

urban heat island under the influence of lake-breeze circulations



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Outline

- ◆ Research Background
- ◆ Model and Simulation Case
- ◆ Model Valadation
- ◆ Lake Breeze at Taihu Impact on UHI
- ◆ On-going work



Background

- The lake Taihu basin overlaps with one of the three city agglomeration regions in China and has high levels of industrial development and population density.
- The high concentration of cities is shown to generate strong urban heat island in Taihu Basin (Zhang et al. 2010 & 2011).



Model and simulation Case

- **WRFV3.3.1**
- **NCAR lake land surface model coupled into Noah land surface model**
- **Mellor-Yamada-Janjic TKE PBL scheme**
- **TEB+TEM Urban Canopy Model**
- **Initial and boundary data: CFSR (Climate Forecast System Reanalysis Data, 0.5x0.5 degree**
- **Validation – Meteorology station observation data**



Model and simulation Case

- **Weather Background**

UTC 2012.7.18.12----UTC 2012.7.20.00

controlled by high pressure, Clear and low wind speed

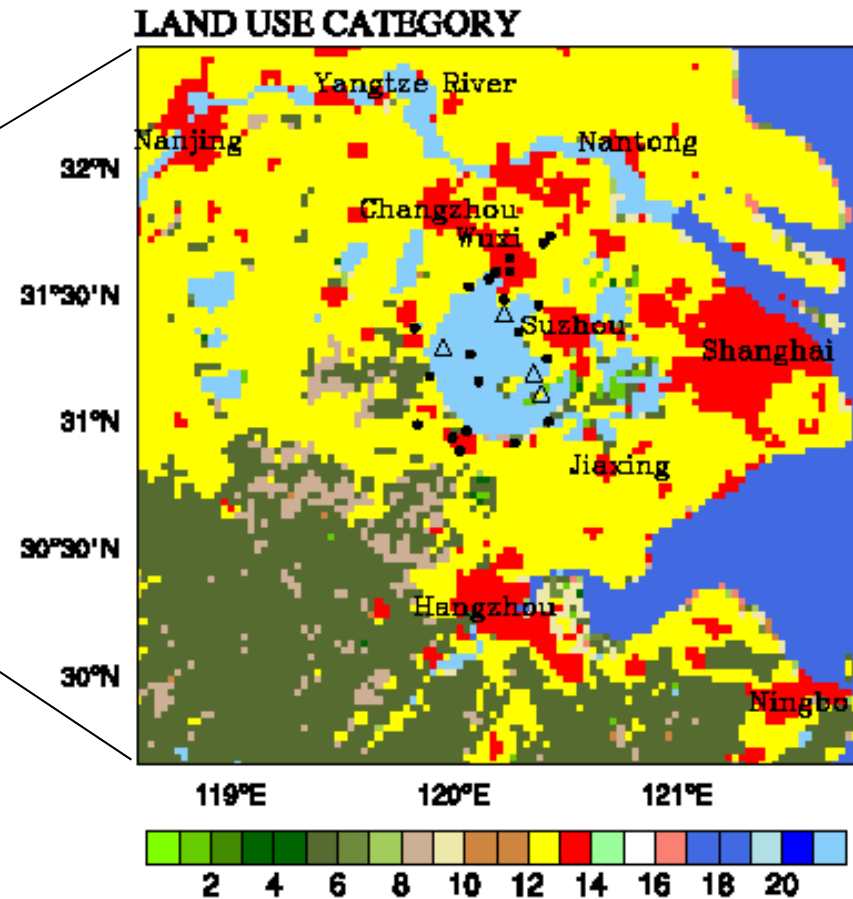
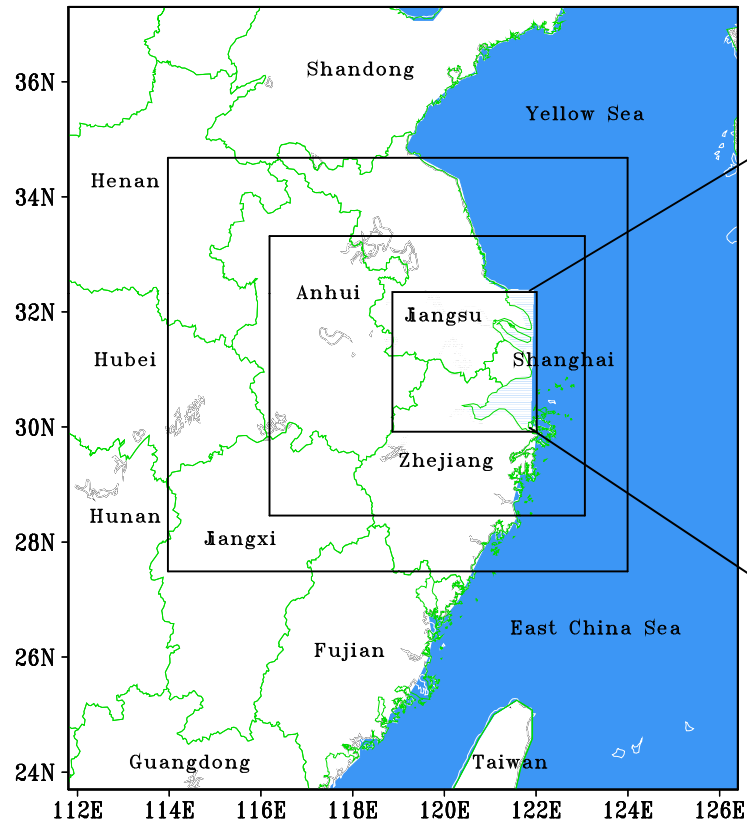
- **Case1: Deep Lake, simulated by WRF-Default**

Case2: Shallow Lake, simulated by WRF-Lake

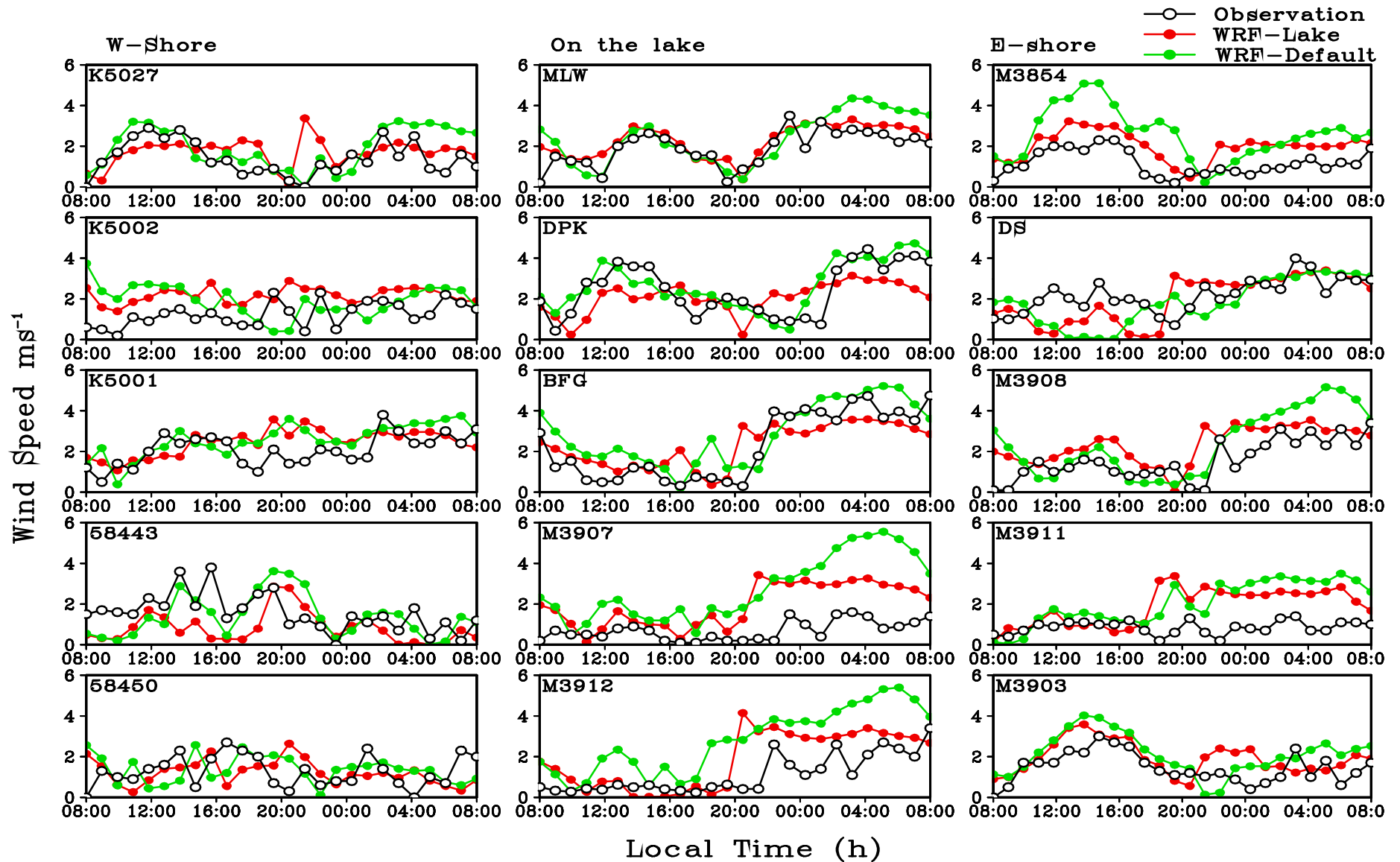
Case3: Without Lake landuse, simulated by WRF-Lake



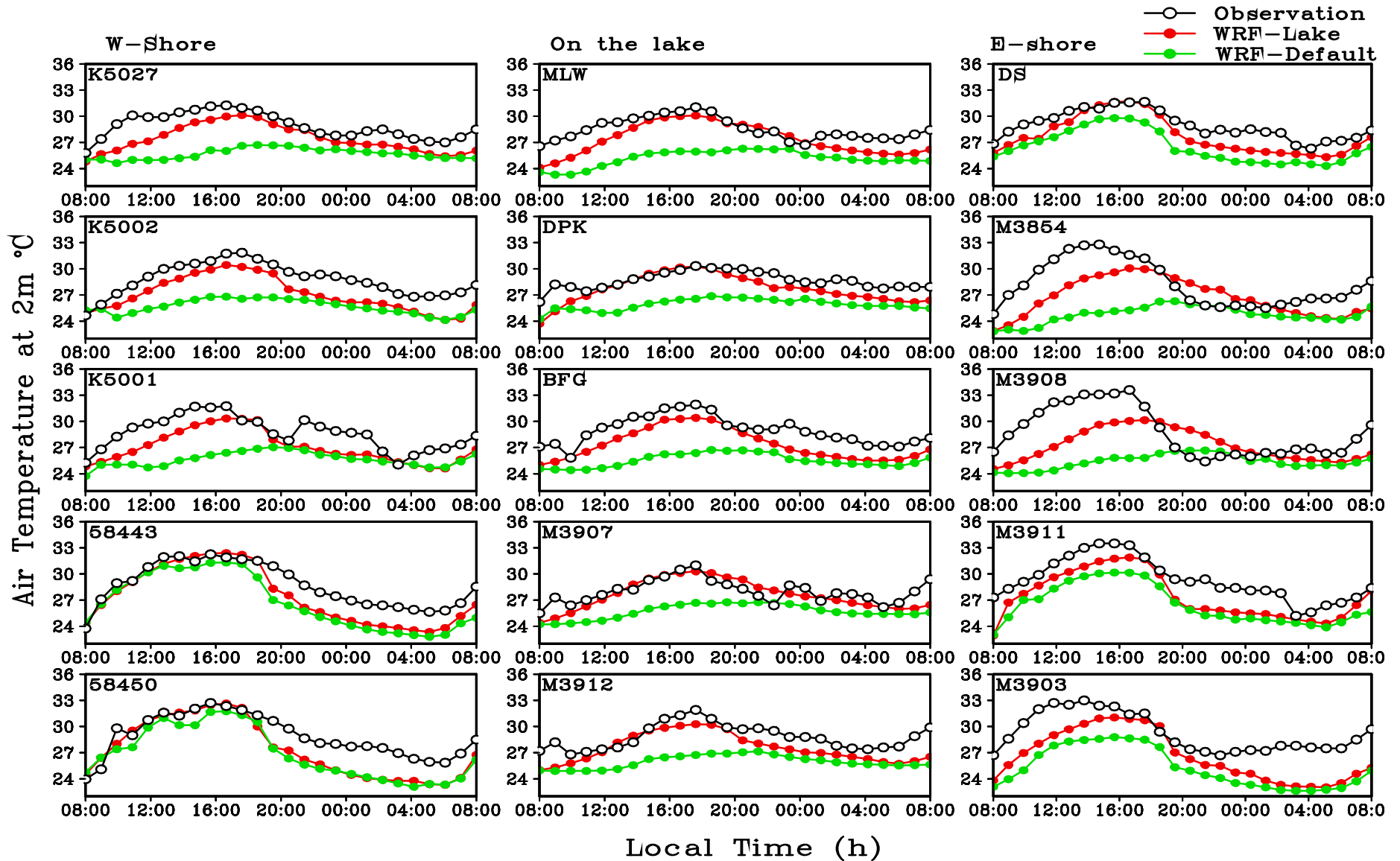
Simulation Domain

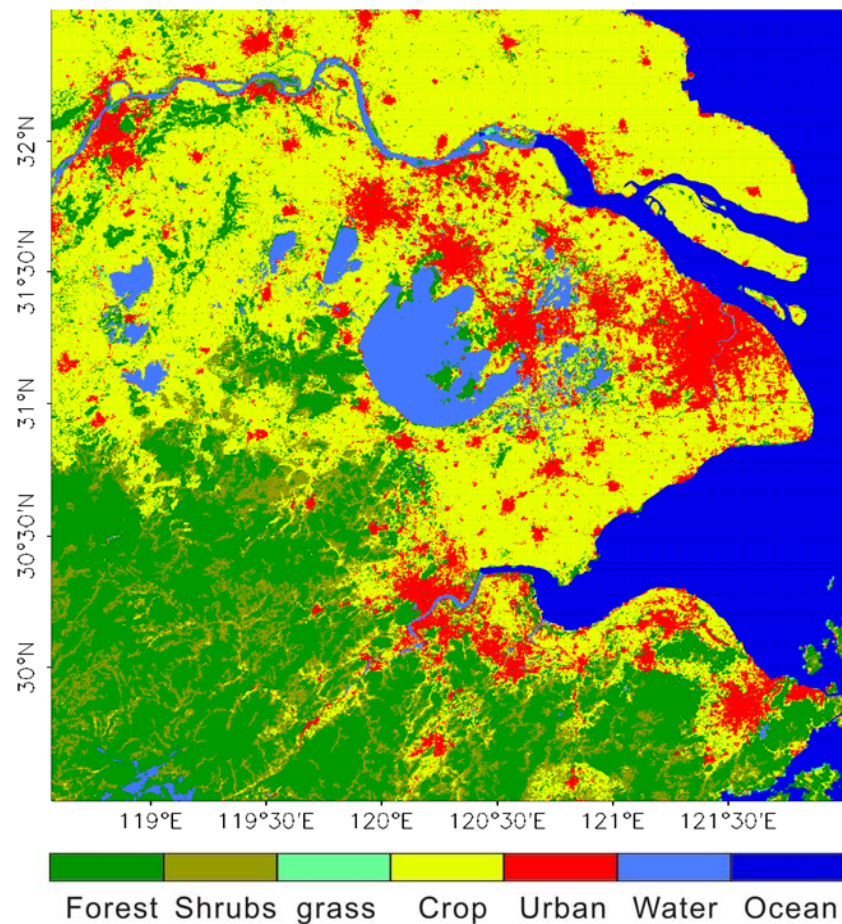


Model Validation

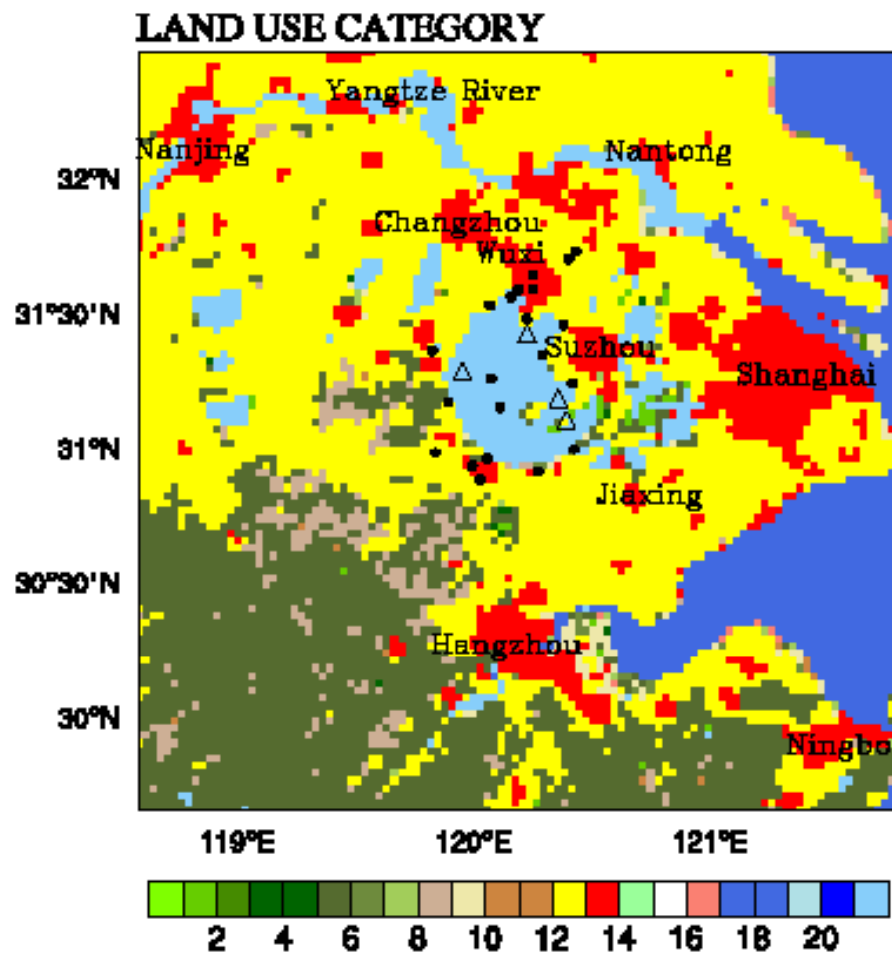


Model Validation





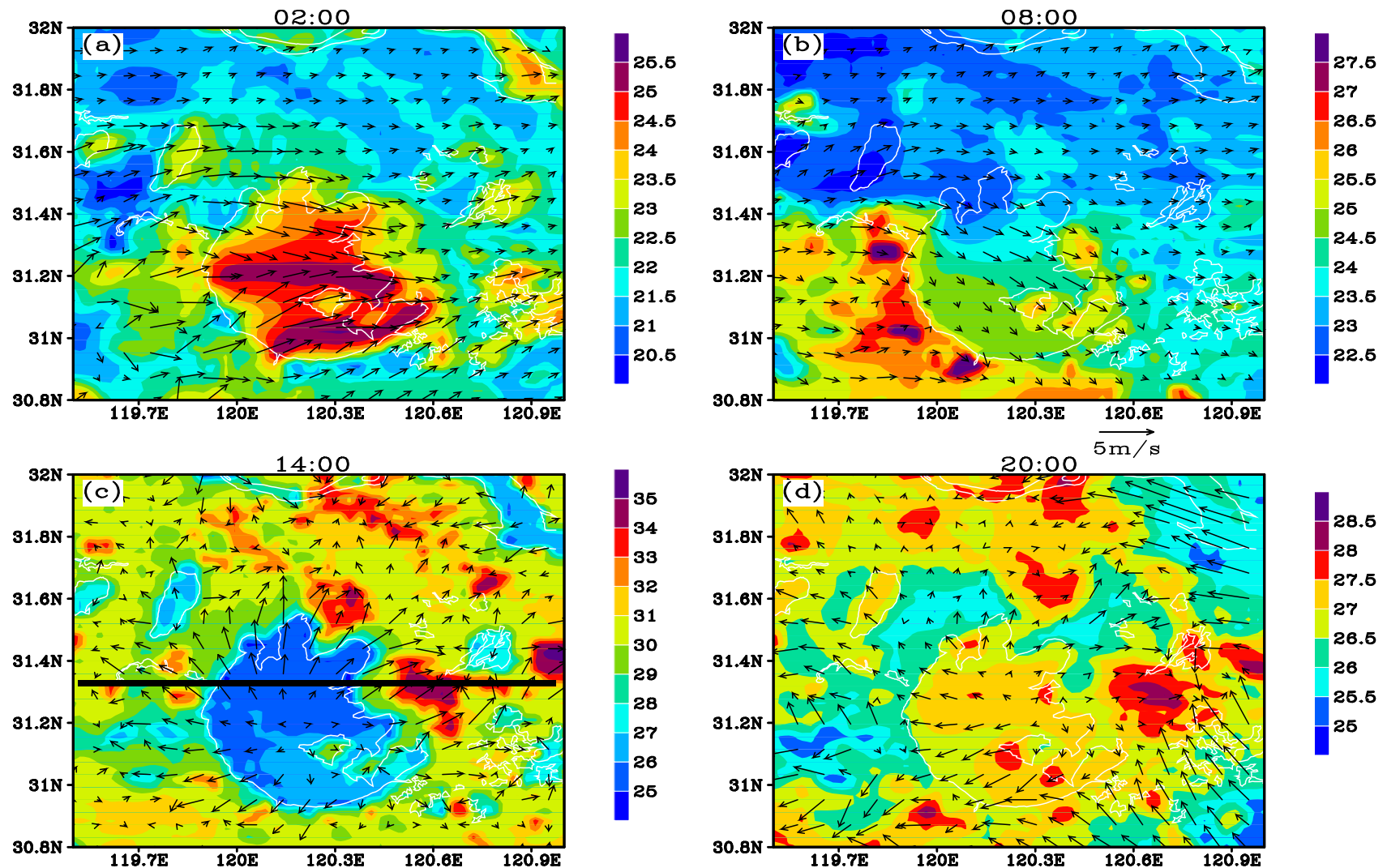
Modis 2012

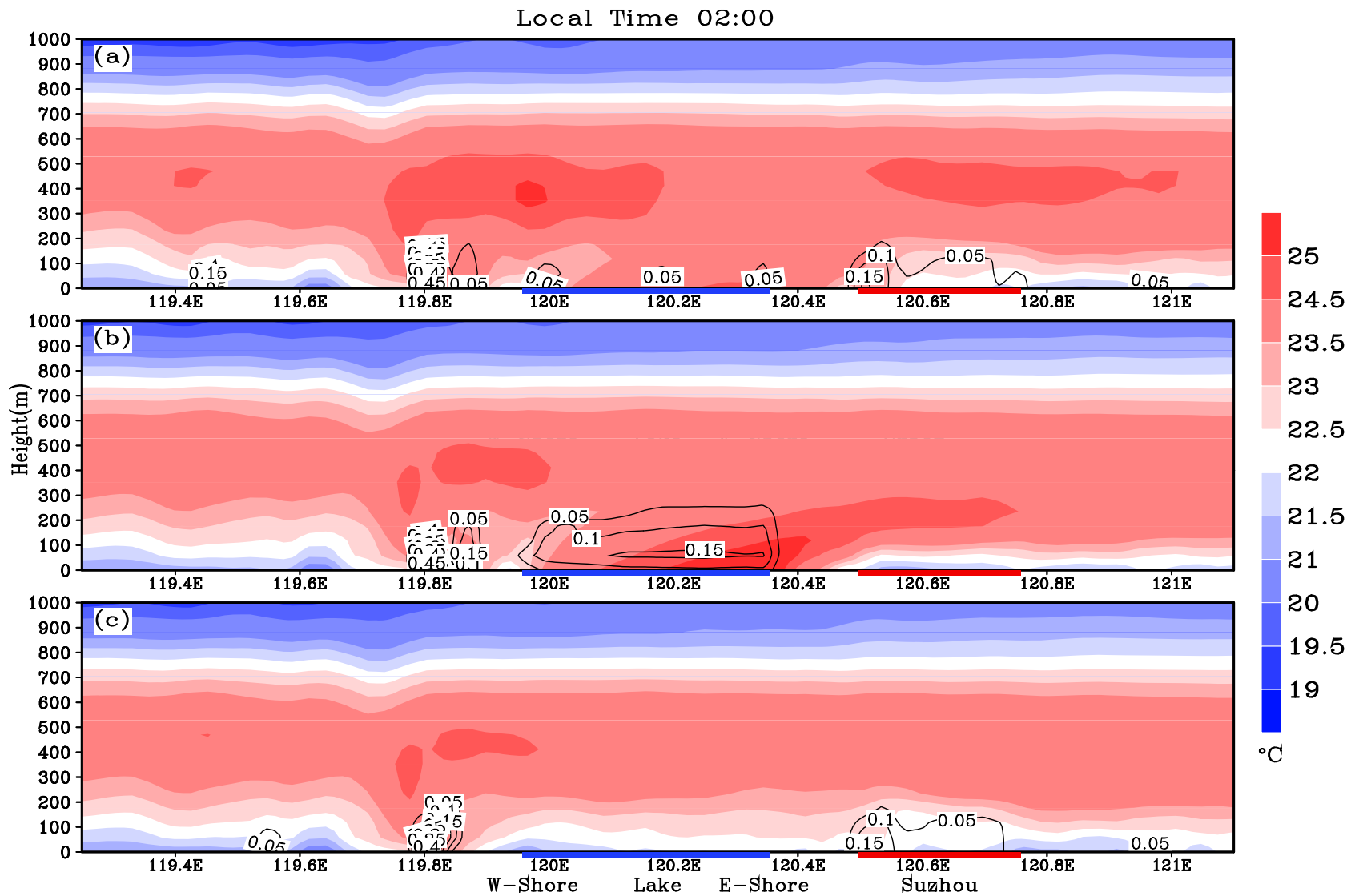


Modis 2005

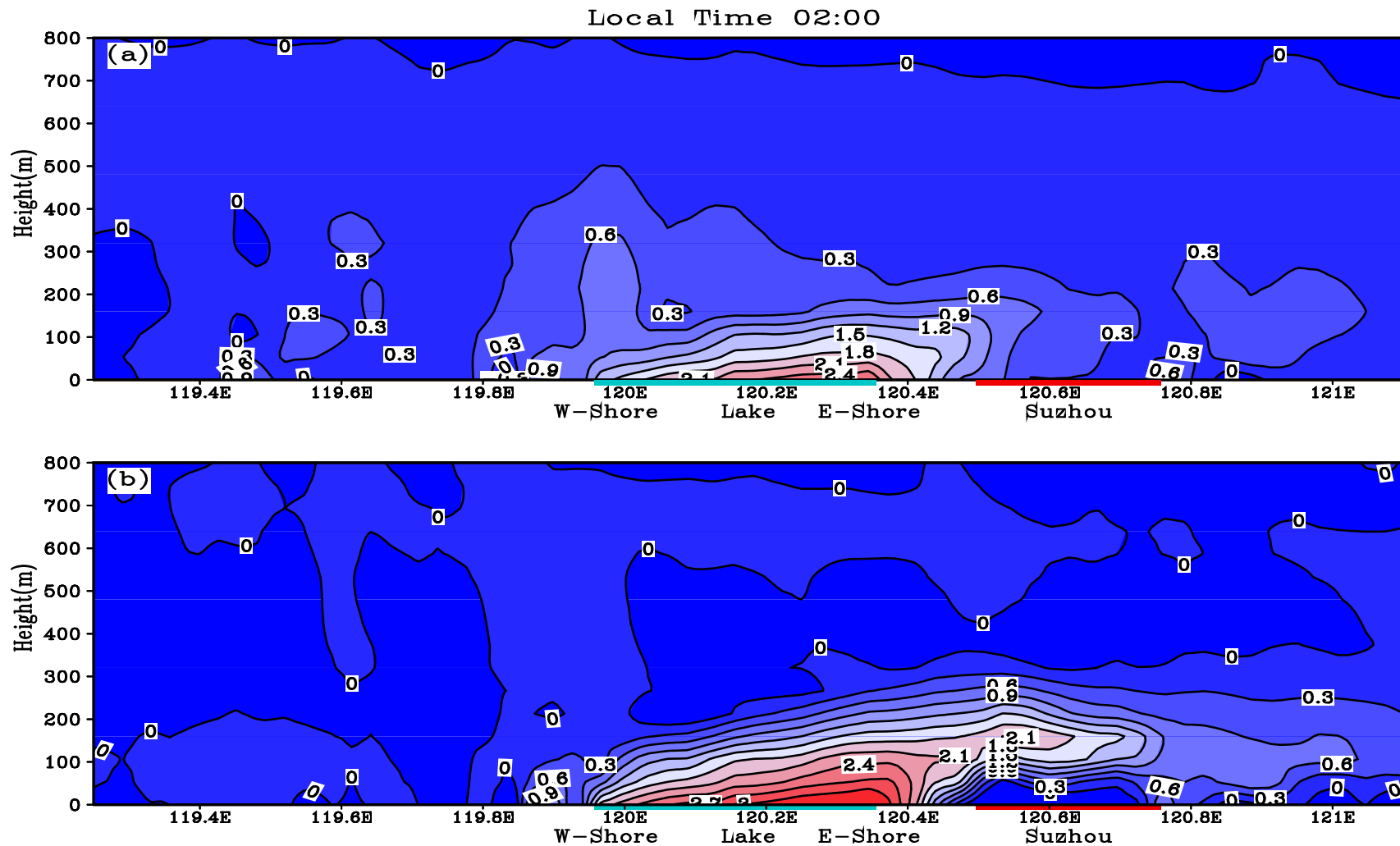


Urban heat island horizontal distribution

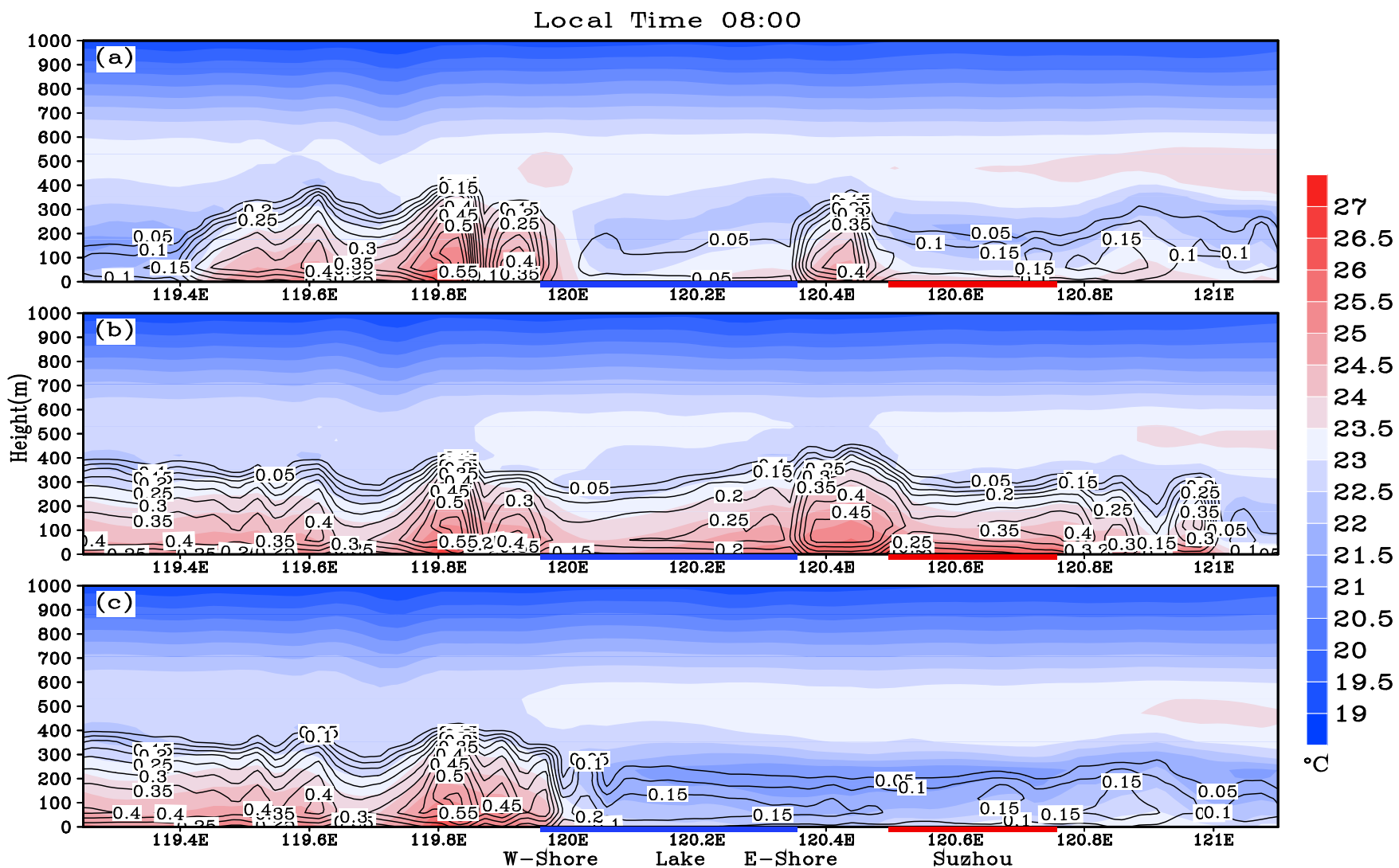




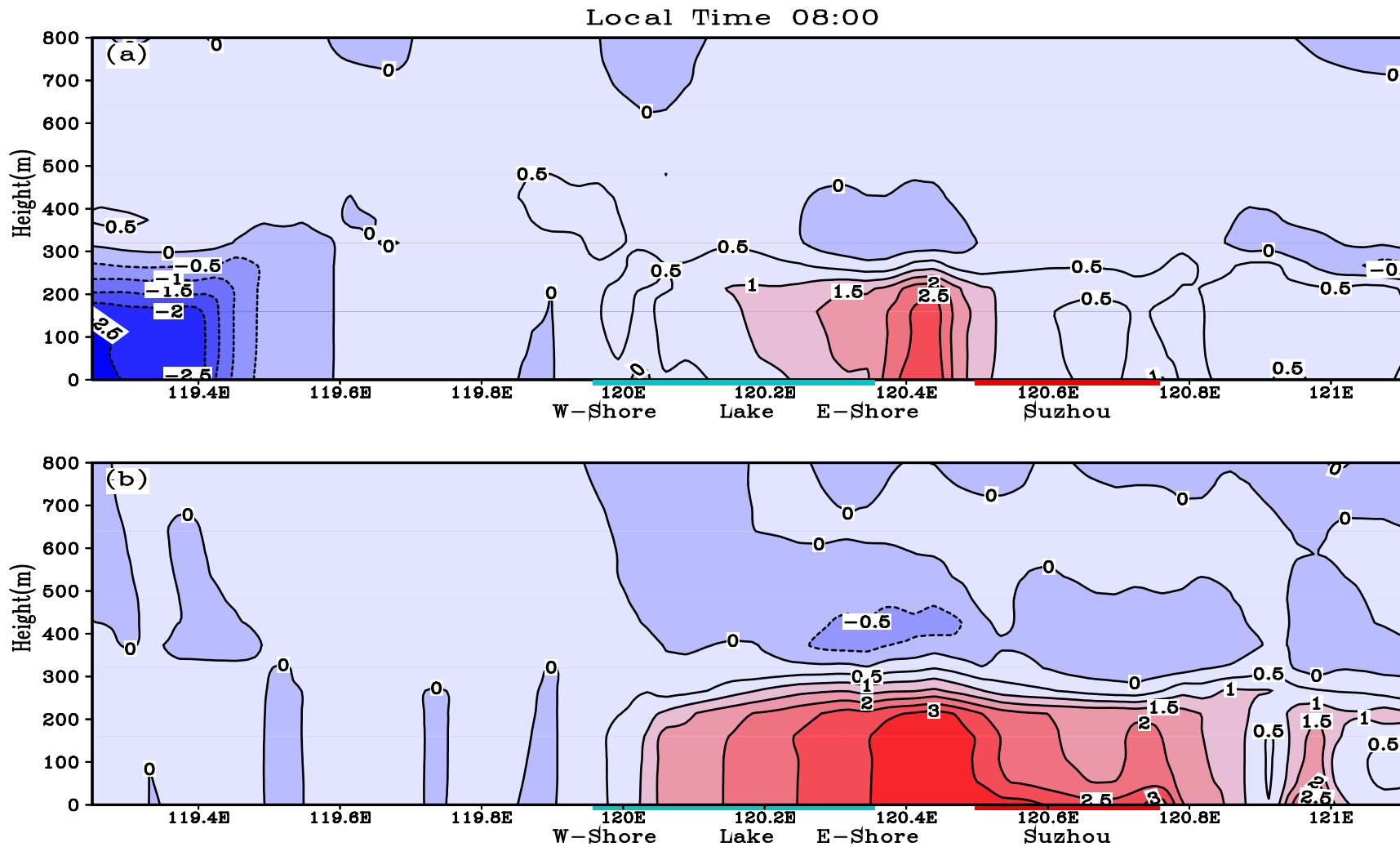
Simulated cross section of air temperature along the centre latitude (32.34°N) at 02:00 July 19,2012 by (a) CASE1;(b)CASE2;(c) CASE3



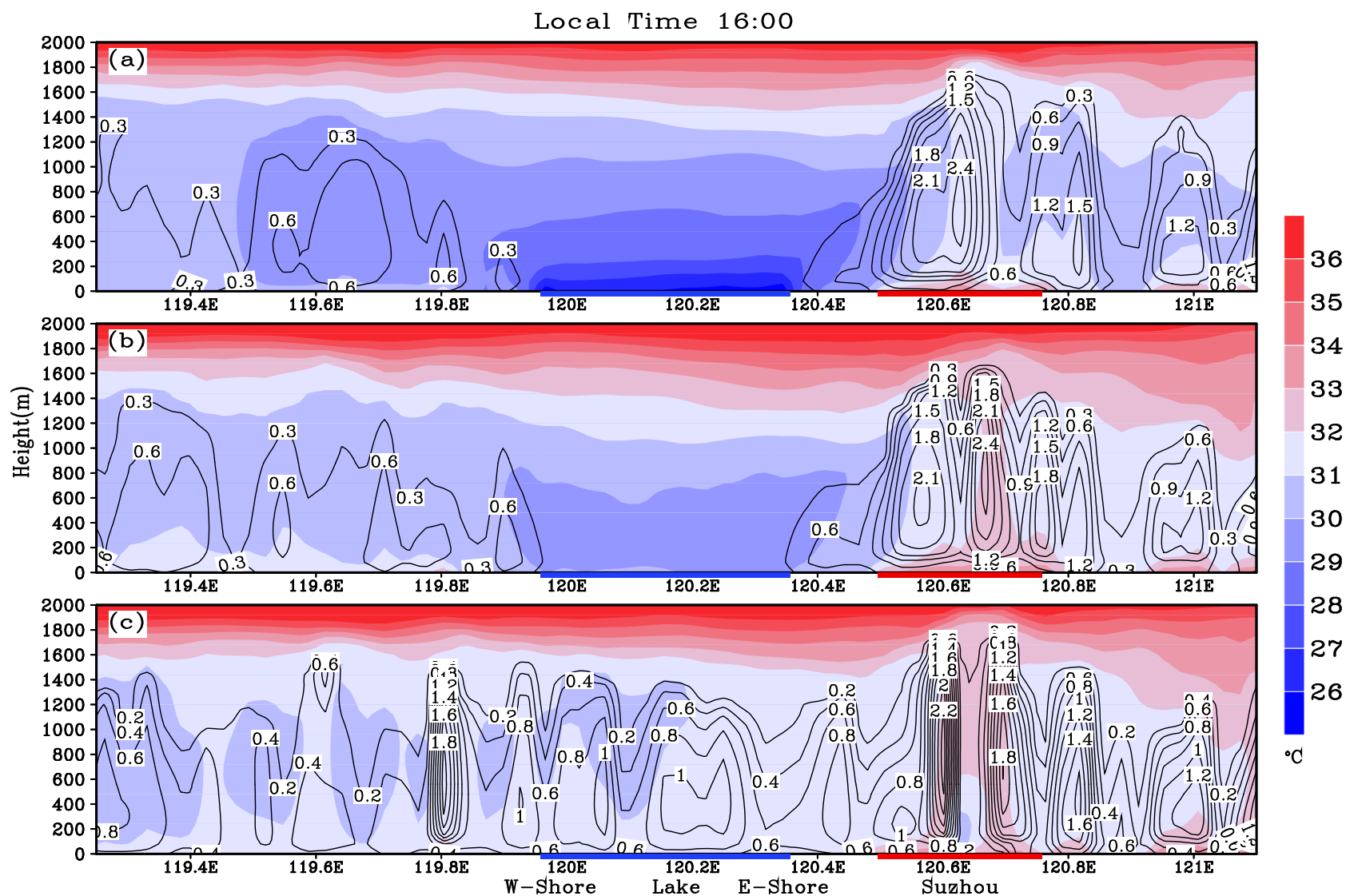
**Cross section of air temperature difference at 02:00
July 19,2012 between (a) CASE1-CASE3; (b) CASE2-
CASE3**



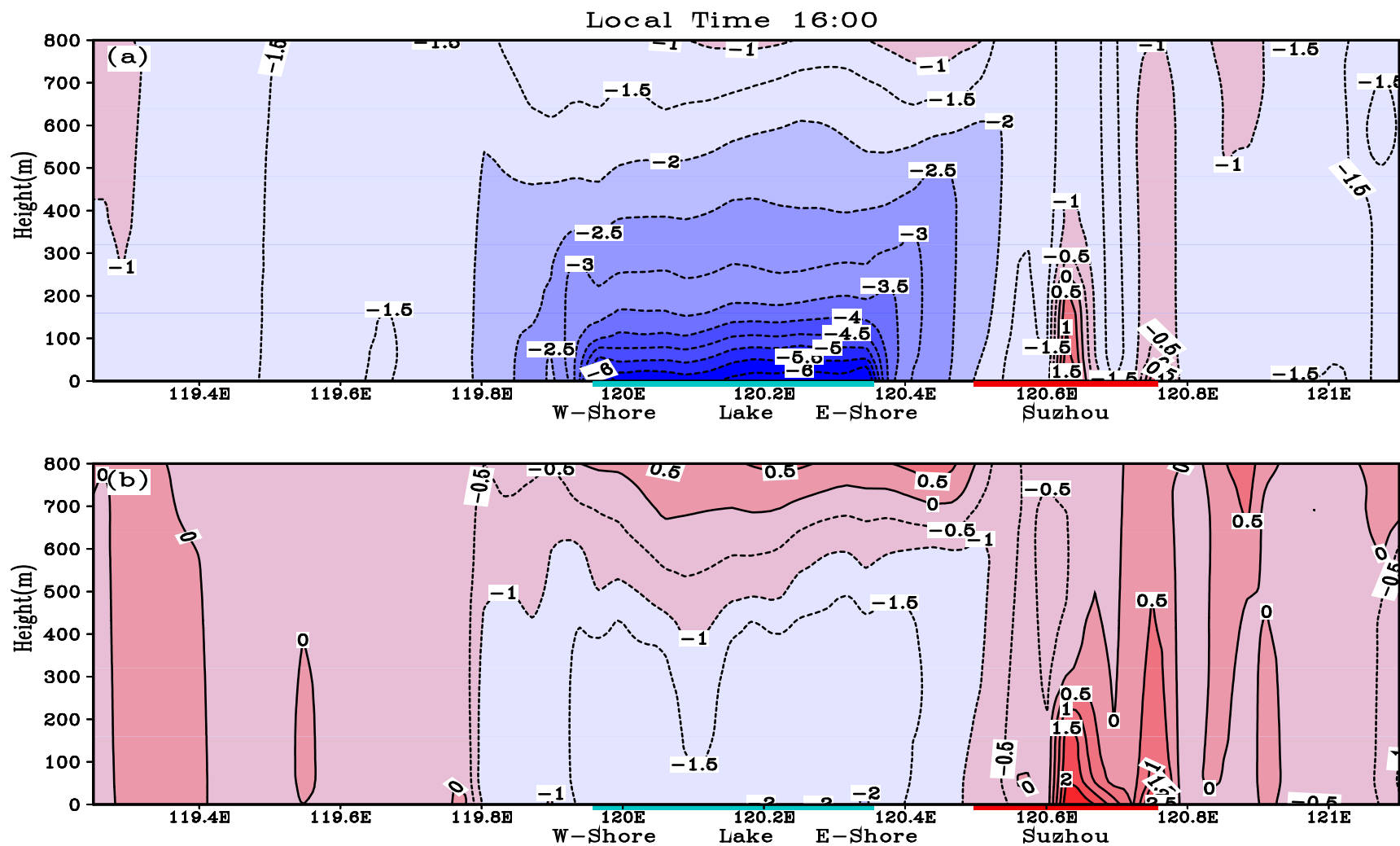
Simulated cross section of air temperature along the centre latitude (32.34°N) at 08:00 July 19,2012 by (a) CASE1;(b)CASE2;(c) CASE3



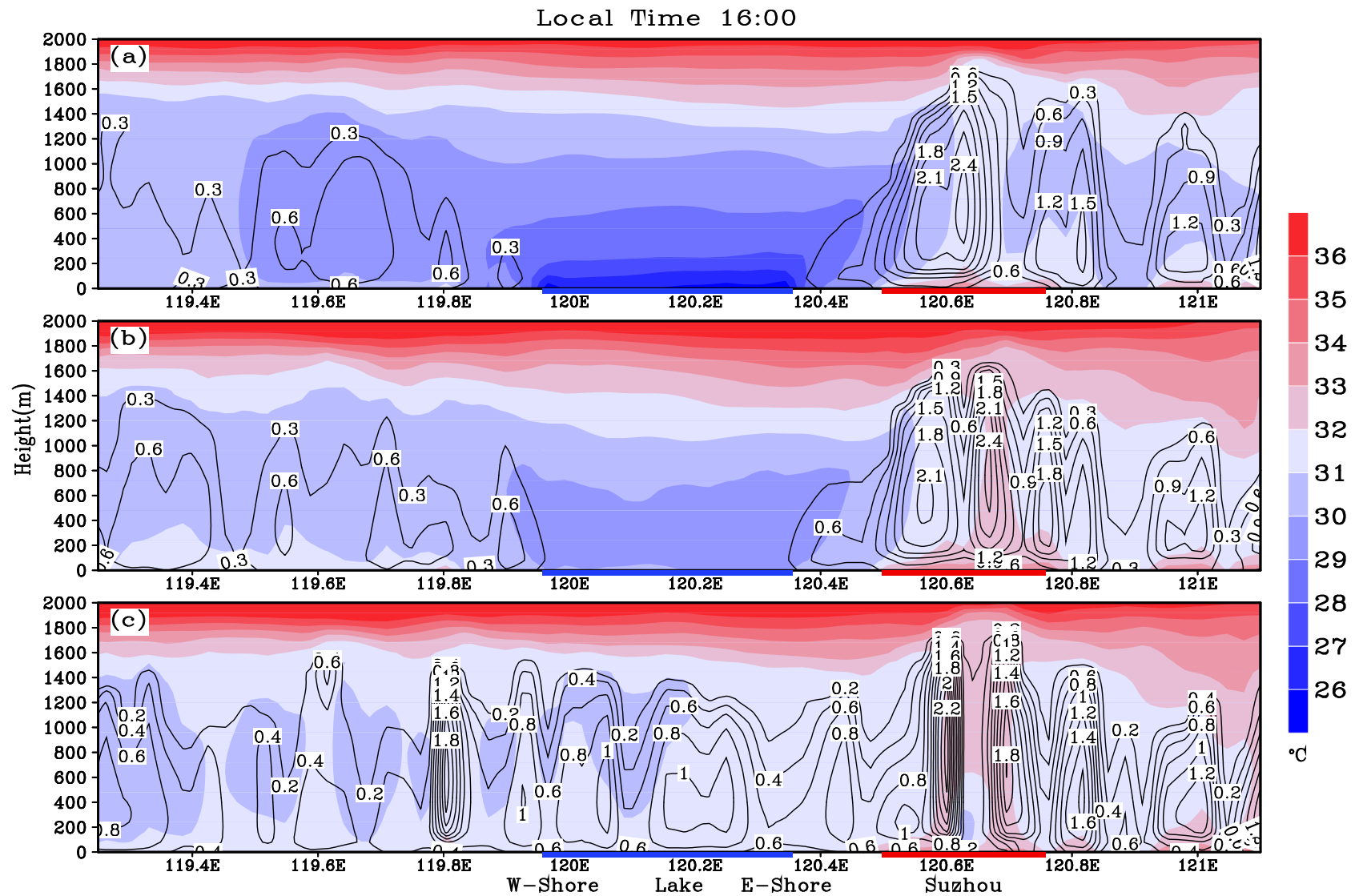
**Cross section of air temperature difference at 08:00
July 19,2012 between (a) CASE1-CASE3; (b) CASE2-
CASE3**



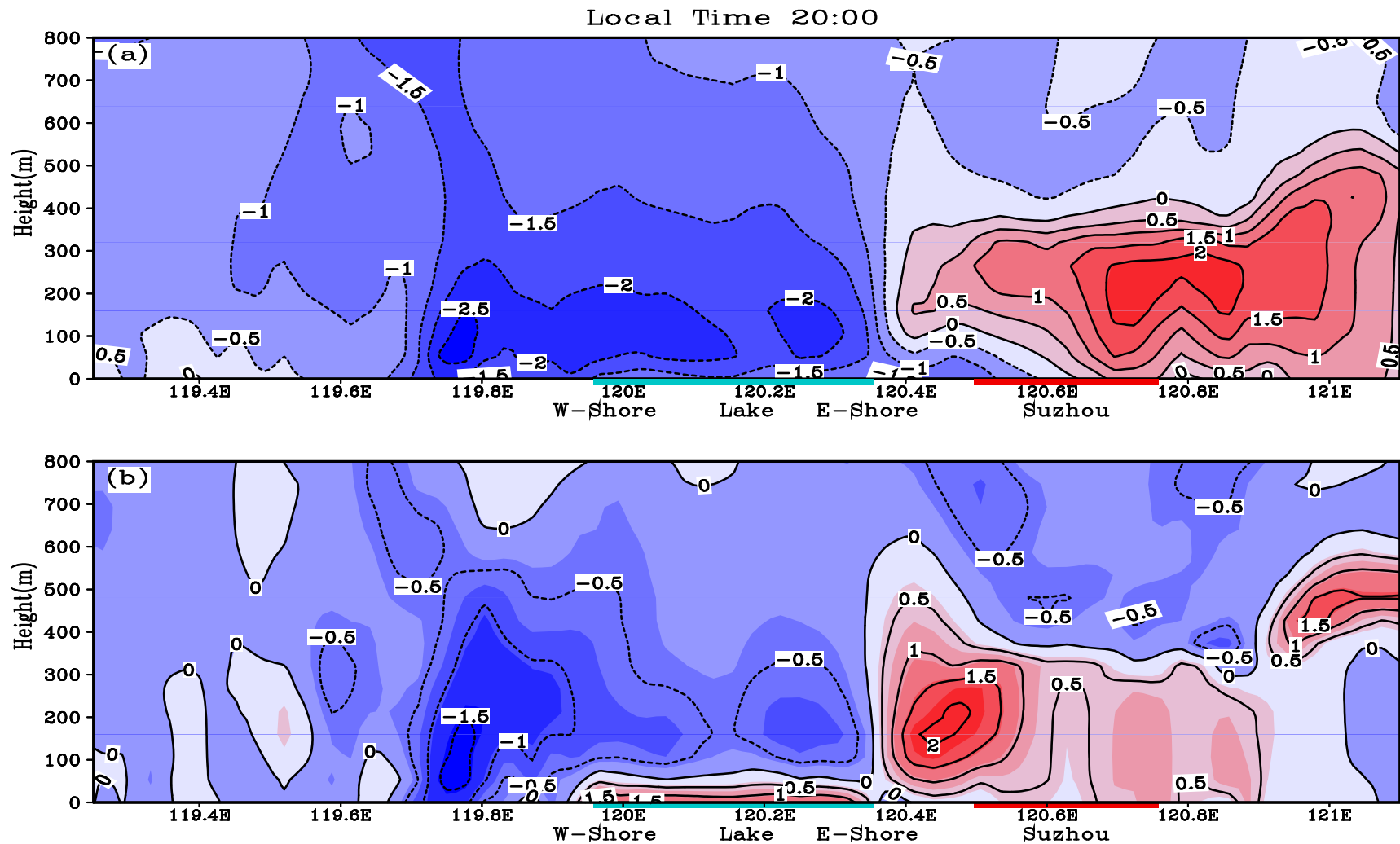
Simulated cross section of air temperature along the centre latitude (32.34°N) at 16:00 July 19,2012 by (a) CASE1;(b)CASE2;(c) CASE3



**Cross section of air temperature difference at 16:00
July 19,2012 between (a) CASE1-CASE3; (b) CASE2-
CASE3**

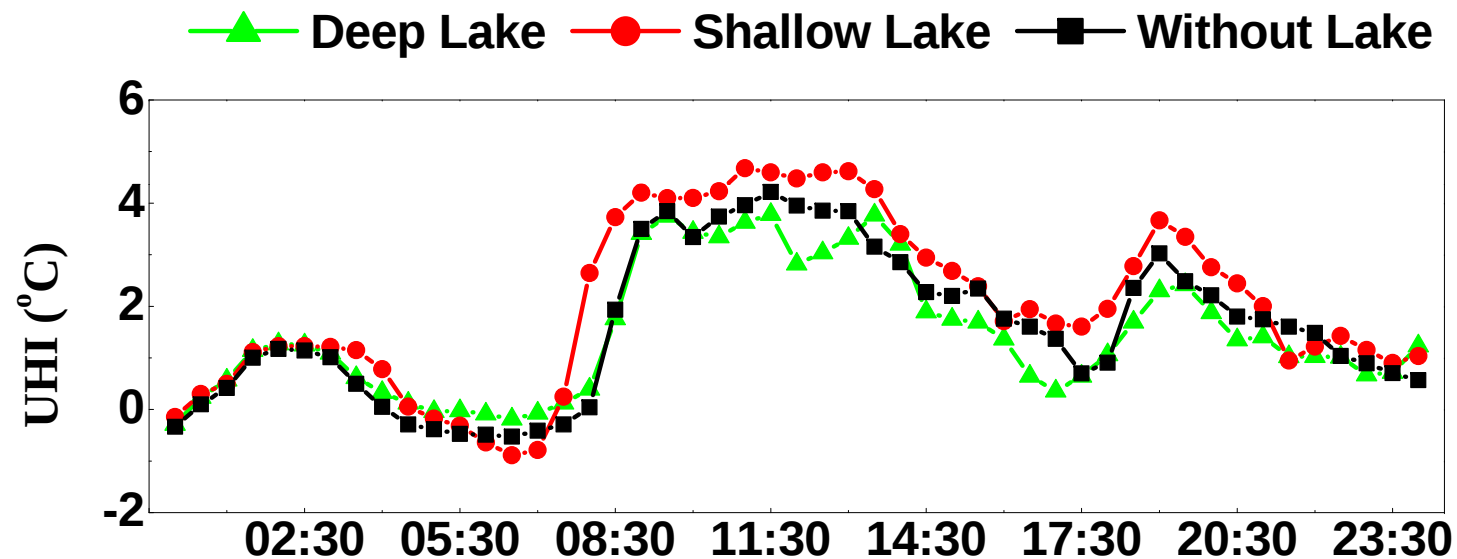


Simulated cross section of air temperature along the centre latitude (32.34°N) at 20:00 July 19,2012 by (a) CASE1;(b)CASE2;(c) CASE3



**Cross section of air temperature difference at 20:00
July 19,2012 between (a) CASE1-CASE3; (b) CASE2-
CASE3**

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On-going Work

Sensitive experiment : Introduce the new landuse type data (Modis 2012)

Discuss the lake breeze circulation impact on urban PBL height and Coastal thermal internal boundary layer



THANK YOU!



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