Yale 耶鲁大学-南京信息工程大学大气环境中心
Yale-NUIST Center on Atmospheric Environment

Temporal and spatial distributions of urban heat island in Nanjing

Yu Zhou

2015.4.17

Outline

- Background
- Objectives
- Method and Data Quality
- Results and Discussion
- On-going work

Background: UHI

- The accelerated urbanization has far-reaching influence upon city climate and the resulting urban heat island (UHI) effect has drawn widespread concern.
- UHI studies are of great utility in the recognition of urban heat equilibrium and a range of boundary layer phenomena.
- The definition of UHI has been extended to urban canopy (UCL) and the urban boundary layer (UBL), so the study of the characteristics of vertical distribution is becoming mor e and more important.

Objectives

- Temporal distributions of UHI in Nanjing
- Spatial distributions of UHI in Nanjing
- The development of boundary layer
- The vertical characteristics of UHI

Outline

- Background
- Objectives
- Method and Data quality
- Results and Discussion
- On going work

Sampling Site

Location	Times	interval	Valid data
NUPT(urban area) NUIST(suburban area)	01/14 08:00- 01/25 23:00	Three hours	NUPT(46 times) NUIST(71 times)

Figure.1 The experiment points. NUPT (urban area), NUIST (suburban area).

Instrument

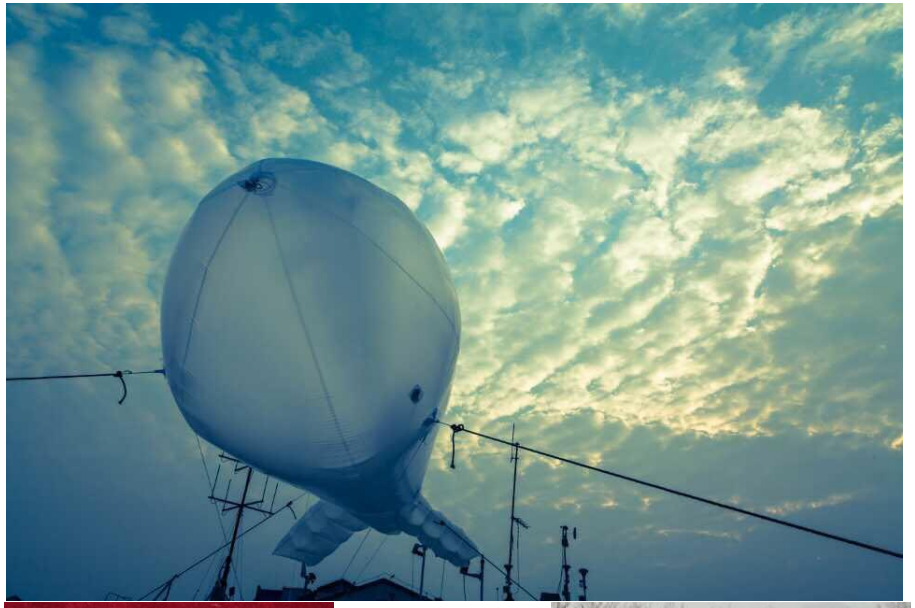

Figure.2 The equipments used in the experiment.

Weather conditon

Table1 . Weather condition of observing date.

Observing Date	Temperature			Humidity	Precipitation	Wind Direction	Wind Speed
	℃			%	mm		$m \cdot s^{-1}$
	Average	Maximum	Minimum	Average	Cumulative		Average
Jan. 14th	6	7	5	91	0.3	north	1.9
Jan. 15th	6	7	5	78	0	north	0.8
Jan. 16th	5	9	1	79	0	northwest-north	1.4
Jan. 17th	3	6	0	63	0	northeast-east	2.2
Jan. 18th	4	-10	-1	67	0	West	2.2
Jan. 19th	6	13	-1	54	0	East	1.7
Jan. 20th	8	13	4	54	0	Southeast-south	2.8
Jan. 21th	8	14	2	63	0	Northwest	2.5
Jan. 22th	3	8	-2	71	0	northwest-east	1.9
Jan. 23th	4	12	-4	75	0	Southeast	1.9
Jan. 24th	8	15	1	76	0	east-south	2.2
Jan. 25th	8	10	7	91	2	northwest-northeast	1.7
Average of Total	5.8	8.7	1.4	71.8	2.3（Cumulative）		1.9

Weather conditon

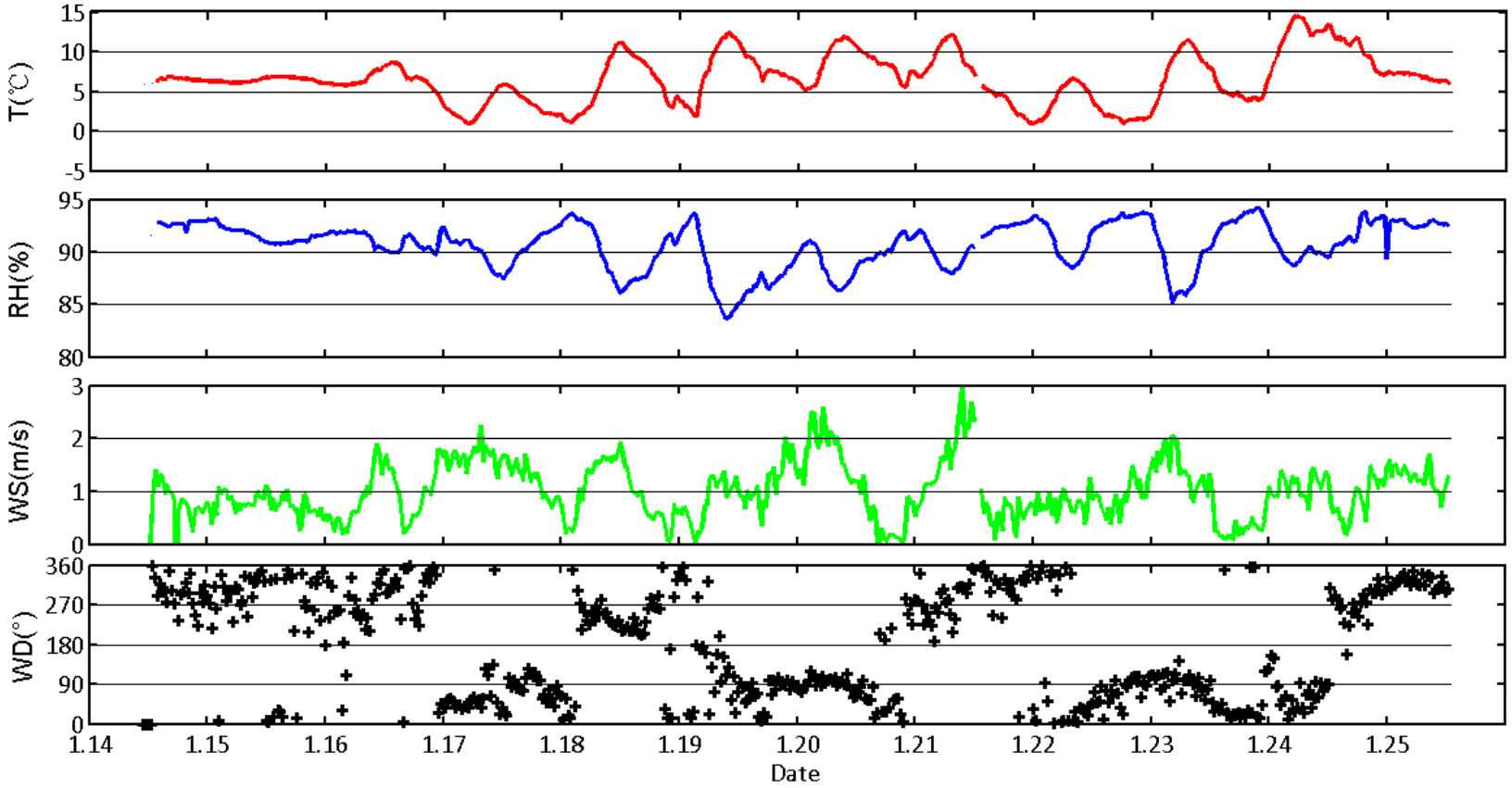

Figure.3 Meteorological elements of Nupt measured by microclimate.

Outline

- Background
- Objectives
- Method and Data quality
- Results and Discussion
- On going work

Results and Discussion:

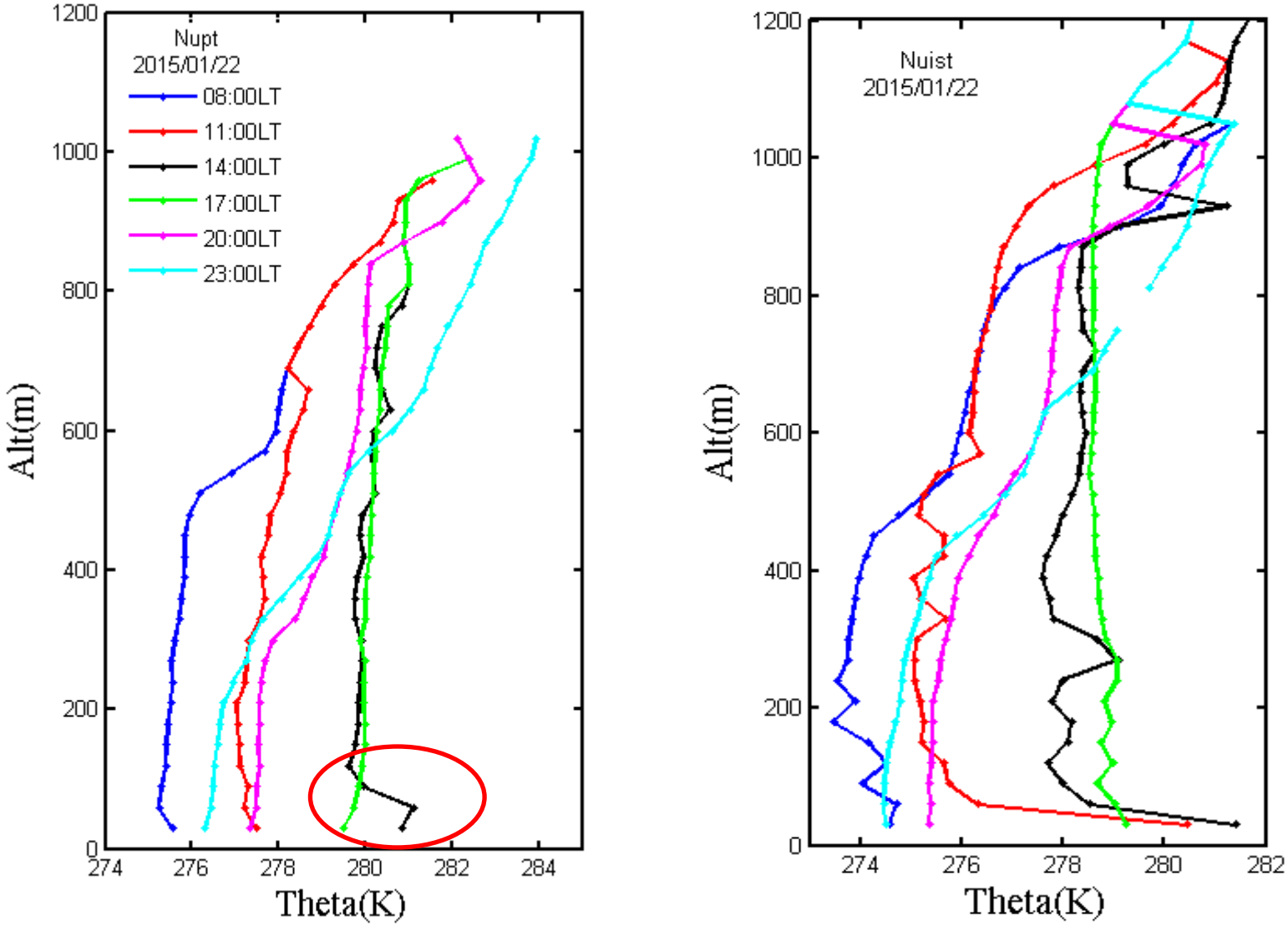

Figure.4 Vertical profile of the average potential temperature distribution varying heights in urban and suburban areas of Nanjing

Results and Discussion:

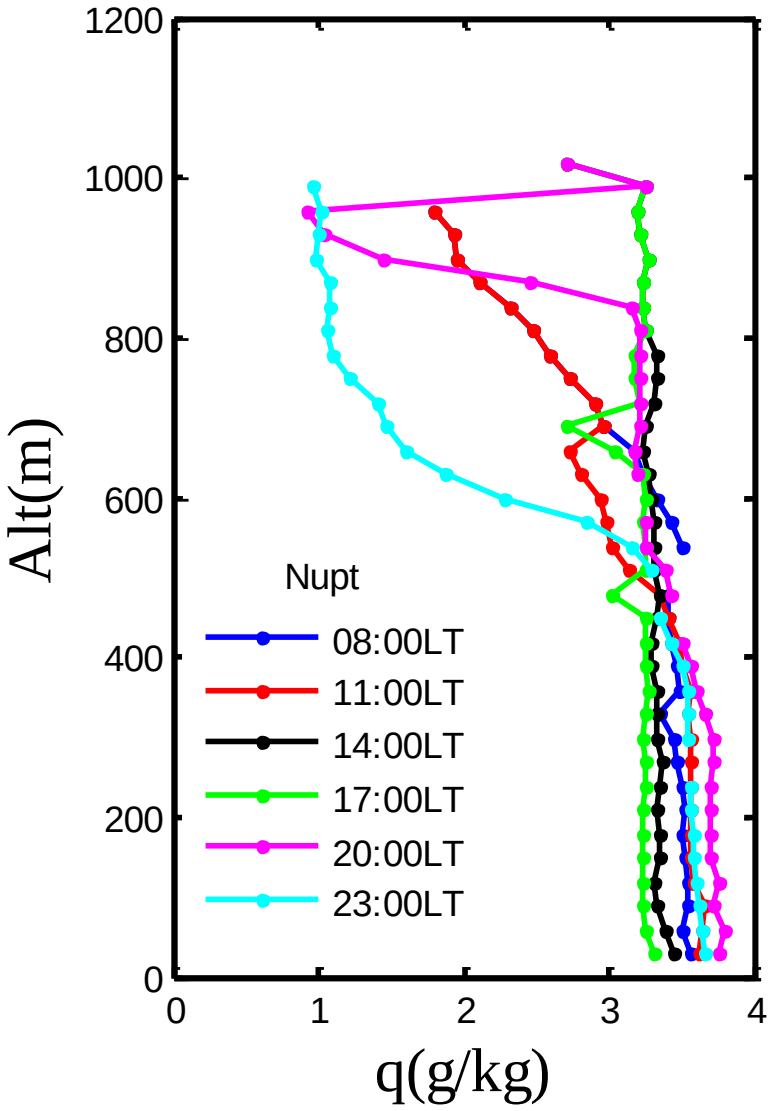

Figure5. Vertical profile of the average specific humidity distribution varying heights in urban area of Nanjing

Results and Discussion:

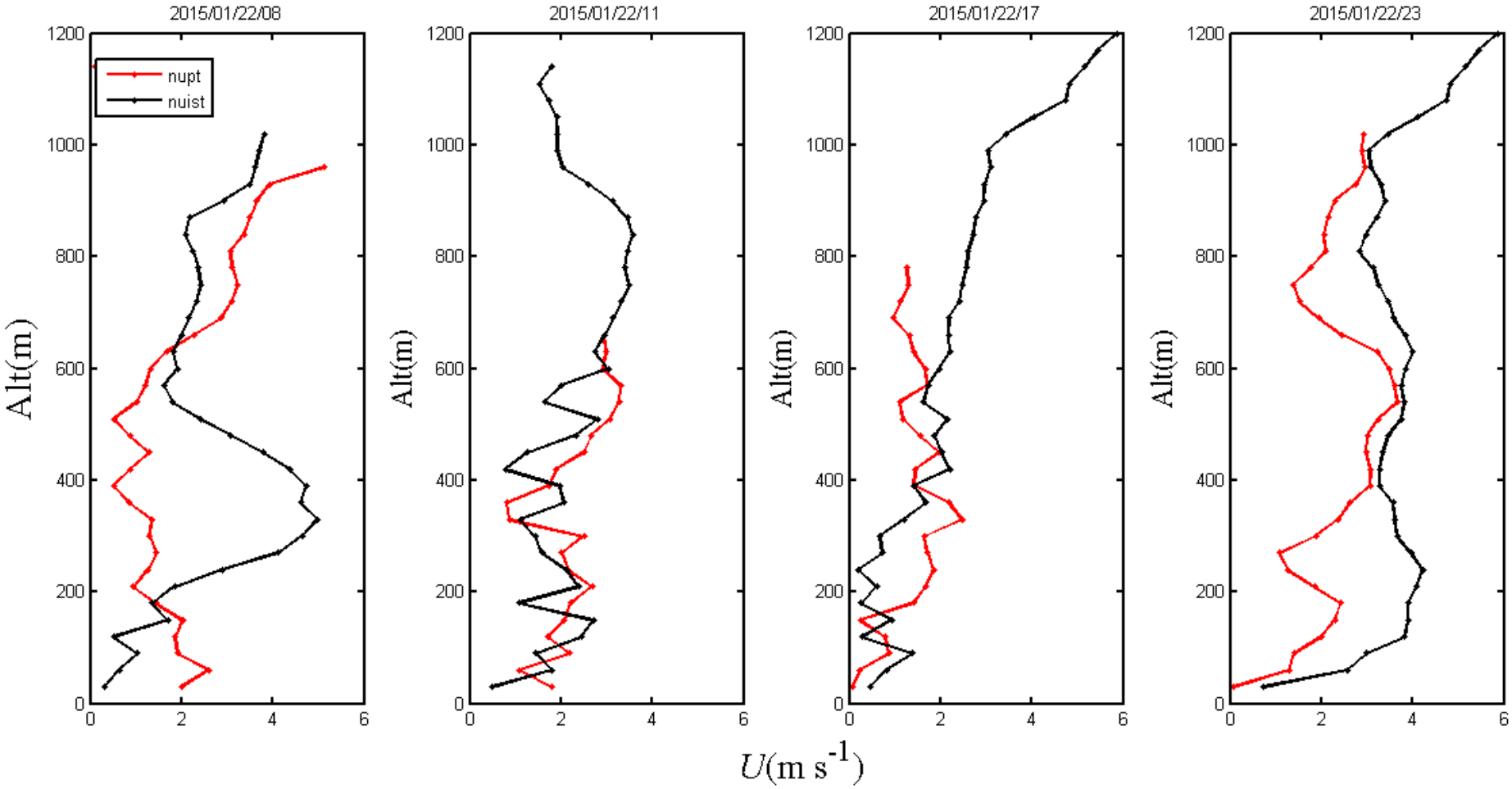

Figure.6 Vertical profile of the average specific wind speed varying heights in urban and suburban areas of Nanjing

Results and Discussion:

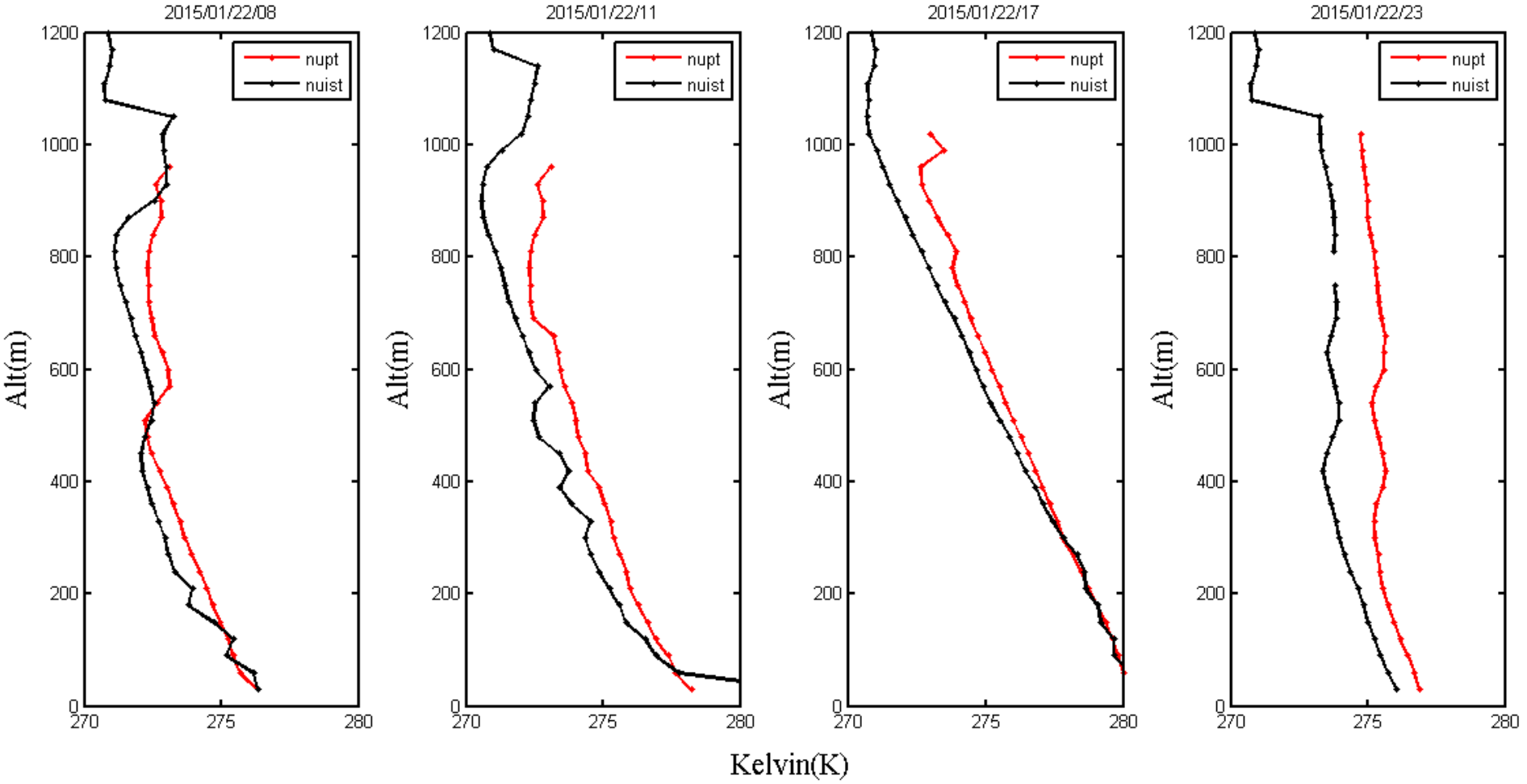

Figure.7 Vertical profile of the average temperature varying heights in urban and suburban areas of Nanjing

Results and Discussion:

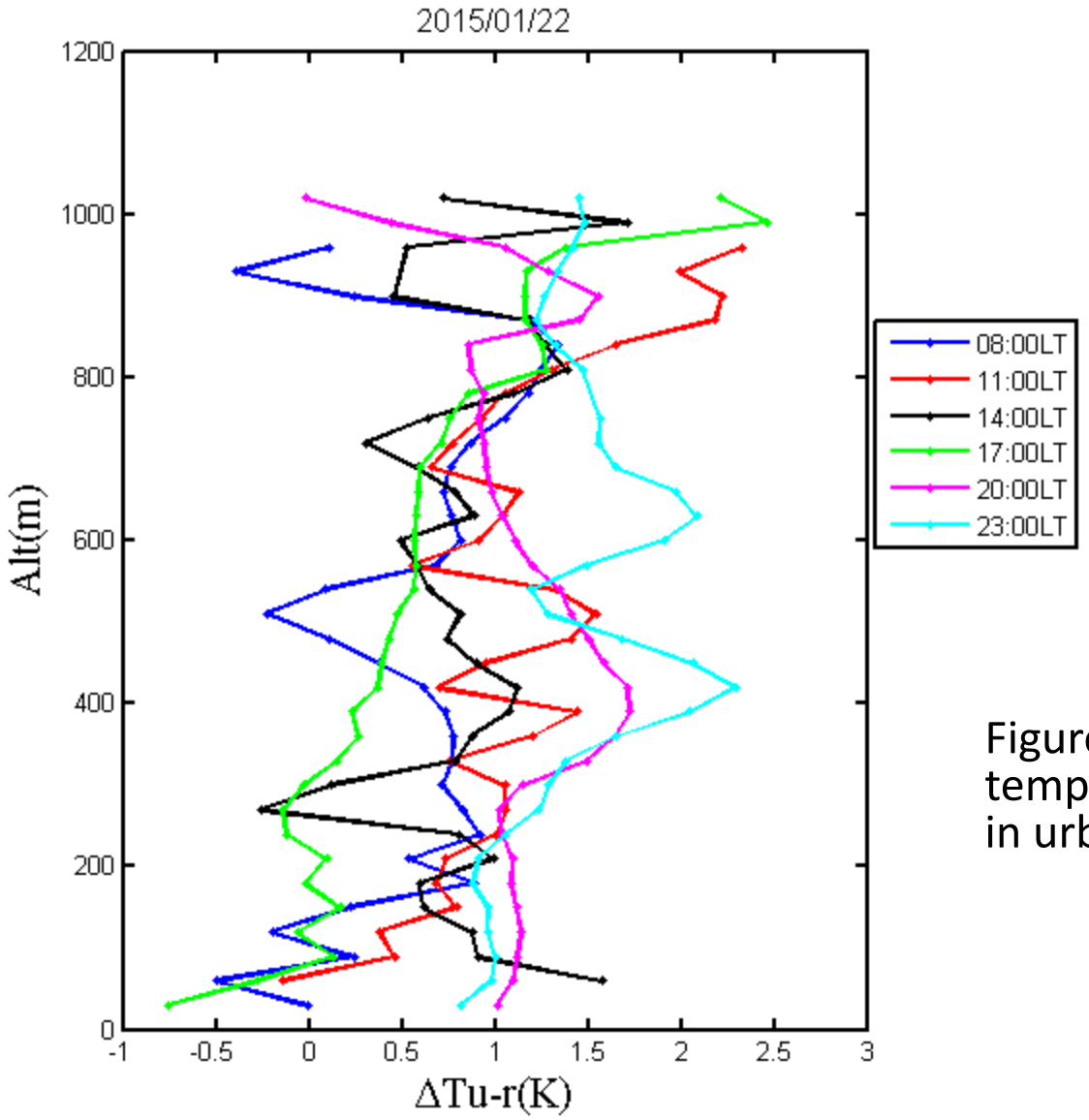

Figure.8 Vertical profile of the average temperature difference varying heights in urban and suburban areas of Nanjing

Conclusion

- The height of boundary layer varies from 300m in the night to above 1000m in the daytime.
- The time of inversion layer is different between urban and suburb, and the height also has obvious difference, the time of inversion layer in urban lag behind in suburb due to the effect of UHI in urban.

On-going work

- Geting the ground sites data and studying spatial and temporal distribution of heat island.
- Further data processing, in order to find more distribution features.
- Combined with pollutant concentration data, analyzing the effect of the boundary layer development on the pollutant diffusion.

Yale 耶鲁大学-南京信息工程大学大气环境中心

Yale-NUIST Center on Atmospheric Environment

Thank you!