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Study on a continuous haze event in January 2015 in Pukou, Nanjing

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Outline

- Introduction
- Data and Methods
- Results and Discussion
- Conclusion

Introduction

- Haze has negative effects on climate change , environment and human health. Fine particulate matter ($PM_{2.5}$) play an important role in the formation of the haze.
- Nanjing is located in Yangtze River Delta, one of the four major areas with severe haze pollution. Highly economic development also resulted in high emissions of atmospheric pollutants.
- A continuous haze episodes occurred in Nanjing from 14 to 28 January 2015, This work try to analyze the event from meteorological condition and mass transport involved in this event.

Data and Methods

- Data

  a. Meteorological parameters

  ENVIS, Germany, Agriculture experiment station ,NUIST

  b. Concentrations of six criteria pollutants

  $PM_{2.5}$, PM_{10}, CO, SO_2, NO_2 and $O_{3,}$

- Methods

  a. PBLH calculation

  NOAA Reanalysis, NCEP GDAS

  b. Backward trajectory HYSPLIT 4.0

Results and Discussion

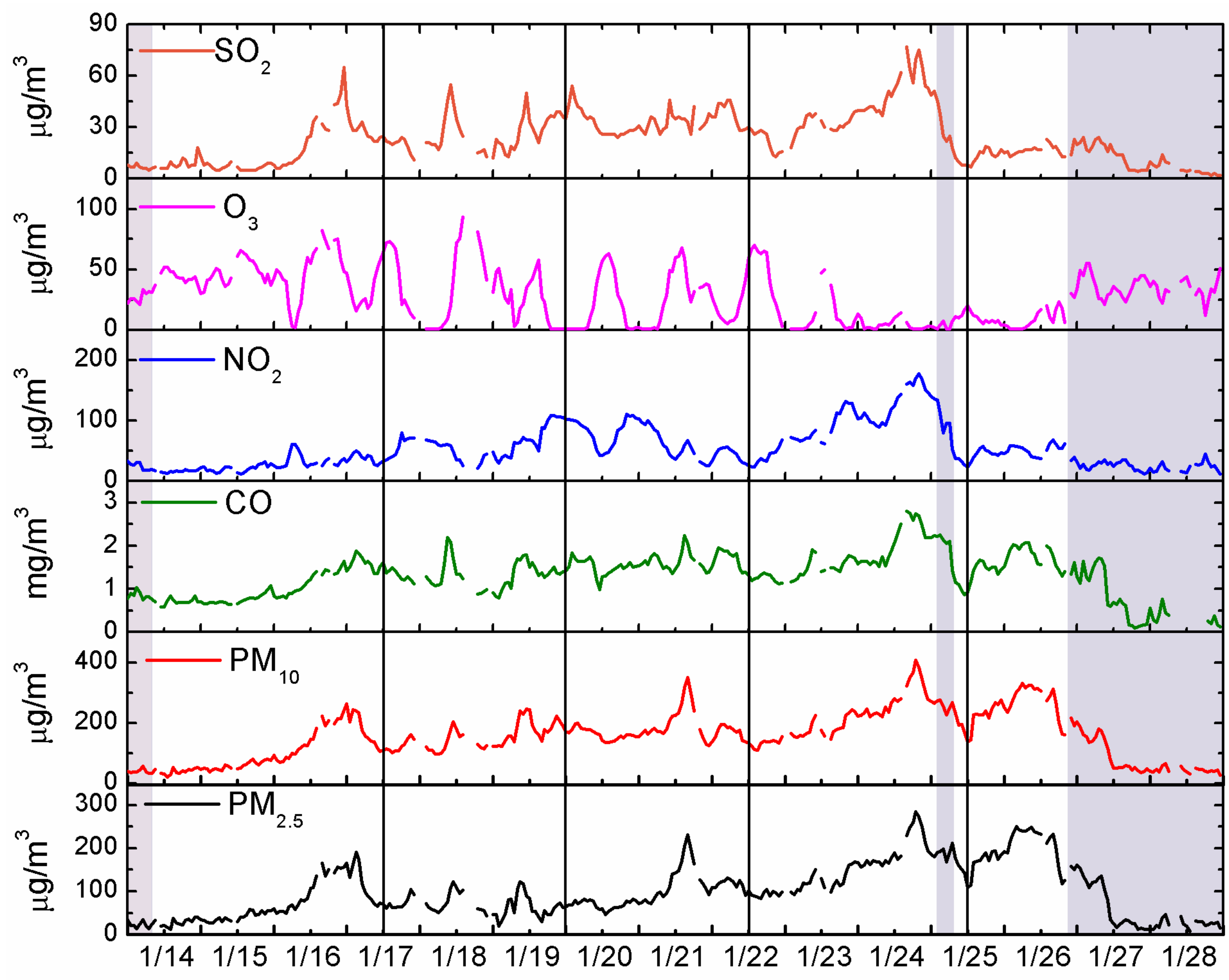


Fig.1. Hourly concentration of 6 criteria pollutants in January 2015

Results and Discussion

Table 1. Information on 6 criteria pollutants in January 2015

	Average	Standard deviation	Maximum	Minimum
$PM_{2.5}$(μg/m^3)	100	64	284（严重）	7
PM_{10}(μg/m^3)	156	82	407（重度）	21
CO(mg/m^3)	1	1	3	0
NO_2(μg/m^3)	54	35	178（良）	12
O_3(μg/m^3)	27	22	93	1
SO_2(μg/m^3)	24	15	77	2

Results and Discussion

Table 2. Information on the haze event in January 2015

Event	PM$_{2.5}$ (μg/m^3)				PM$_{10}$ (μg/m^3)			
	Mean ± S.D	Maximum	Minimum	Pollutant ratio（%）	Mean ± S.D	Maximum	Minimum	Pollutant ratio（%）
part1	64±46	190	12	29.6	95±65	263	21	20.0
Part2	49±24	123	20	32.2	152±41	245	97	42.4
Part3	99±38	230	46	70.5	178±42	351	125	78.7
Part4	153±49	284	84	100.0	217±68	407	110	83.3
Part5	112±85	250	7	55.4	153±104	330	27	49.4

Results and Discussion

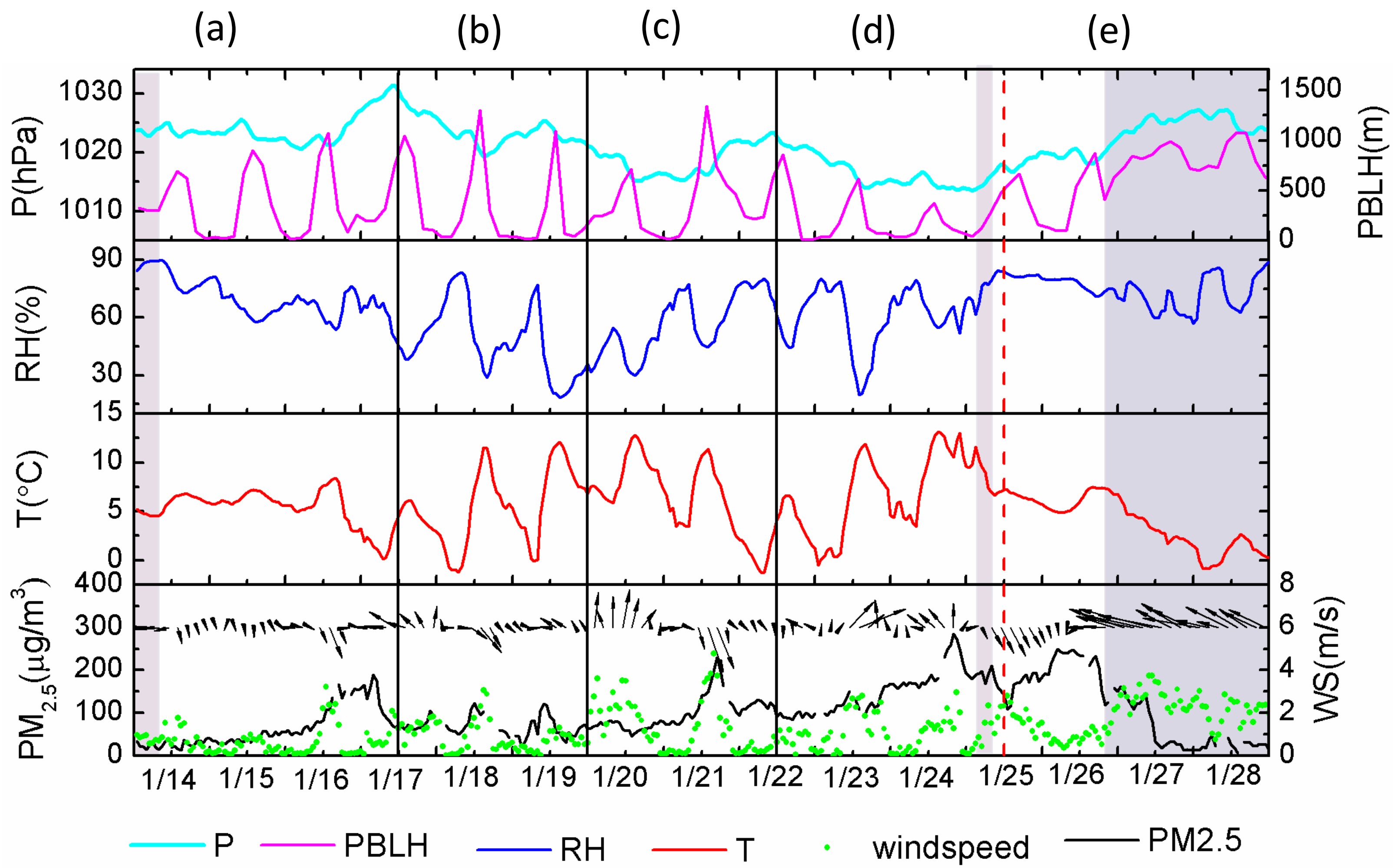


Fig.2. Near-surface meteorology and PM2.5 mass concentration variations

Results and Discussion

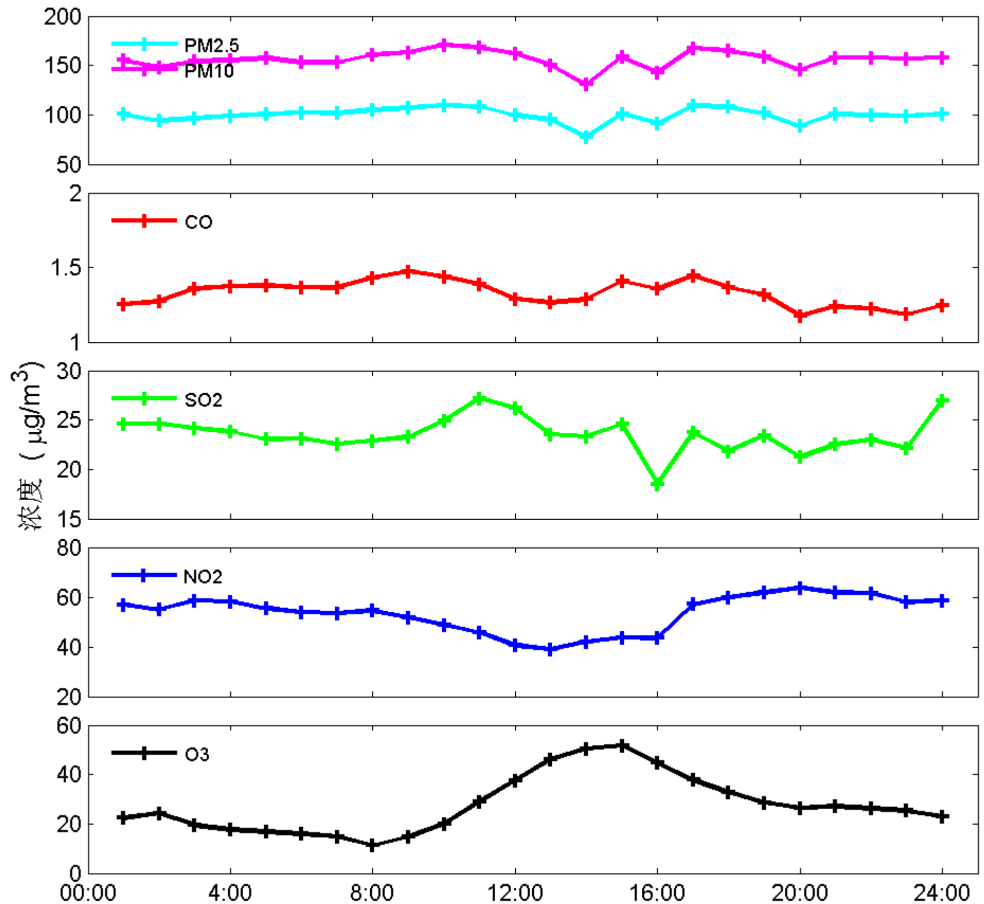


Fig.3. Daily variation of 6 criteria pollutants

Results and Discussion

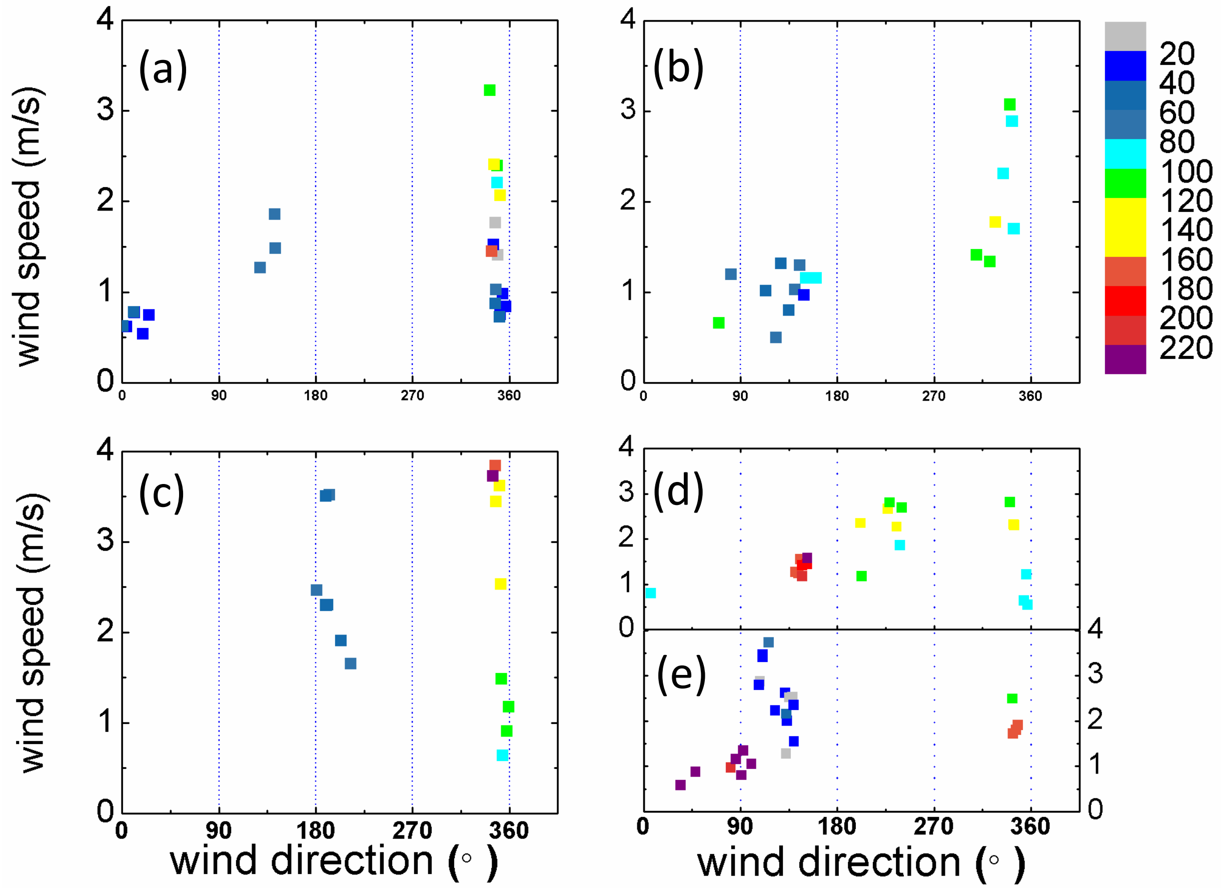


Fig.4. Hourly PM2.5 mass concentration and the corresponding near-surface wind speed and direction

Results and Discussion

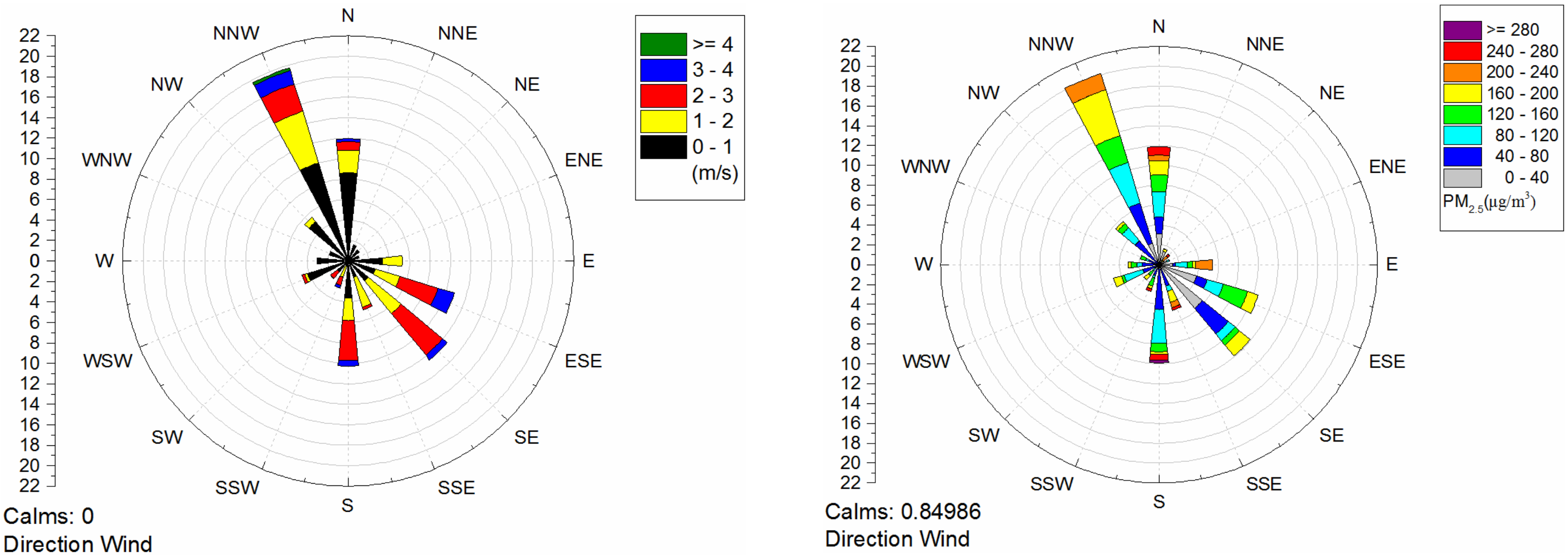


Fig.5. wind rose diagrams of wind speed and $PM_{2.5}$ concentration

Results and Discussion

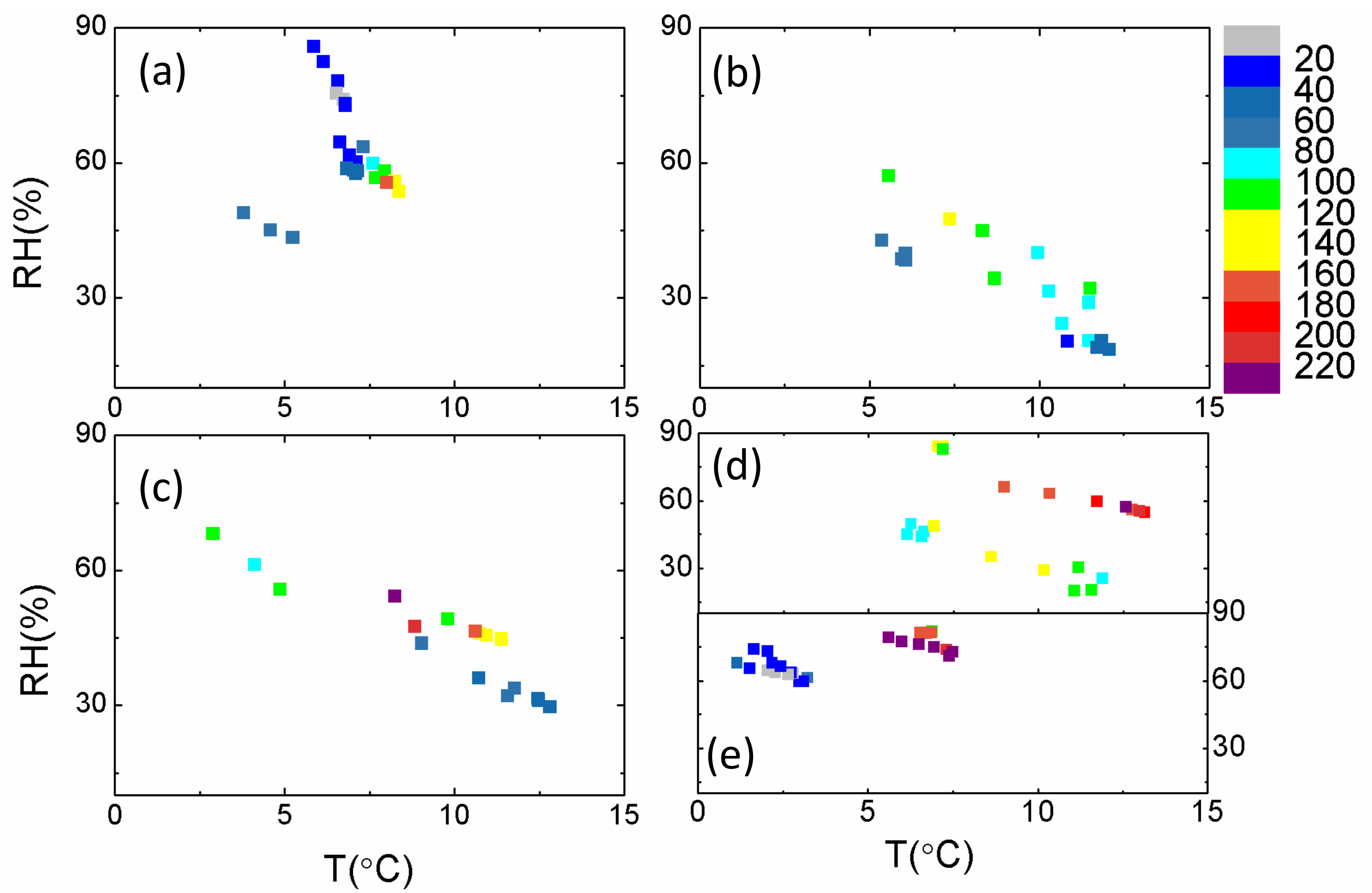
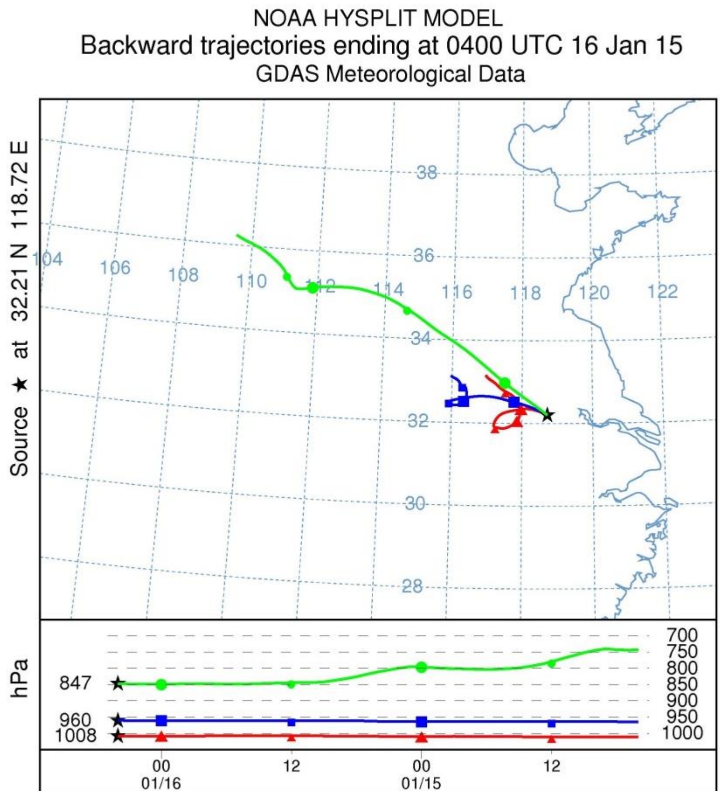


Fig.6. Hourly PM2.5 mass concentration and the corresponding T and RH

Results and Discussion

- Backward trajectories



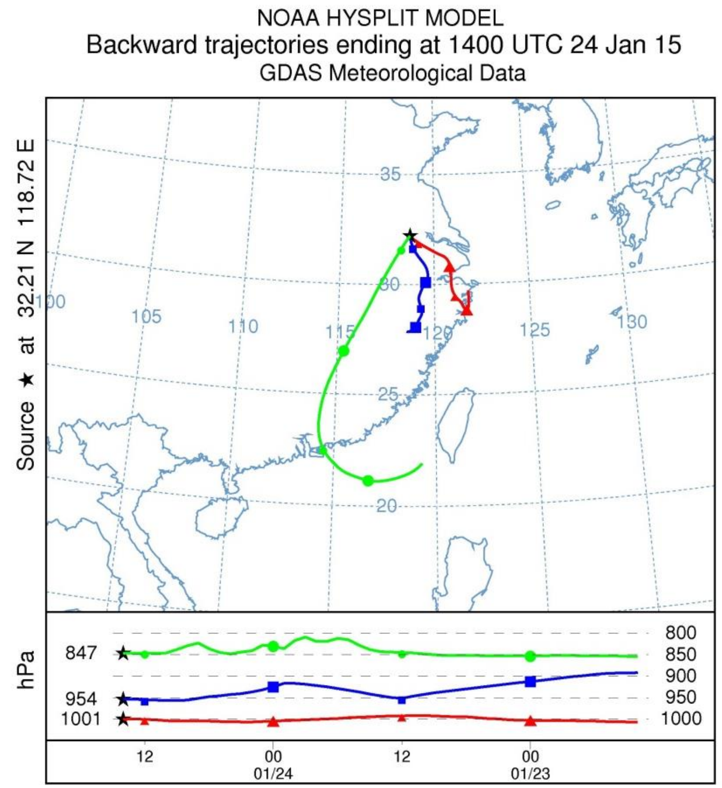


Fig.7. 48-h backward trajectory of the Nanjing

Results and Discussion

- Backward trajectories

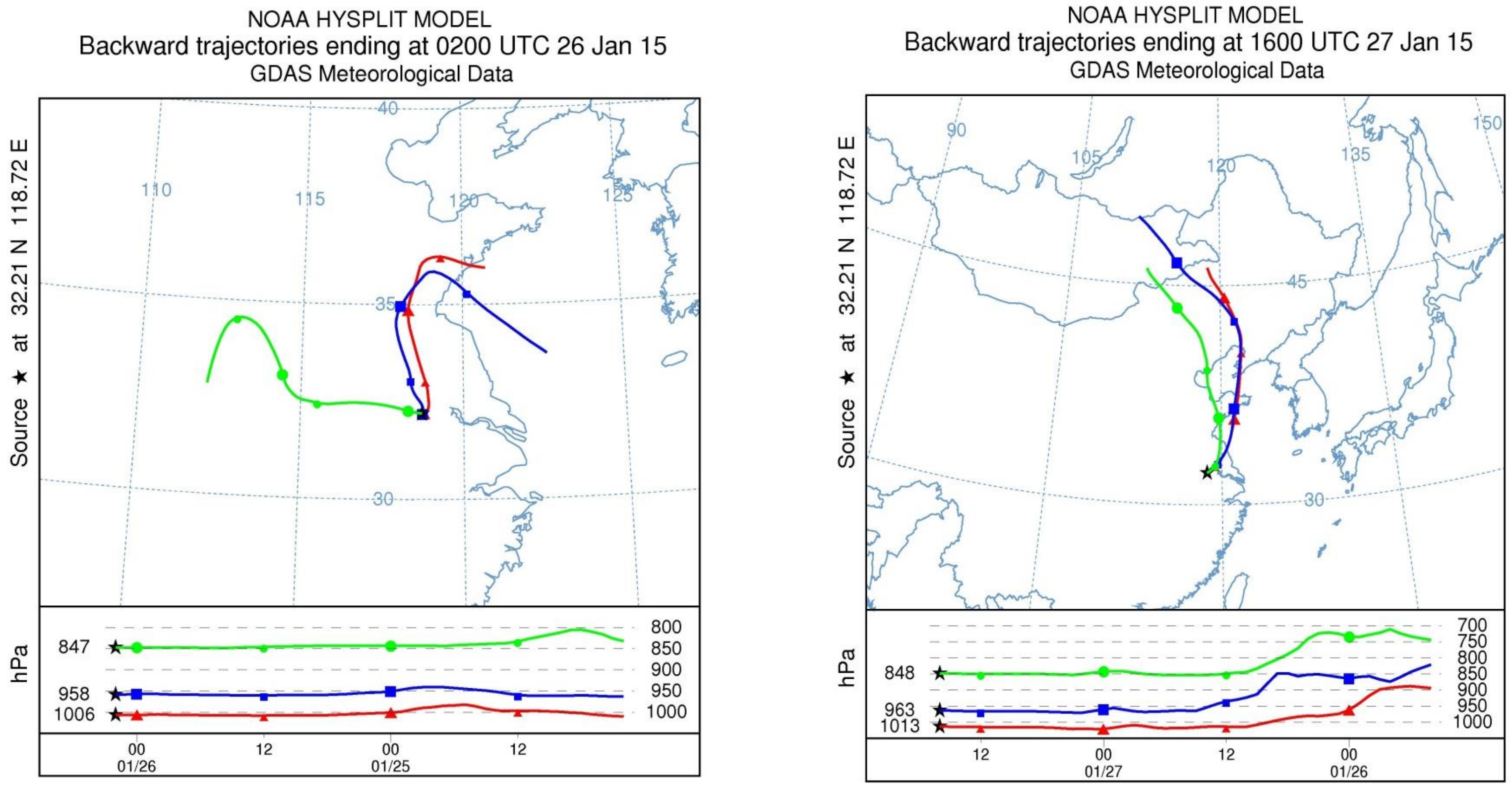
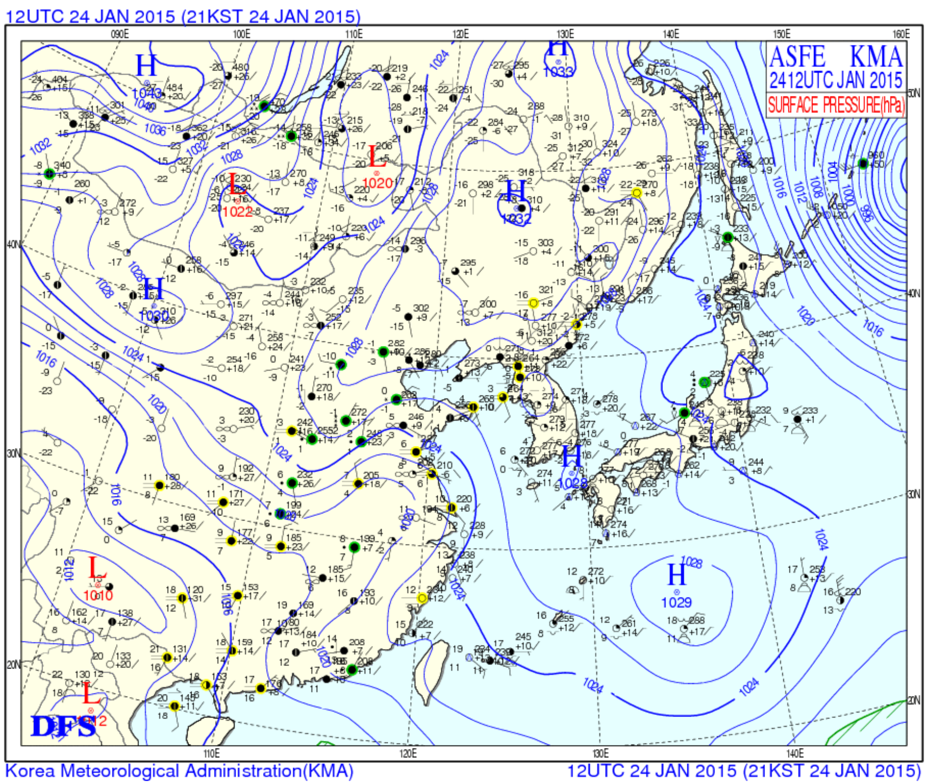


Fig.8. 48-h backward trajectory of the Nanjing

Results and Discussion



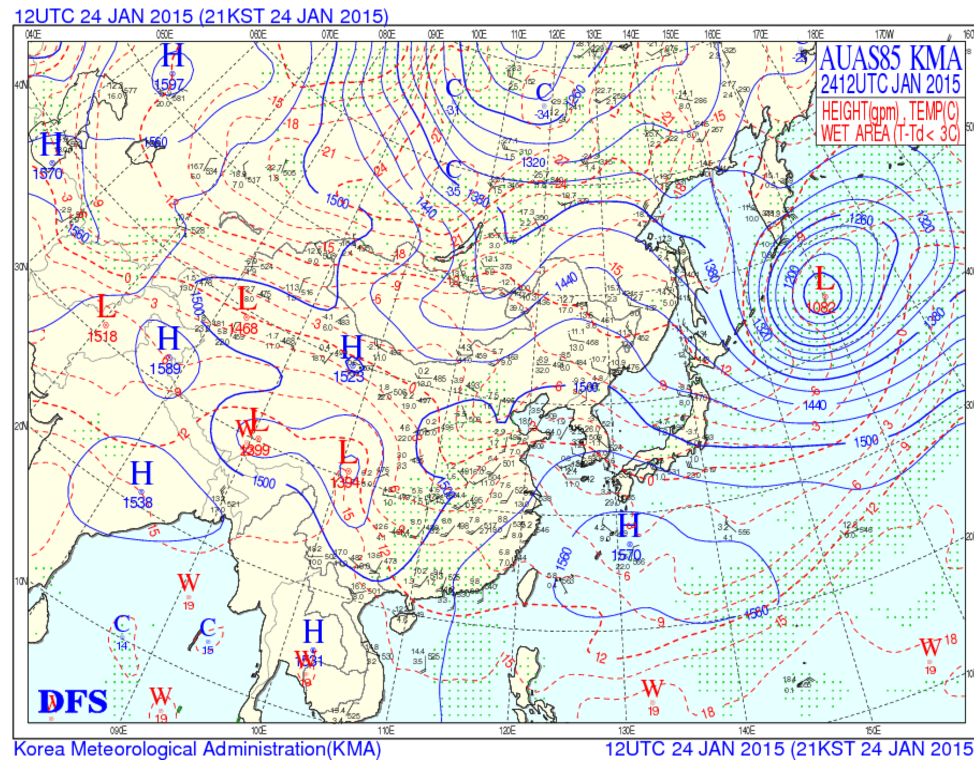


Fig .9. Pressure distribution at 20:00 on 24 January 2015

Results and Discussion

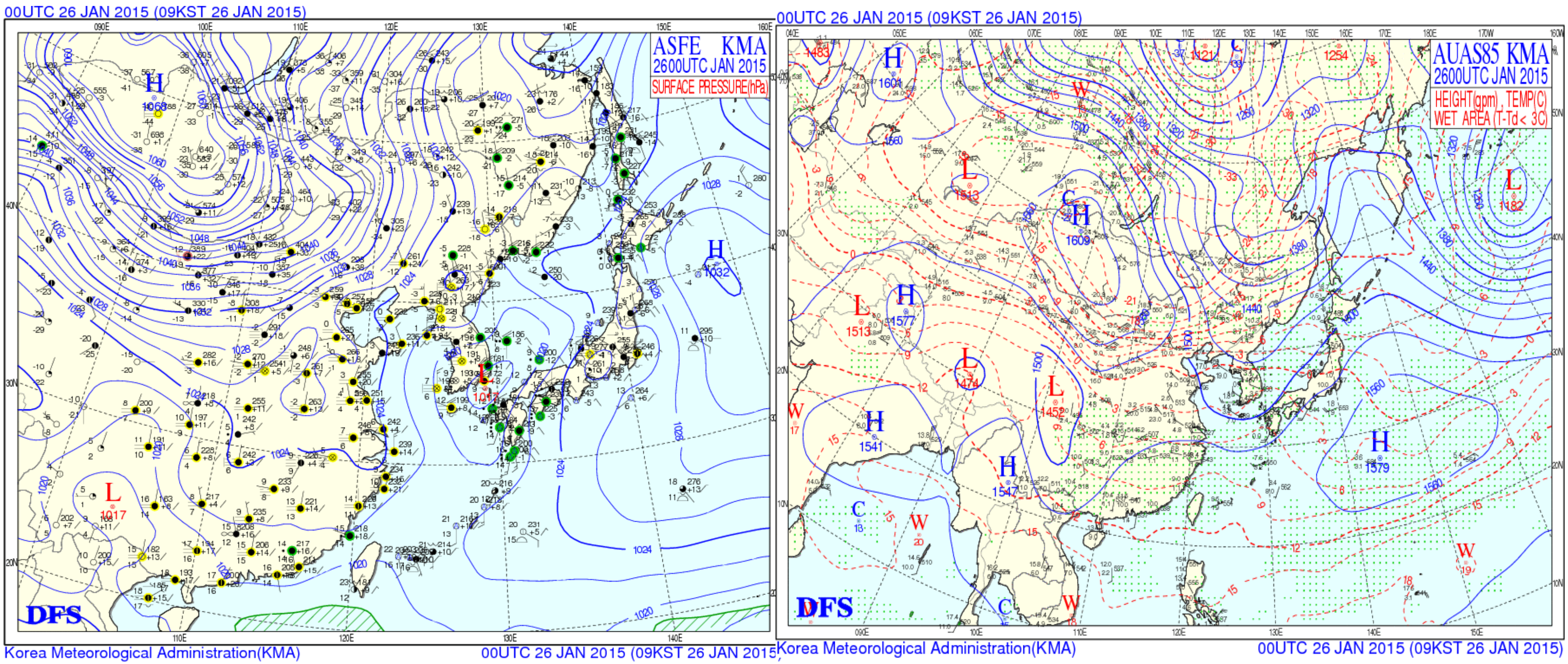


Fig .10. Pressure distribution at 8:00 on 26 January 2015

Results and Discussion

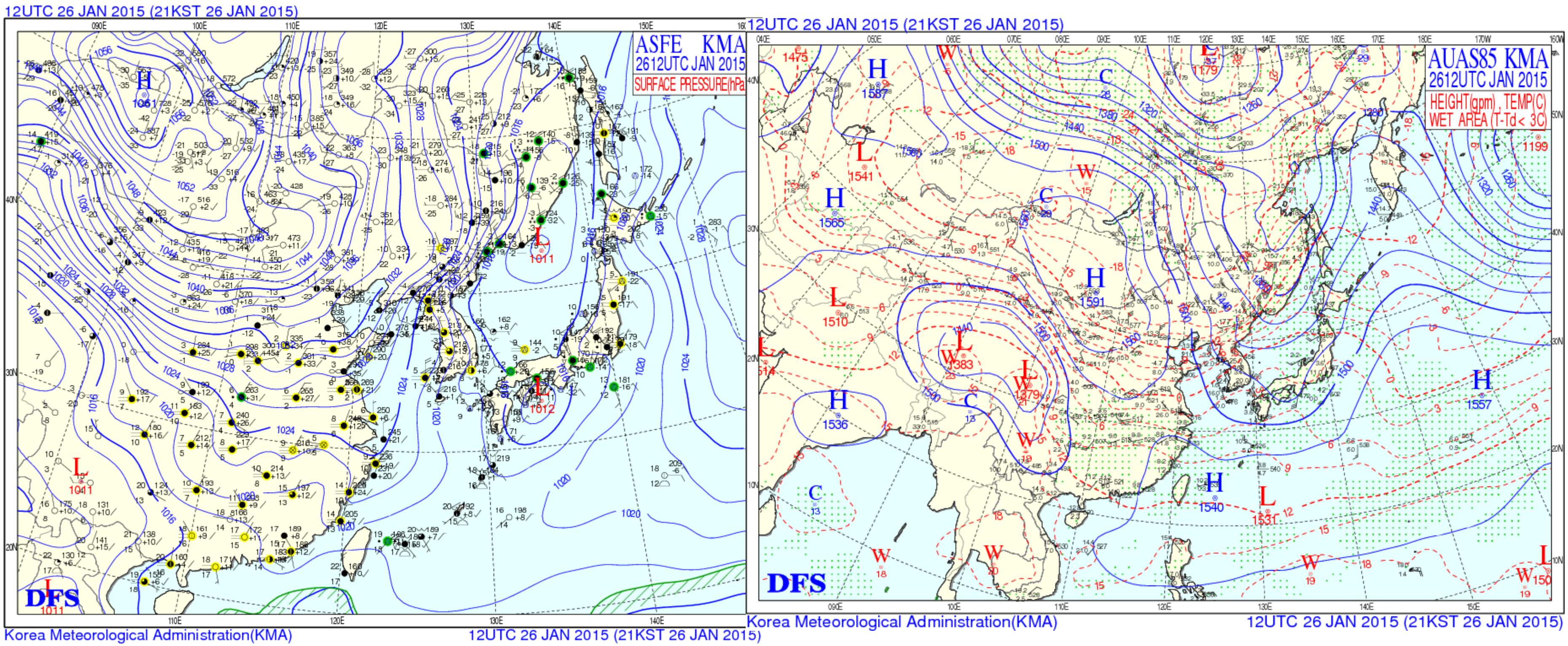


Fig .10. Pressure distribution at 20:00 on 26 January 2015

Conclusion

- The low height of the planetary boundary layer, regional transfer , stationary meteorological condition and local emissions contributed to the haze formation.
- The main reason that caused high concentration of $PM_{2.5}$ is different in different haze event.
- The concentration of $PM_{2.5}$ and PM_{10} has a significant diurnal variation. Peak value appeared at 10:00 and 17:00, respectively.

Thank you