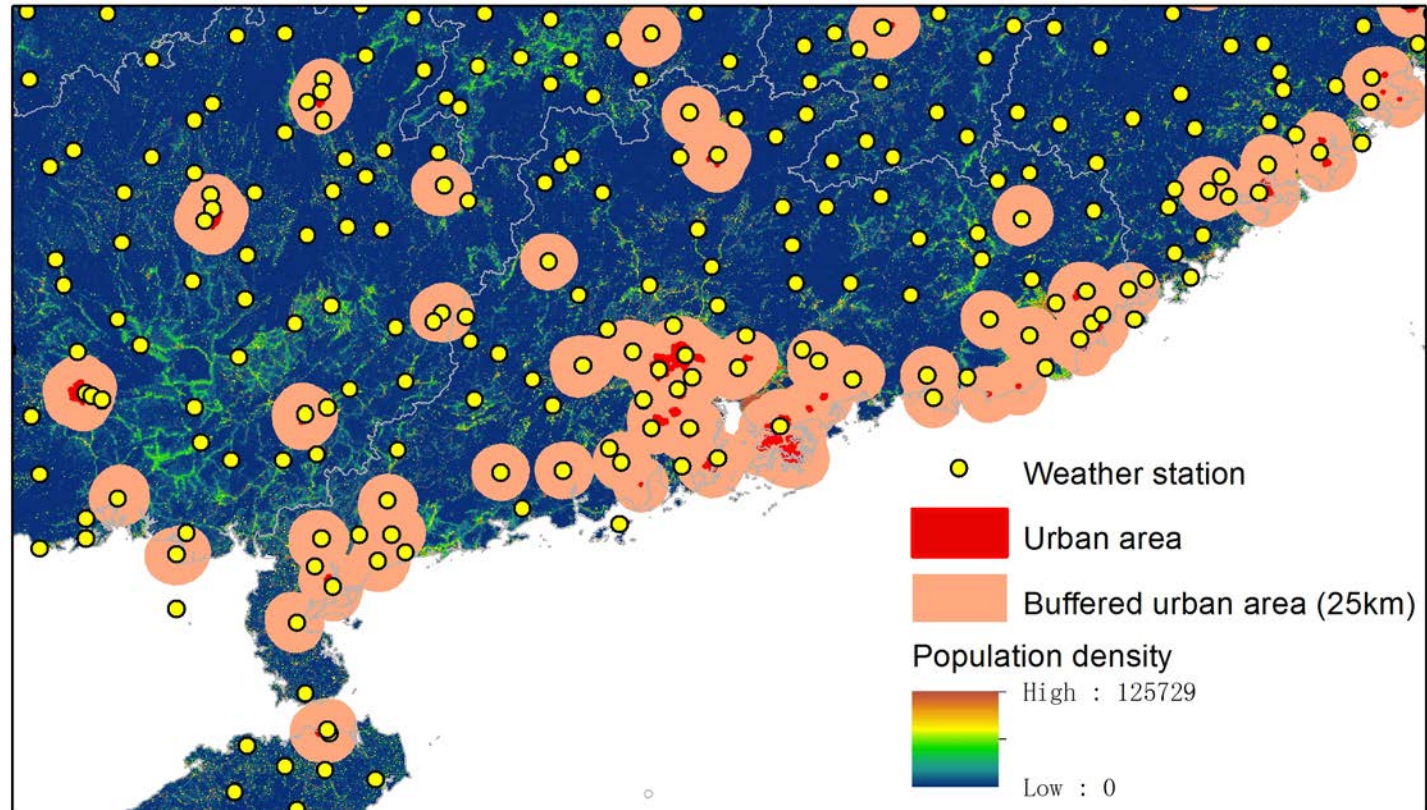
Located within 25km of urban areas, and population density  $> 500$  persons /km<sup>2</sup> (avg.=5580.8)

## Paired rural stations:

Located within 30-100km of urban areas, and population density  $< 200$  persons /km<sup>2</sup> (avg.=66.3)

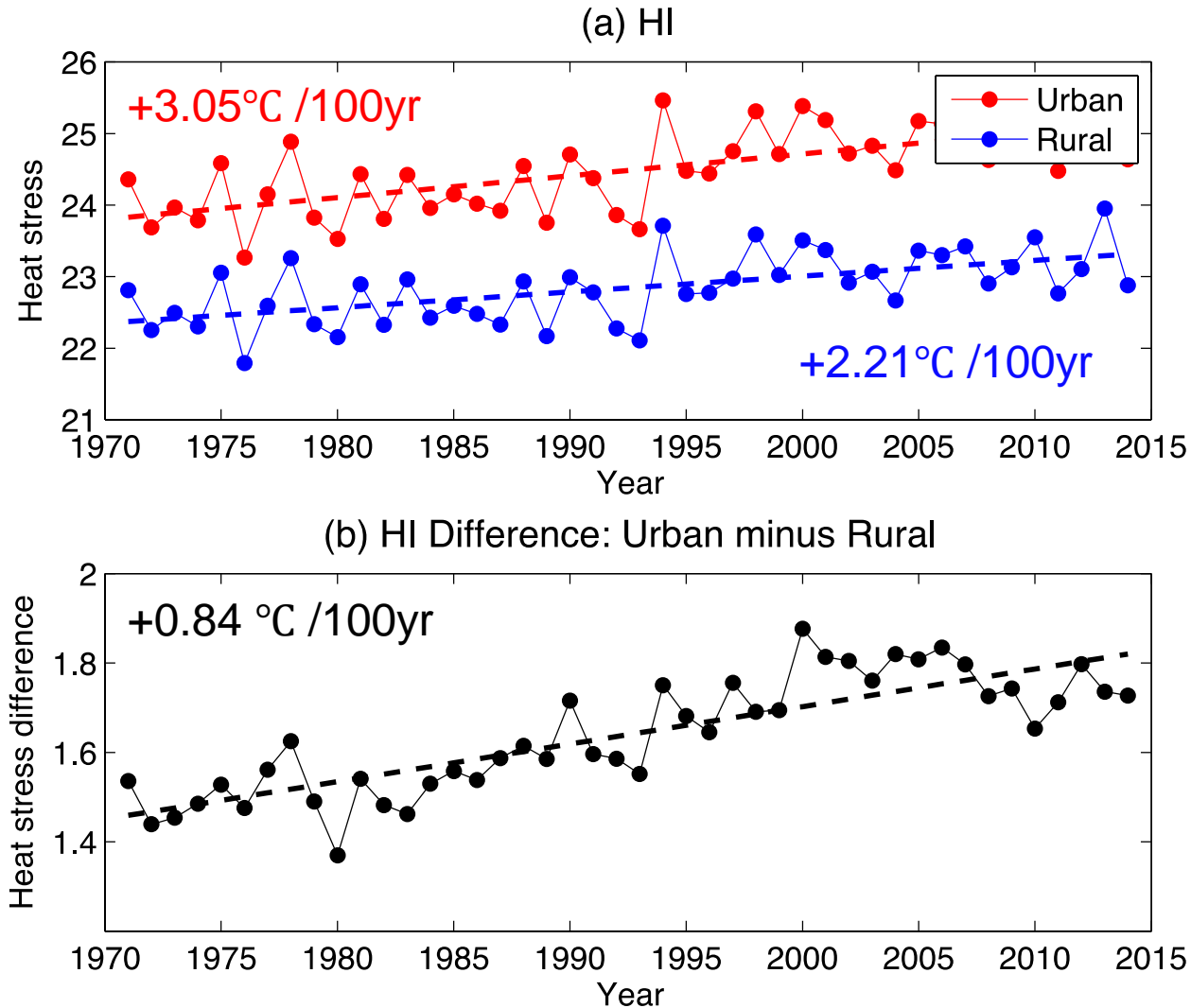
Mishra et al. (ERL, 2015)

An example in southern China

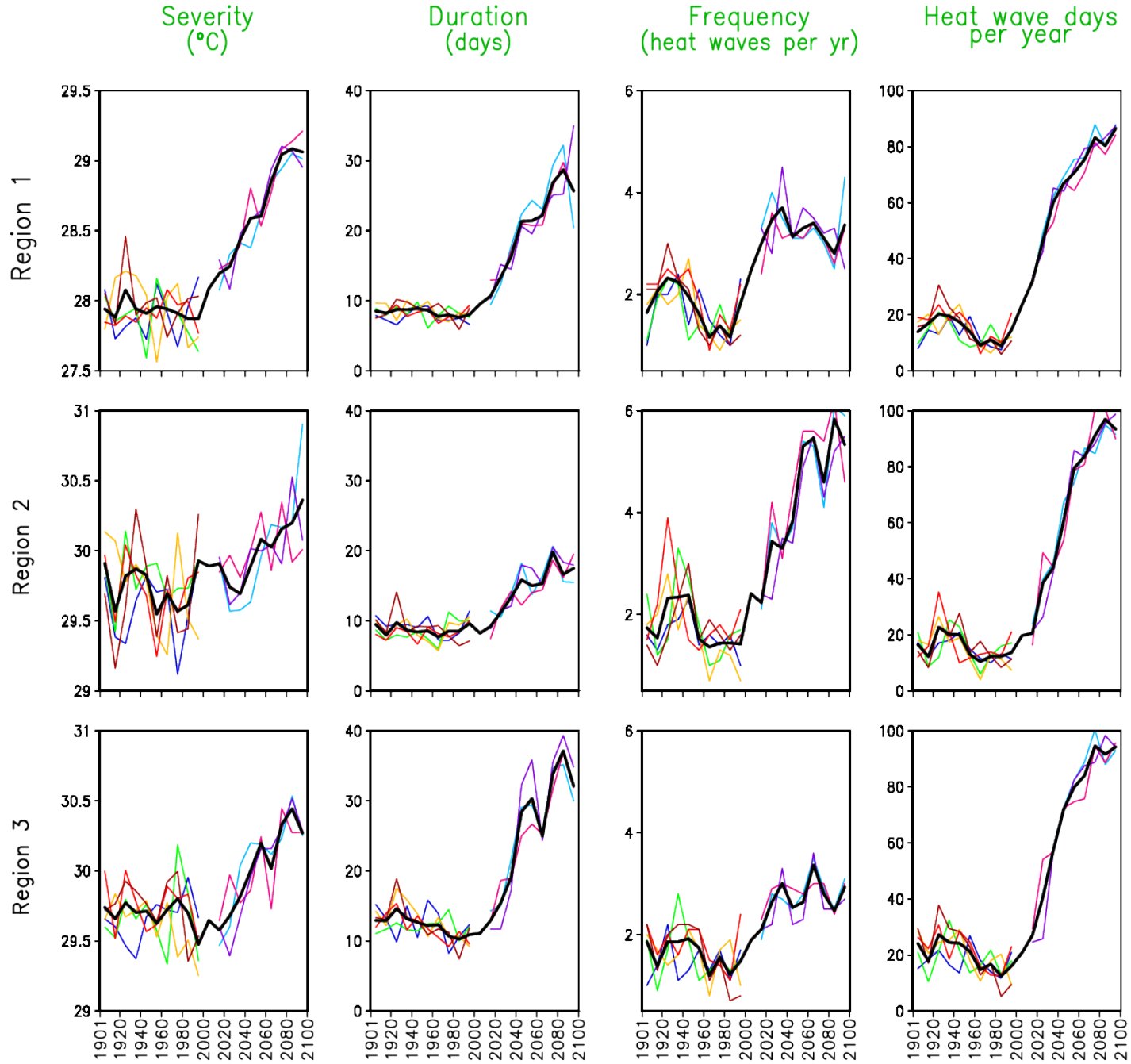




# Changes of mean HI for urban and rural



# CM3



# Thank You



香港中文大學  
The Chinese University of Hong Kong



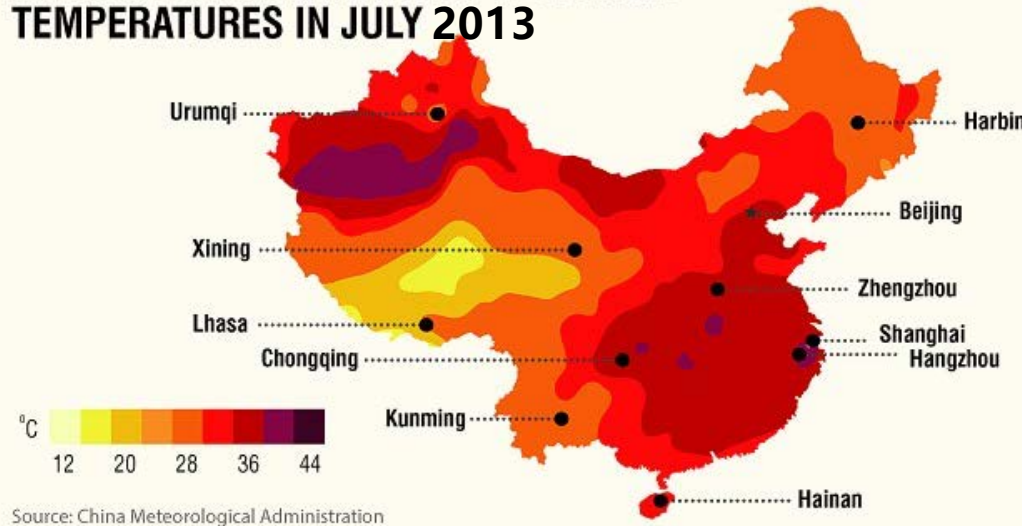
香港中文大學環境、  
能源及可持續發展研究所  
Institute of Environment,  
Energy and Sustainability, CUHK

- **2013 heat wave in China: > 5000 heat-related cases** (Gu et al., 2015)

maximum temperature: 44.1 °C in Xinchang, Zhejiang

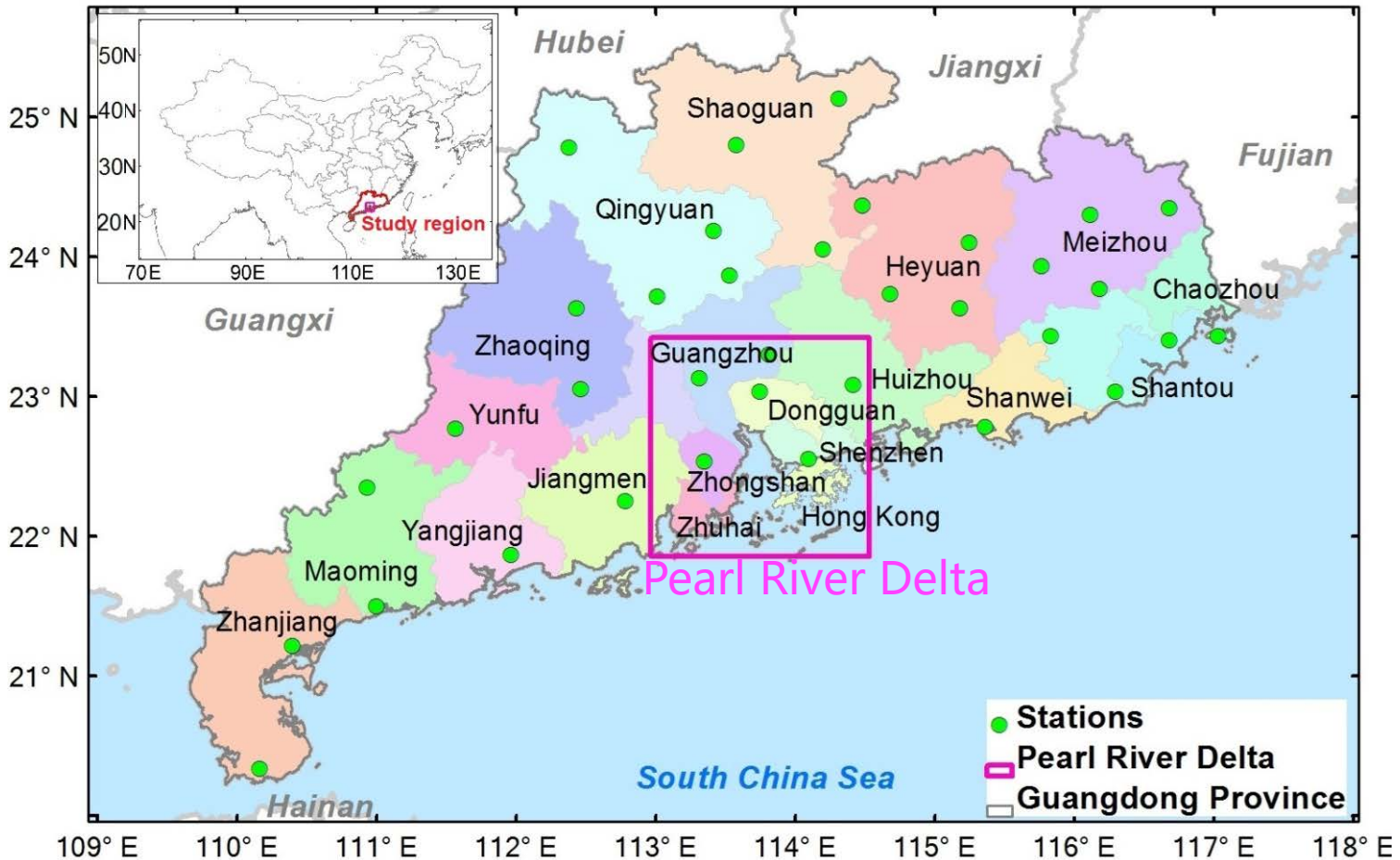
Hangzhou: >40°C for consecutive 8 days

### MAINLAND CHINA: HIGHEST-RECORDED TEMPERATURES IN JULY 2013



Suining, Sichuan, 2013

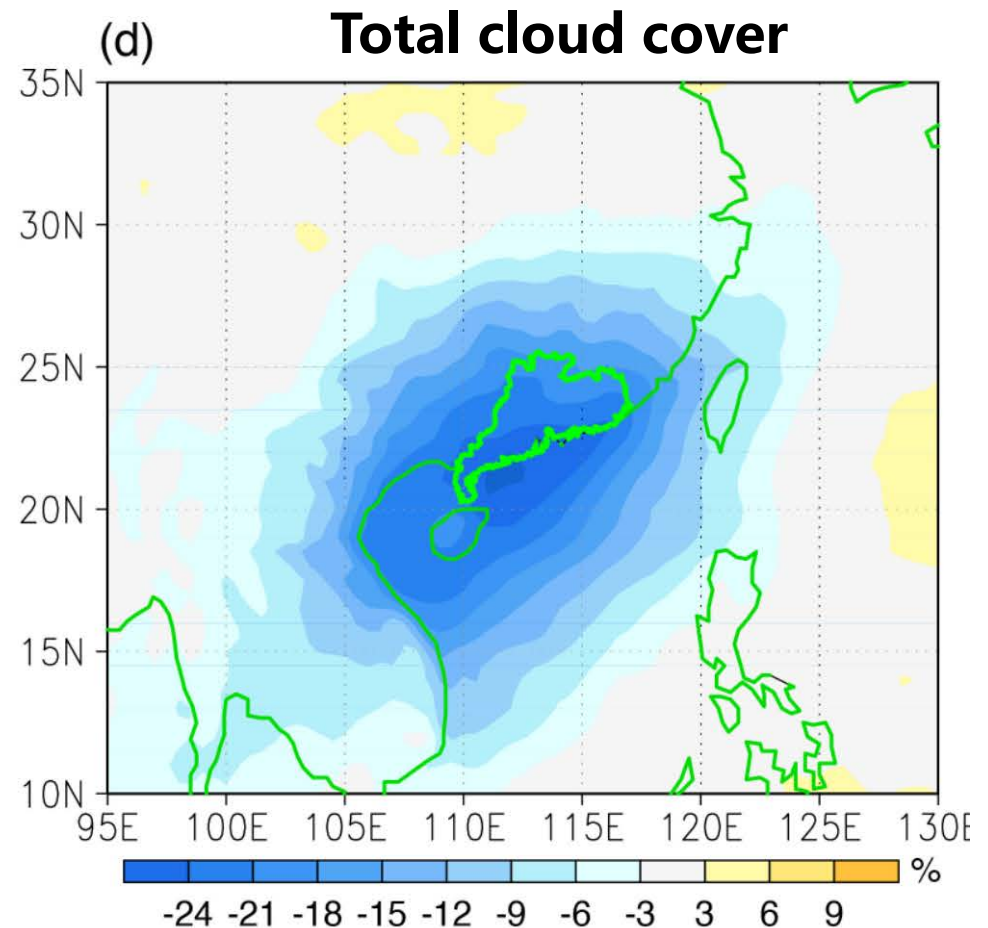
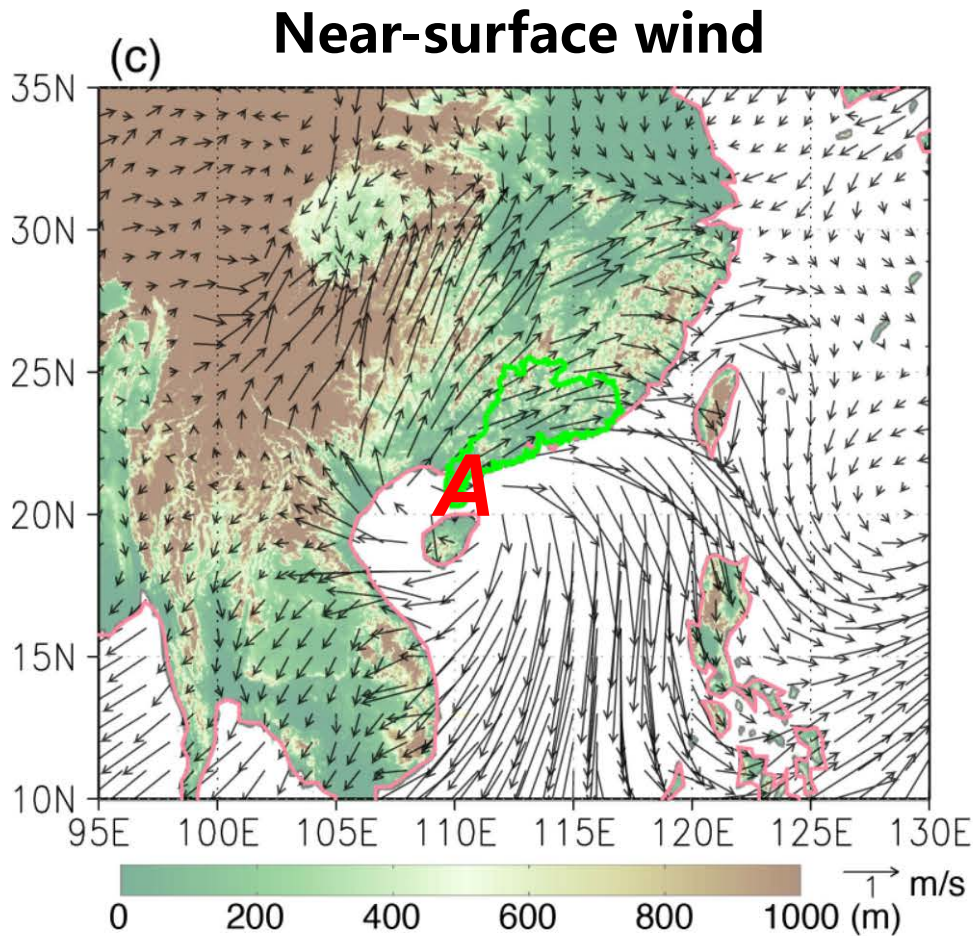
# Study region

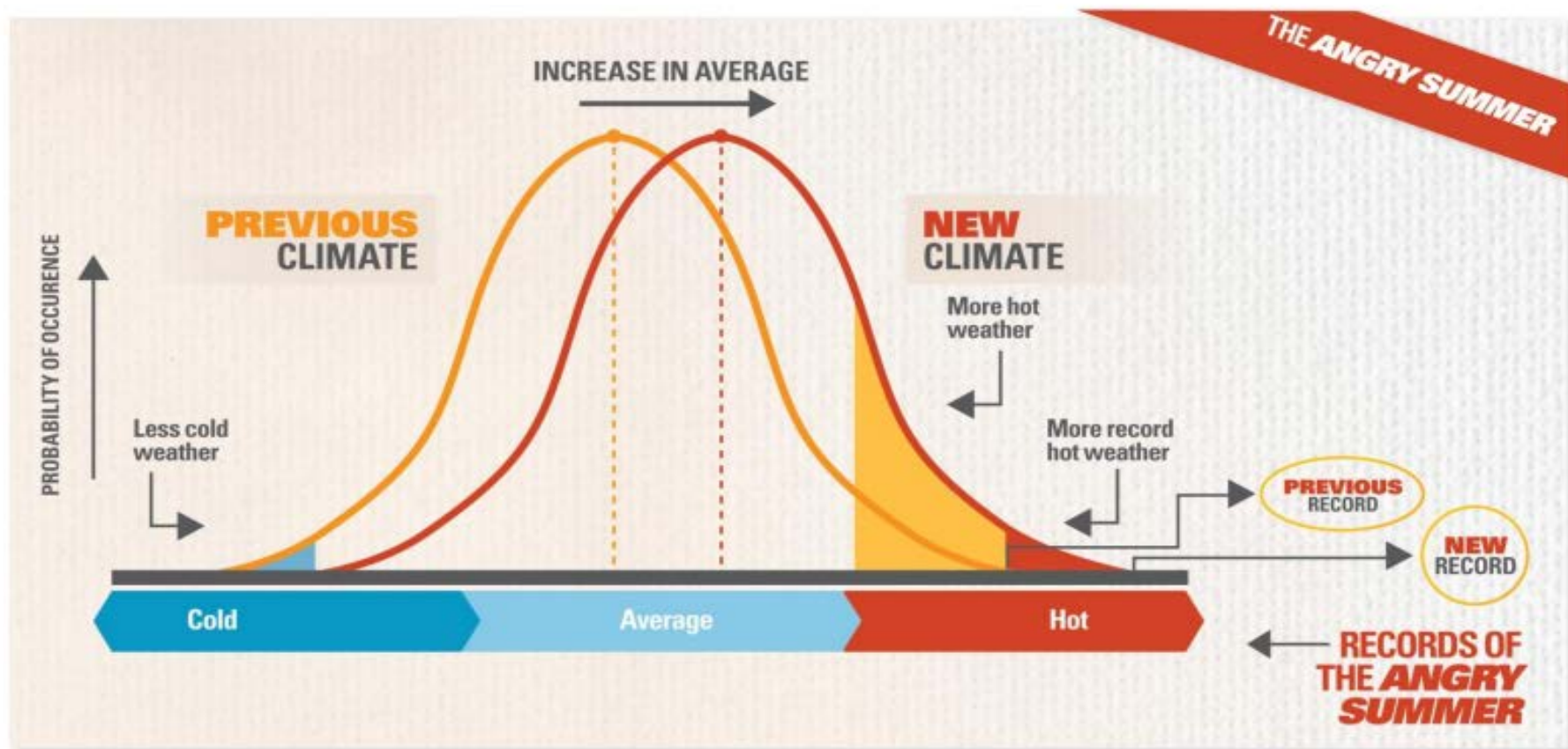


Population: 116 millions (Pop. density in PRD: 1190 per km<sup>2</sup>)



# Synoptic behavior and atmospheric controls





SOURCE: Modified from: Intergovernmental Panel on Climate Change (IPCC), (2007). Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K., Tignor, M.M.B., Miller, H.L. Jr and Chen, Z. (eds). Cambridge, UK and New York, NY, USA: Cambridge University Press.

PDF

