

Relationship between Urbanization and Climate Change in South China

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Outline

- **Background**
- **Objectives, long-term goals and vision**
- **Research methodology**

Background

Hong Kong



Guangzhou



Urban Area vs. Farmland

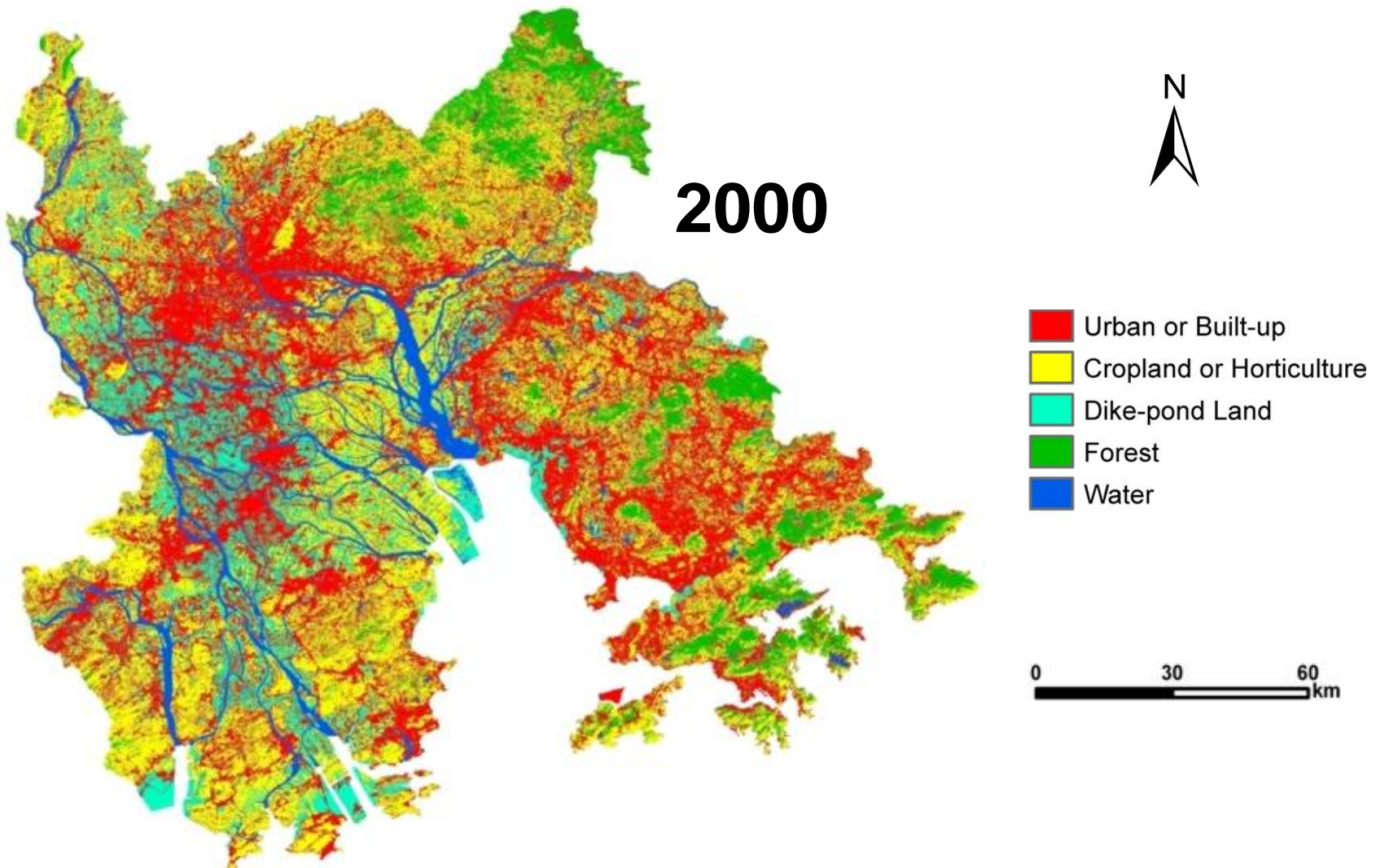
Shenzhen



Farmland in Guangdong

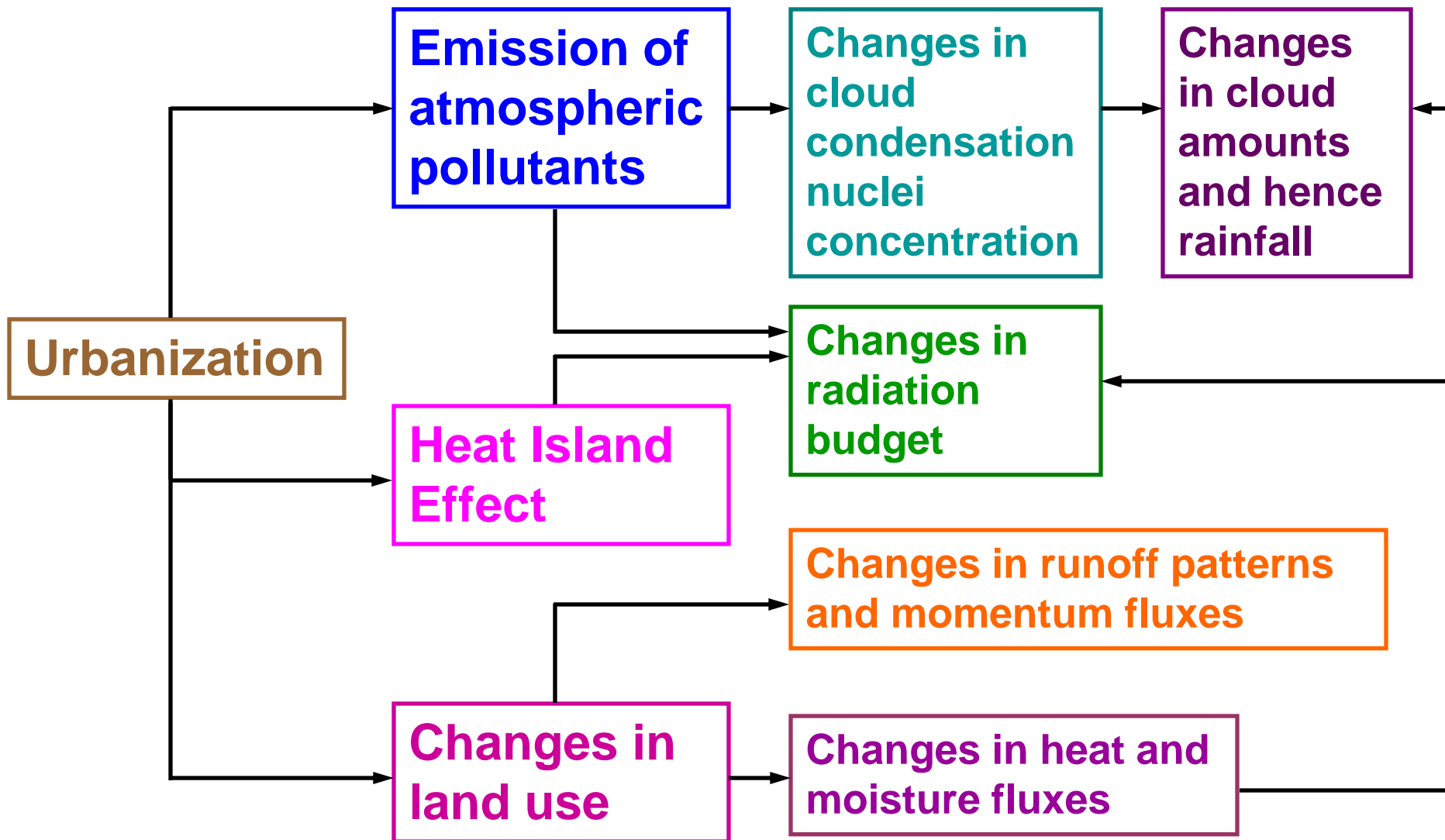


Urban or Built-up Area in the Pearl River Delta

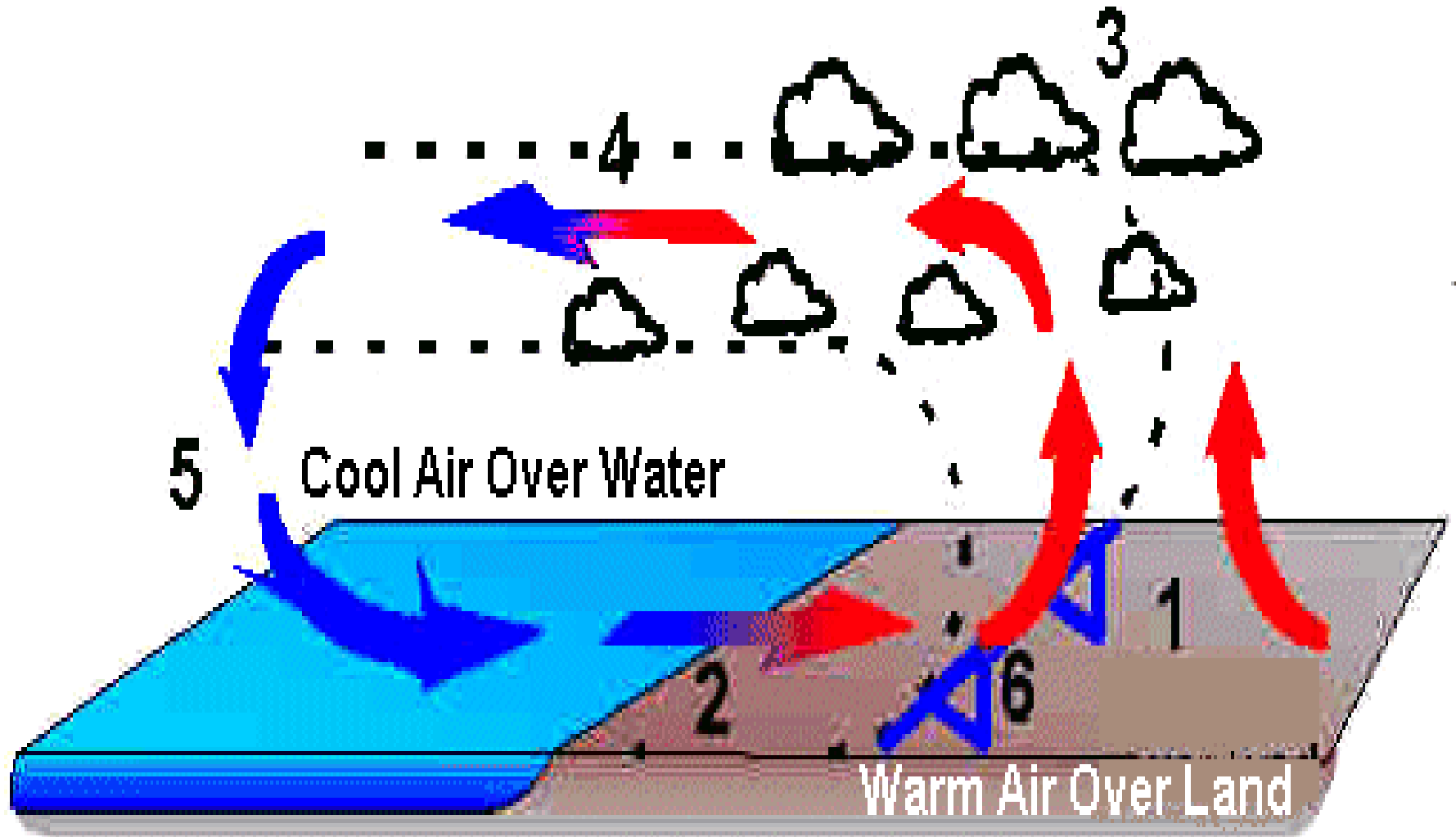


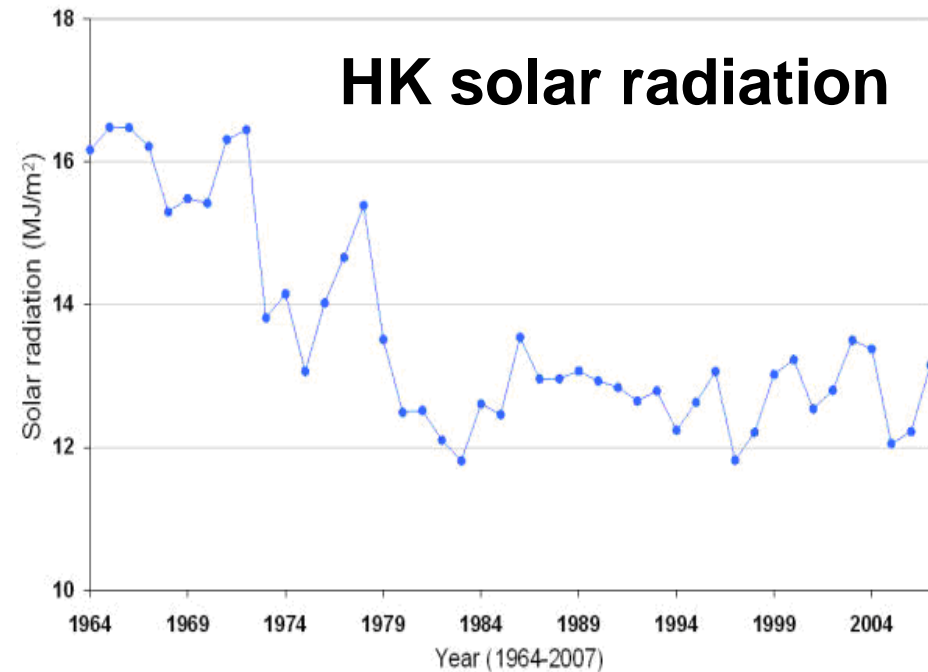
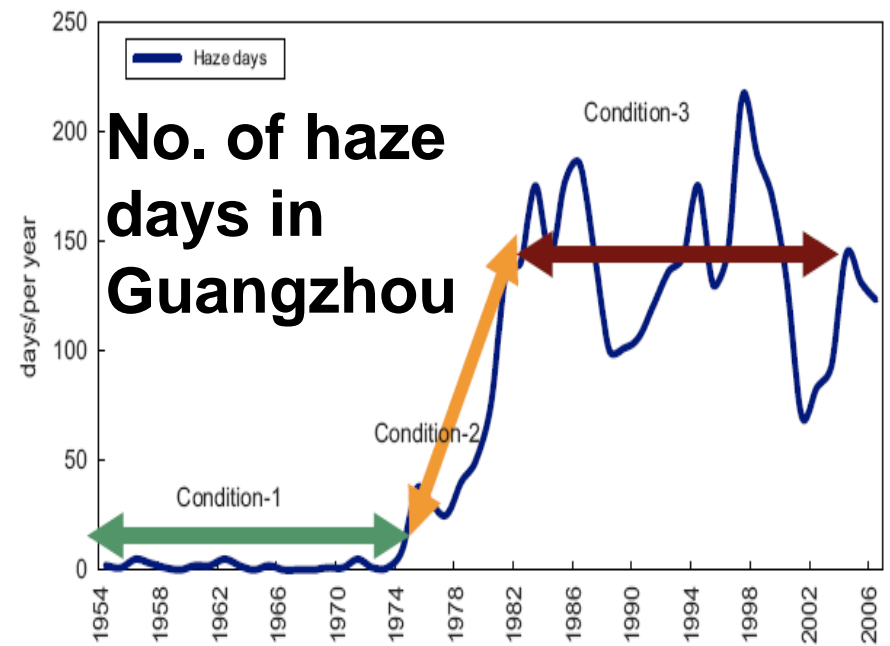
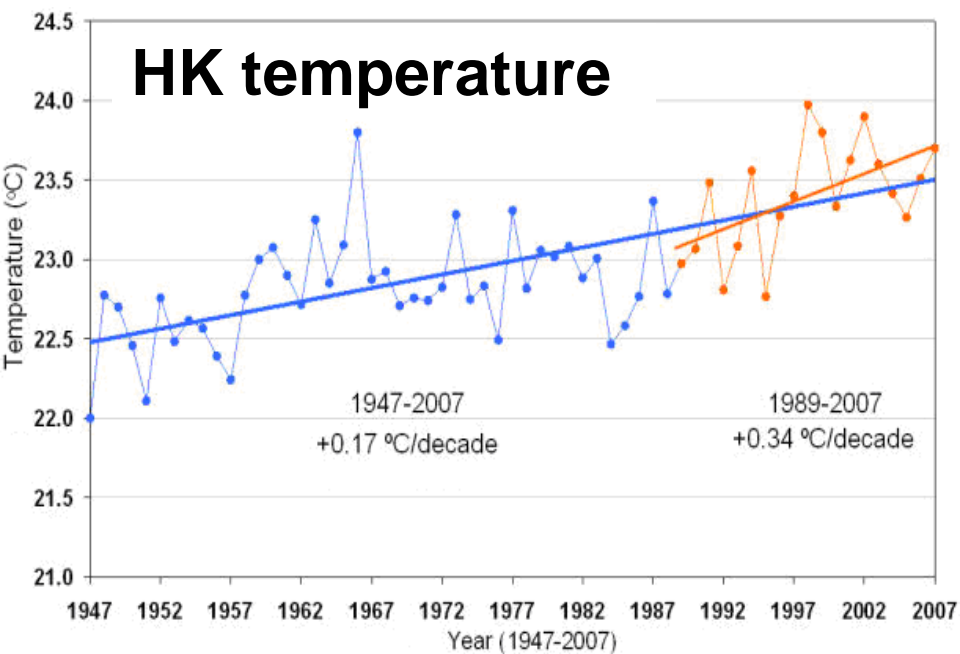
Year :	1980	→	1990	→	2000
Urban or Built-up (km ²) :	2230	→	3950	→	6570

Effects of Urbanization on Climate



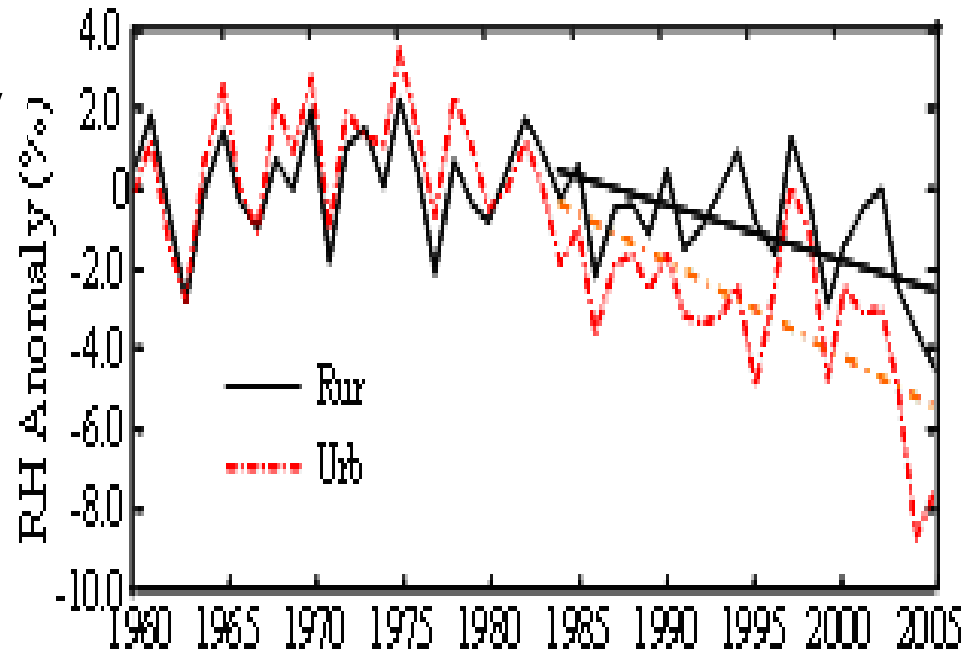
Land-sea Breeze Circulation



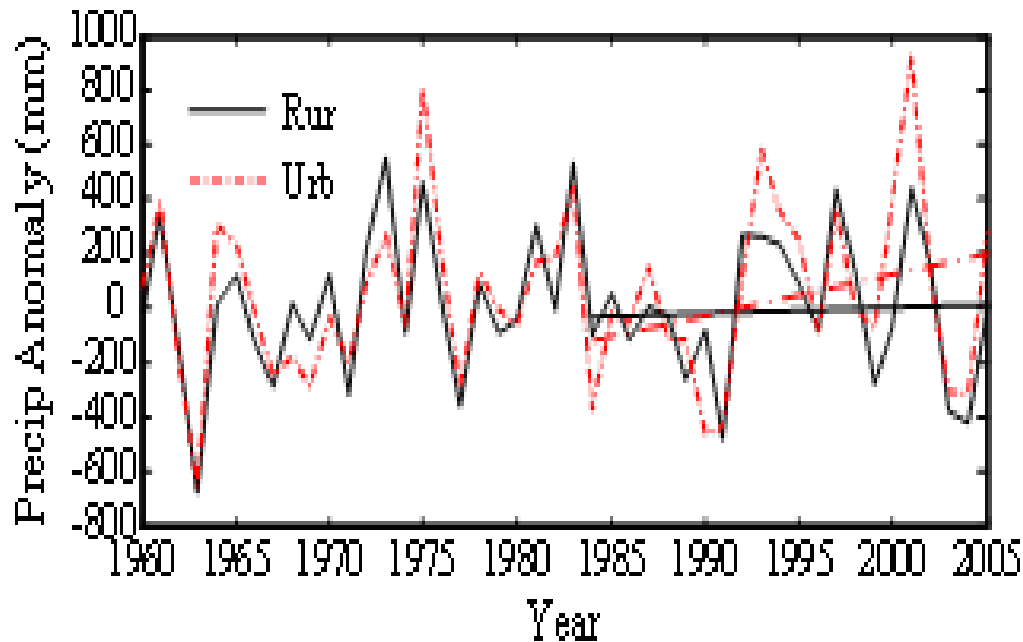


**Climate Change
in the PRD
(related to
radiation)**

PRD relative humidity



PRD rainfall



**Climate Change
and Urbanization
in the PRD
(related to water)**

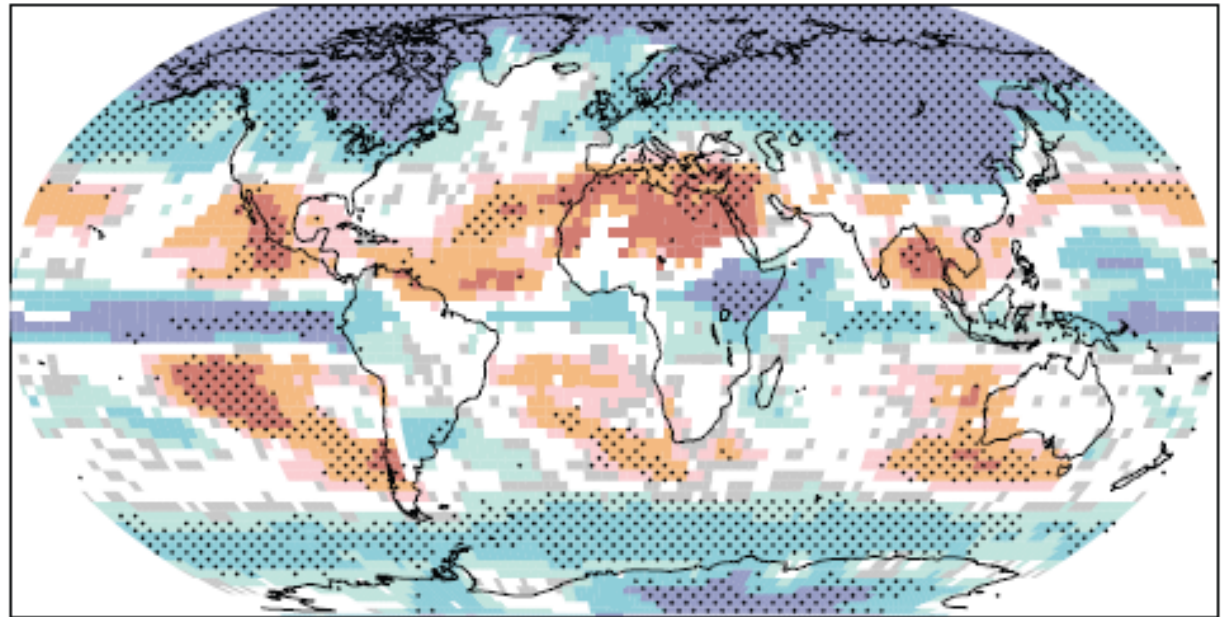
Projected Patterns of Precipitation Changes

multi-model

A1B

winter

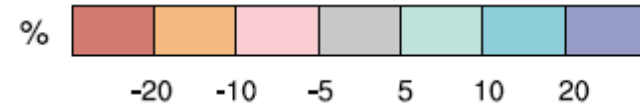
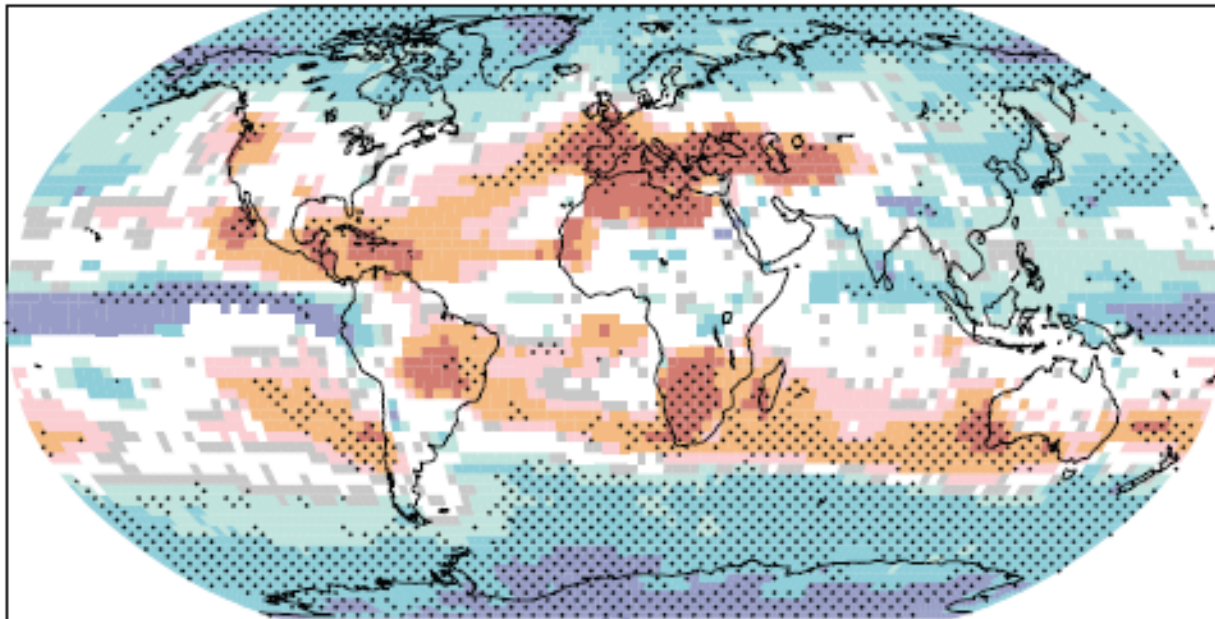
DJF



multi-model

A1B summer

JJA



Objectives, Long-term Goals and Vision

Objectives

- **To understand the effects of urbanization and their relative contributions on the observed climate change in the Pearl River Delta region**
- **To estimate what might be expected in the future given current projections of changes in urbanization**

Long-term Goals

Science

Improved understanding of how urbanization has contributed towards the climate change of a region

Improved understanding of the effects of various components of urbanization, and thus how they might be better represented in the models

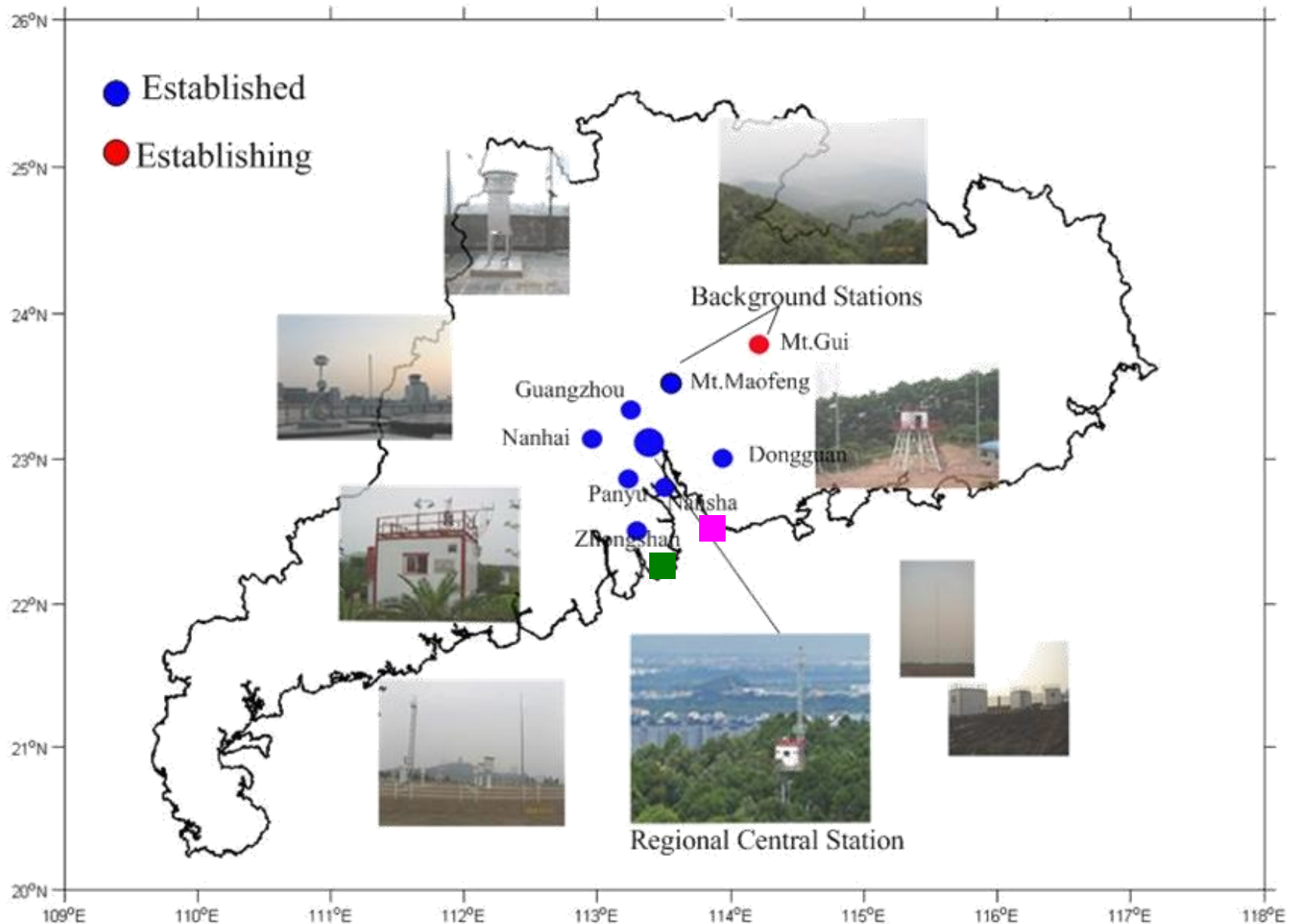
Applications

To provide useful information for government planners as to how they can achieve a balance between economic development in terms of urbanization and changes in the climate

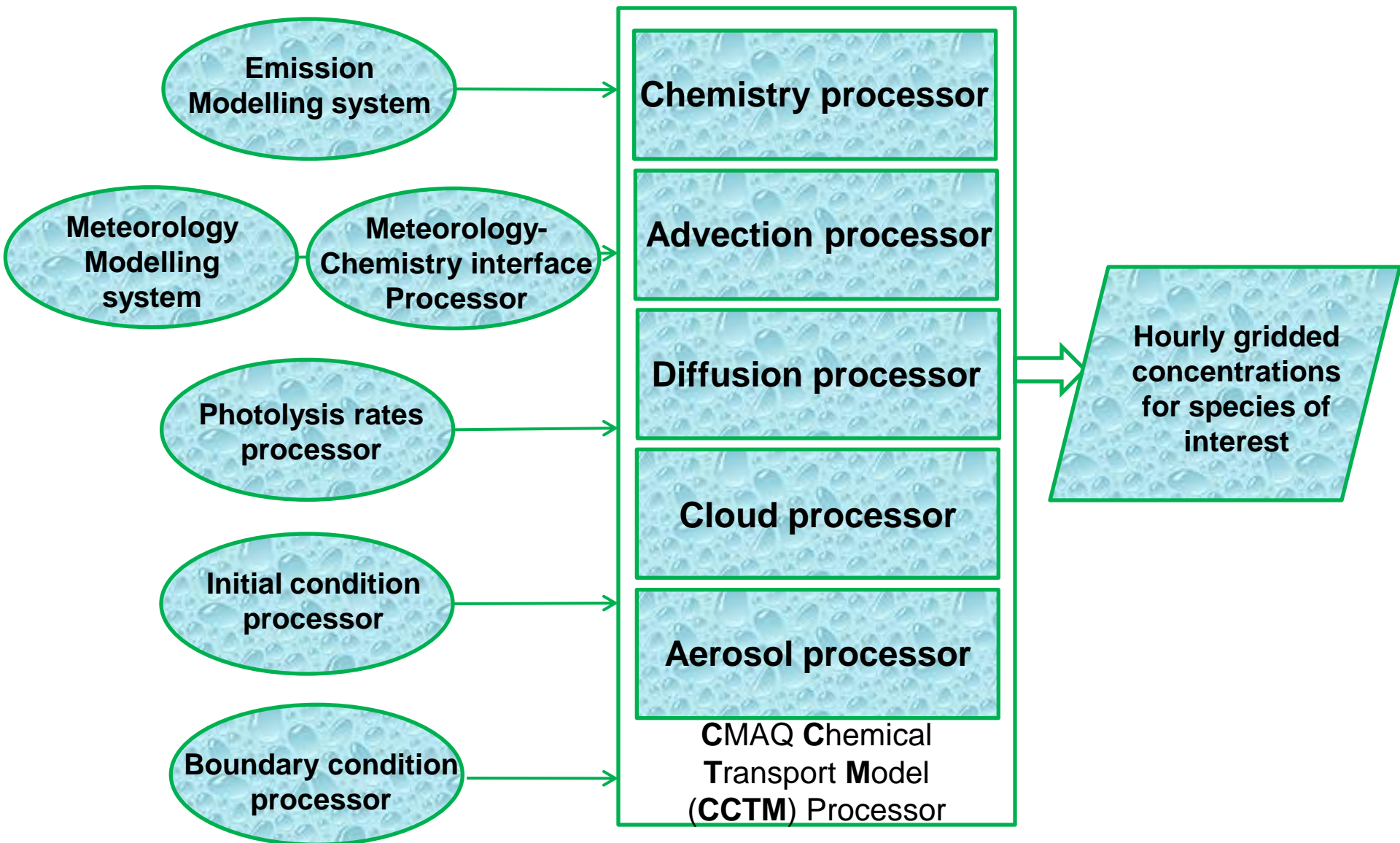
To estimate consequences of local climate change if current developments are to continue so that adaptation strategies could be developed

***Research
Methodology***

Observational Stations in PRD

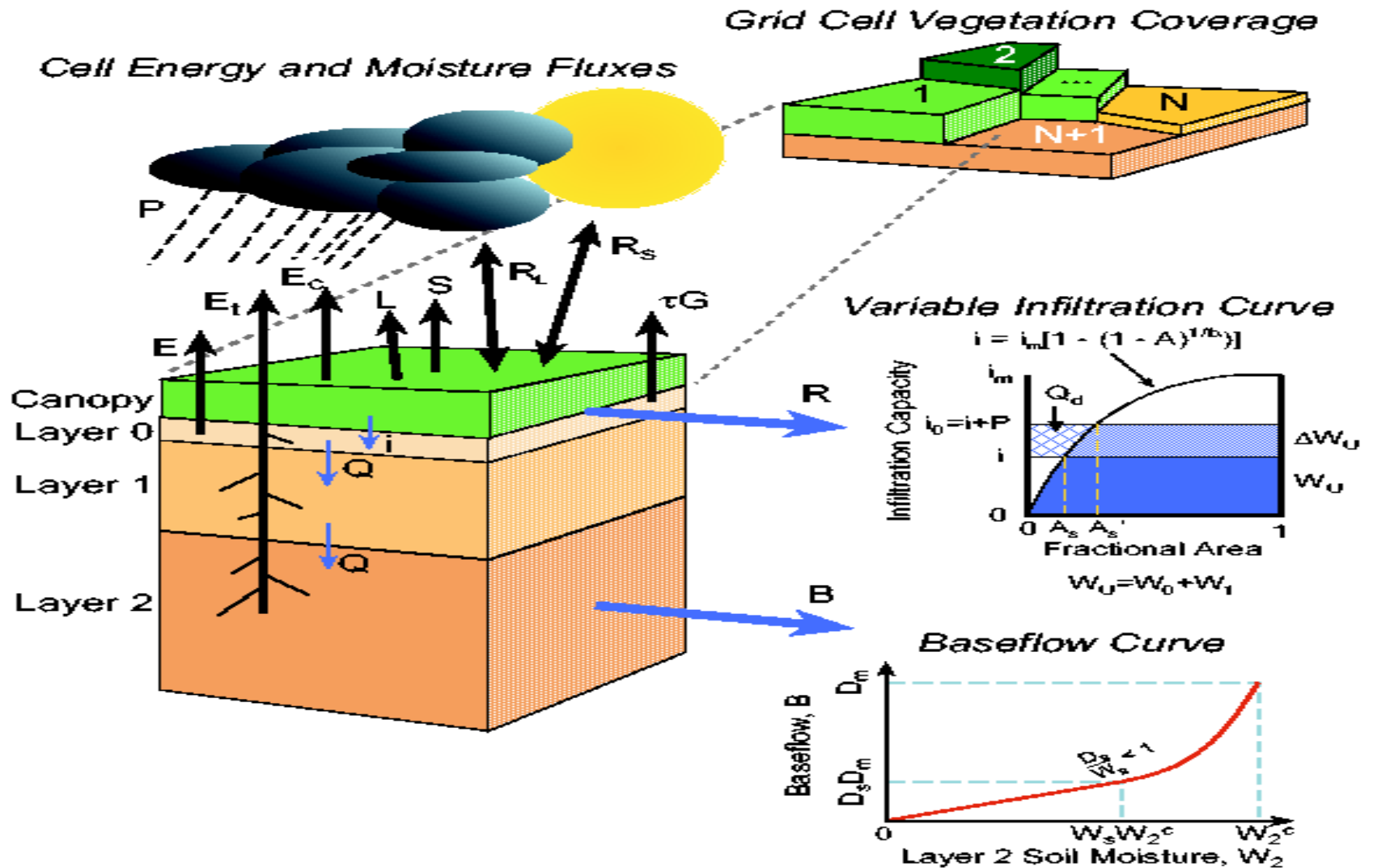


Chemical Transport Model (Models-3/CMAQ model)



Land Surface Model

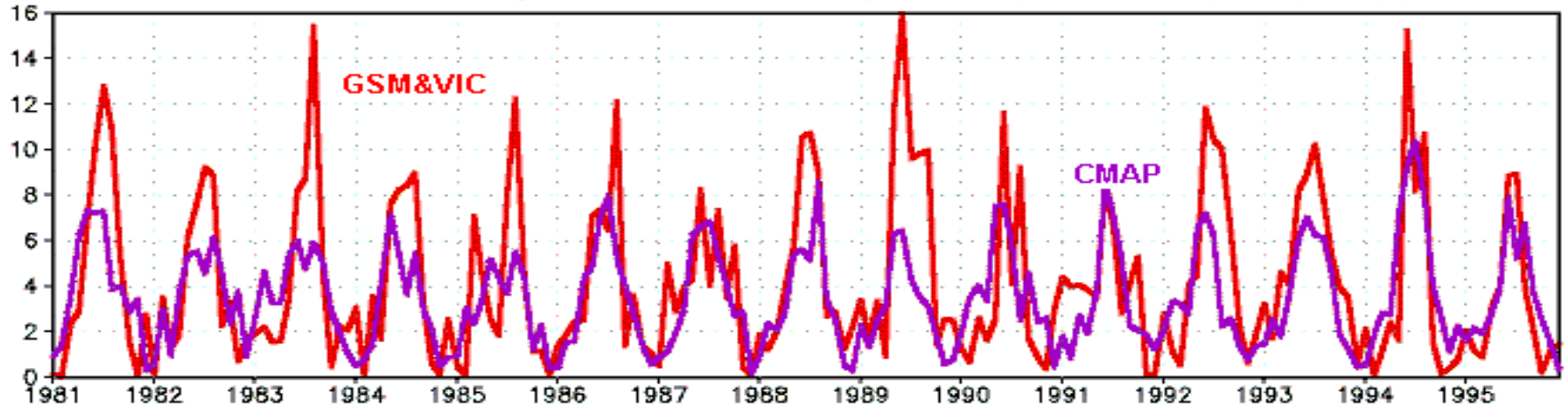
Variable Infiltration Capacity (VIC) Macroscale Hydrologic Model



Land Surface Model (LSM)

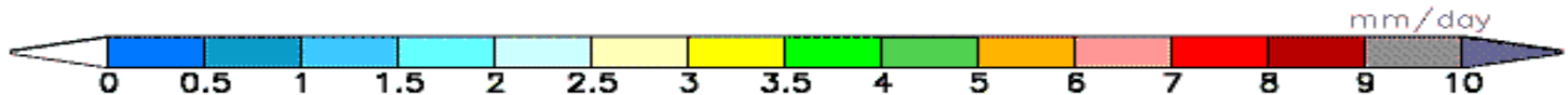
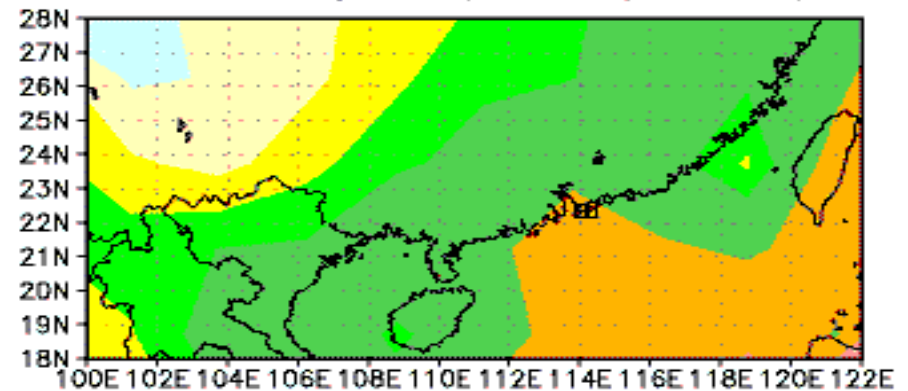
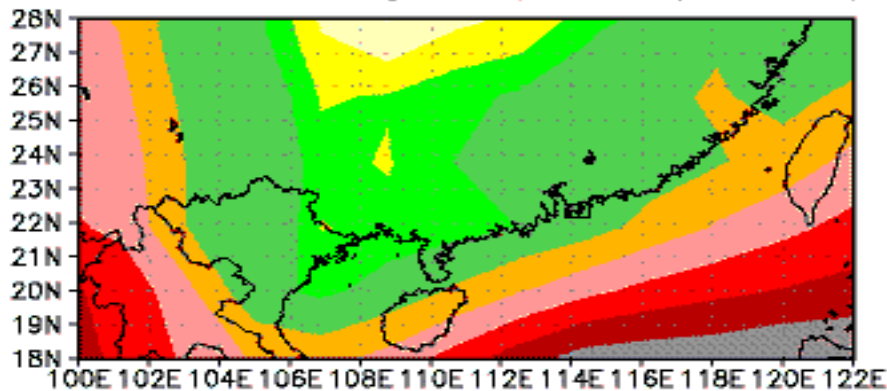
Rainfall simulation over South China by coupling the LSM and a global climate model (GSM)

Pearl River Drainage Basin: Monthly Precipitation (mm/day)



GSM&VIC Monthly Precipitation (1981-95)

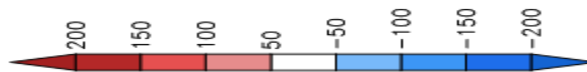
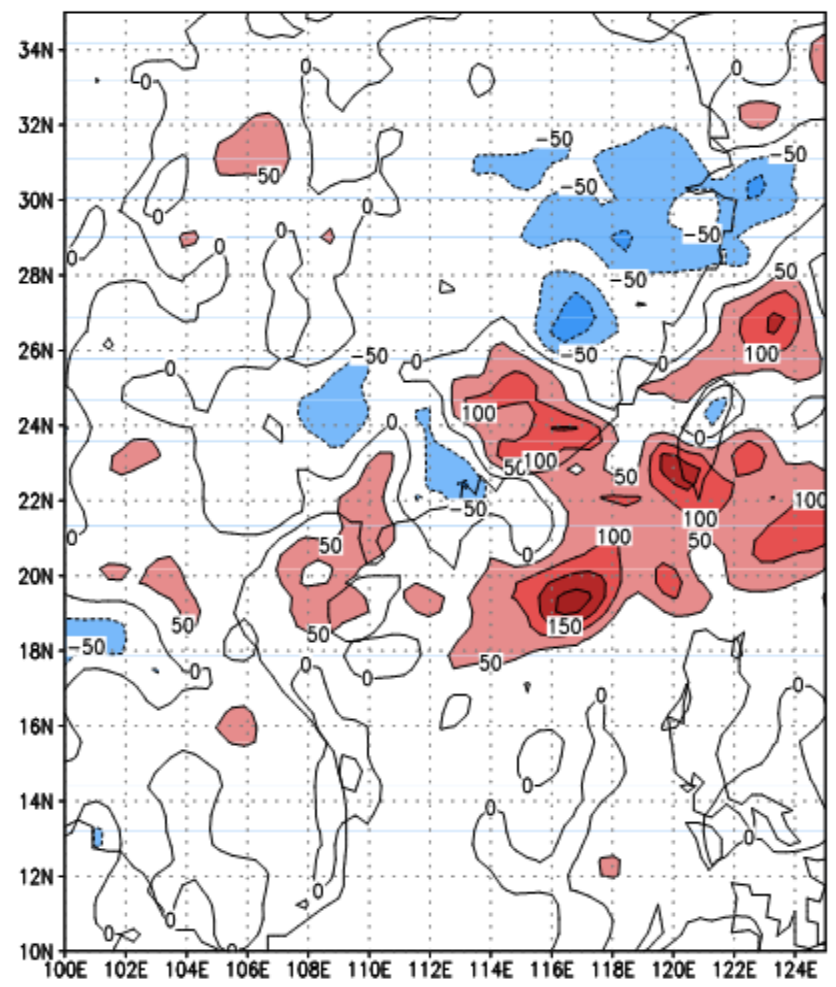
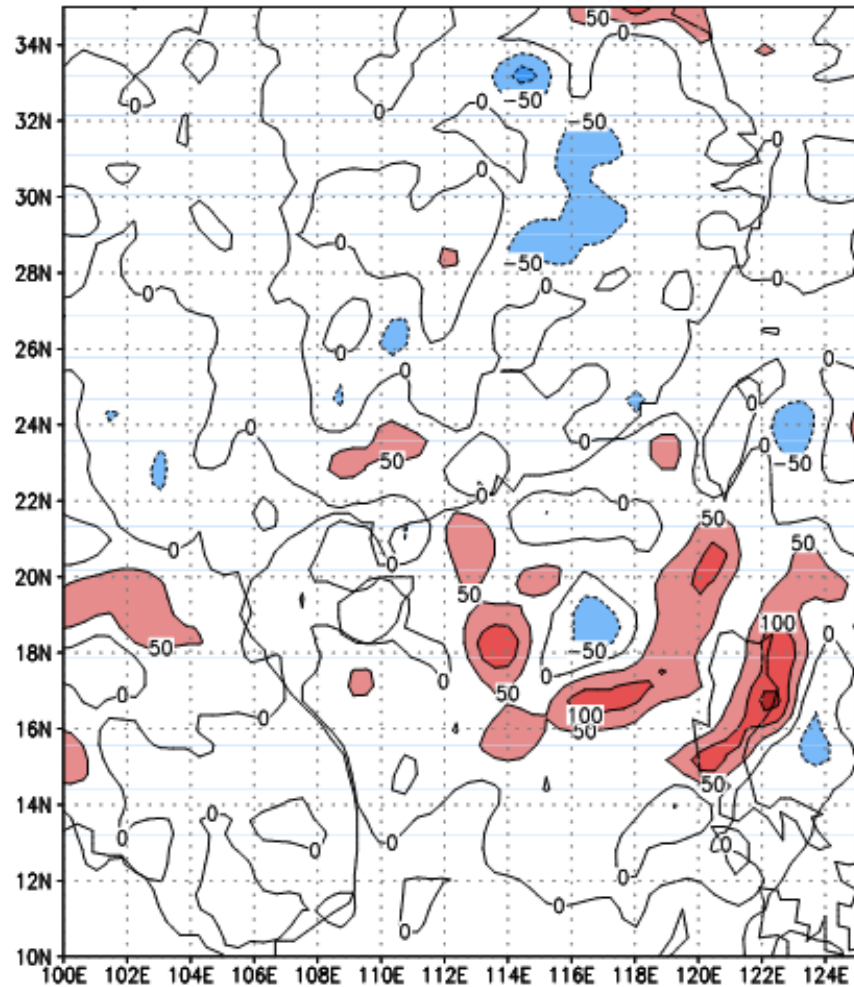
CMAP Monthly Precipitation (1981-95)



Preliminary Results of Model Simulations of the Effect of Urbanization

Effect of increasing the roughness of the Earth's surface on rainfall

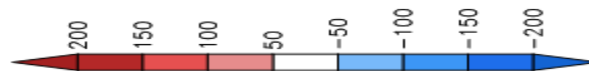
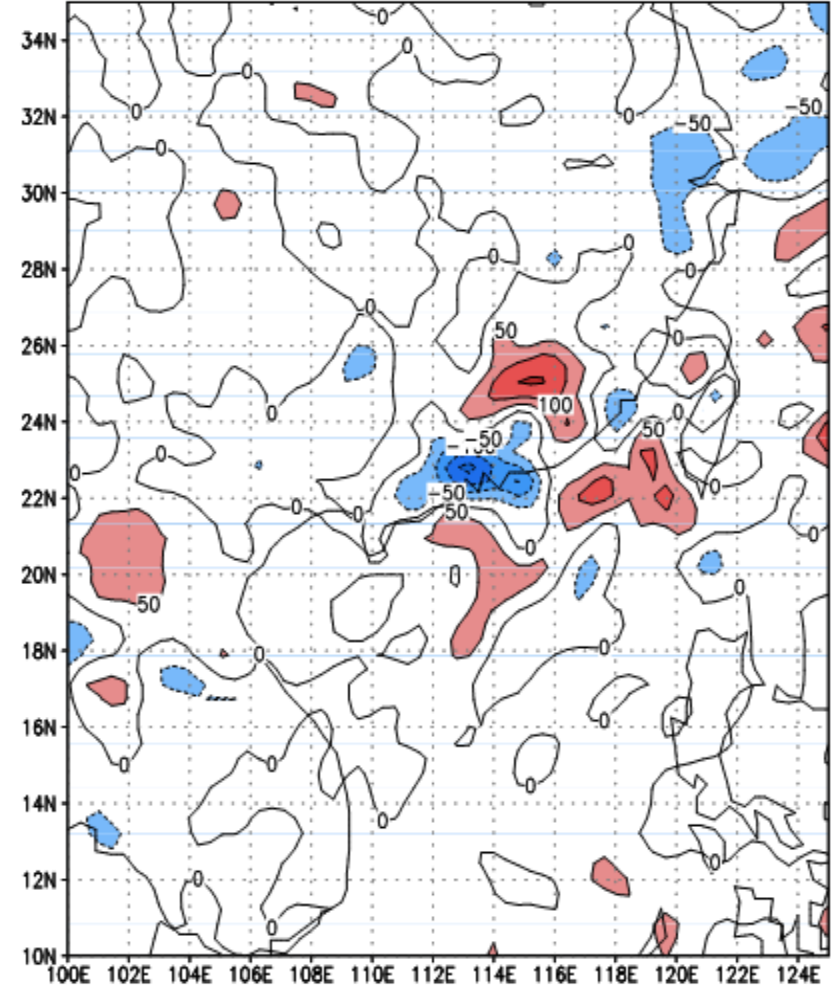
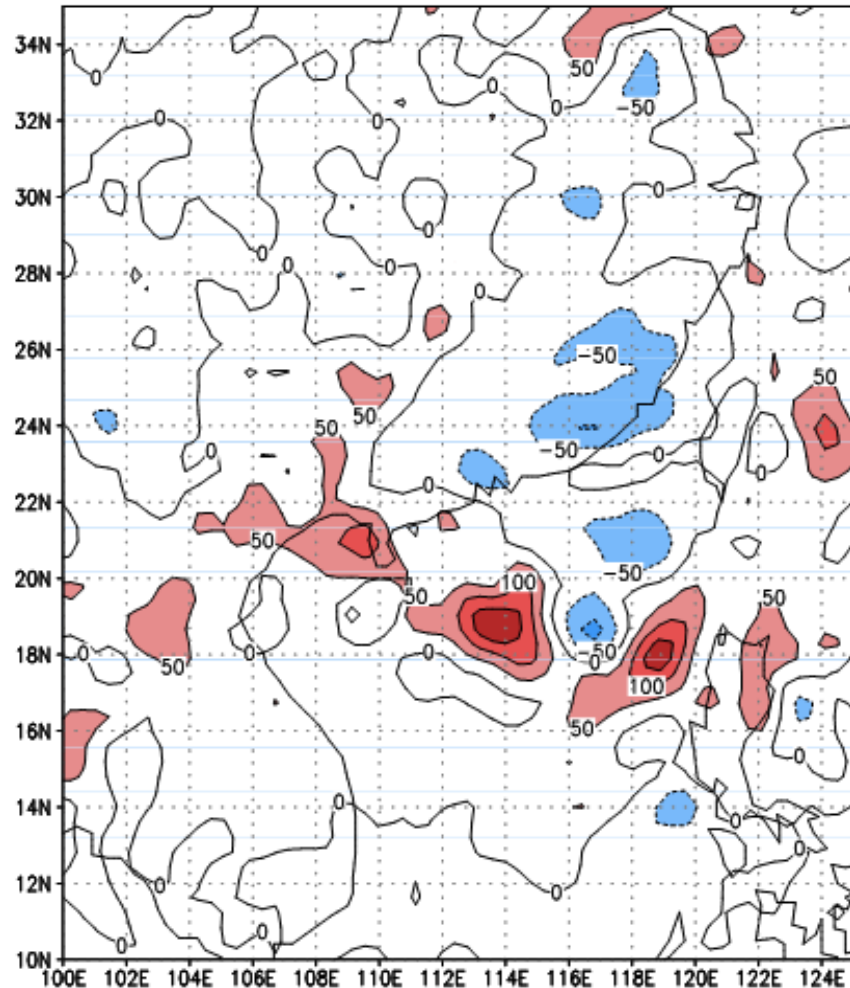
Total Diff in May 1998 (mm) (Rough-Ctrl) Total Diff in June 1998 (mm) (Rough-Ctrl)



Preliminary Results of Model Simulations of the Effect of Urbanization

Effect of turning off the moisture flux on rainfall

Total Diff in May 1998 (mm) (Noqflx-Ctrl) Total Diff in June 1998 (mm) (Noqflx-Ctrl)



Thank You