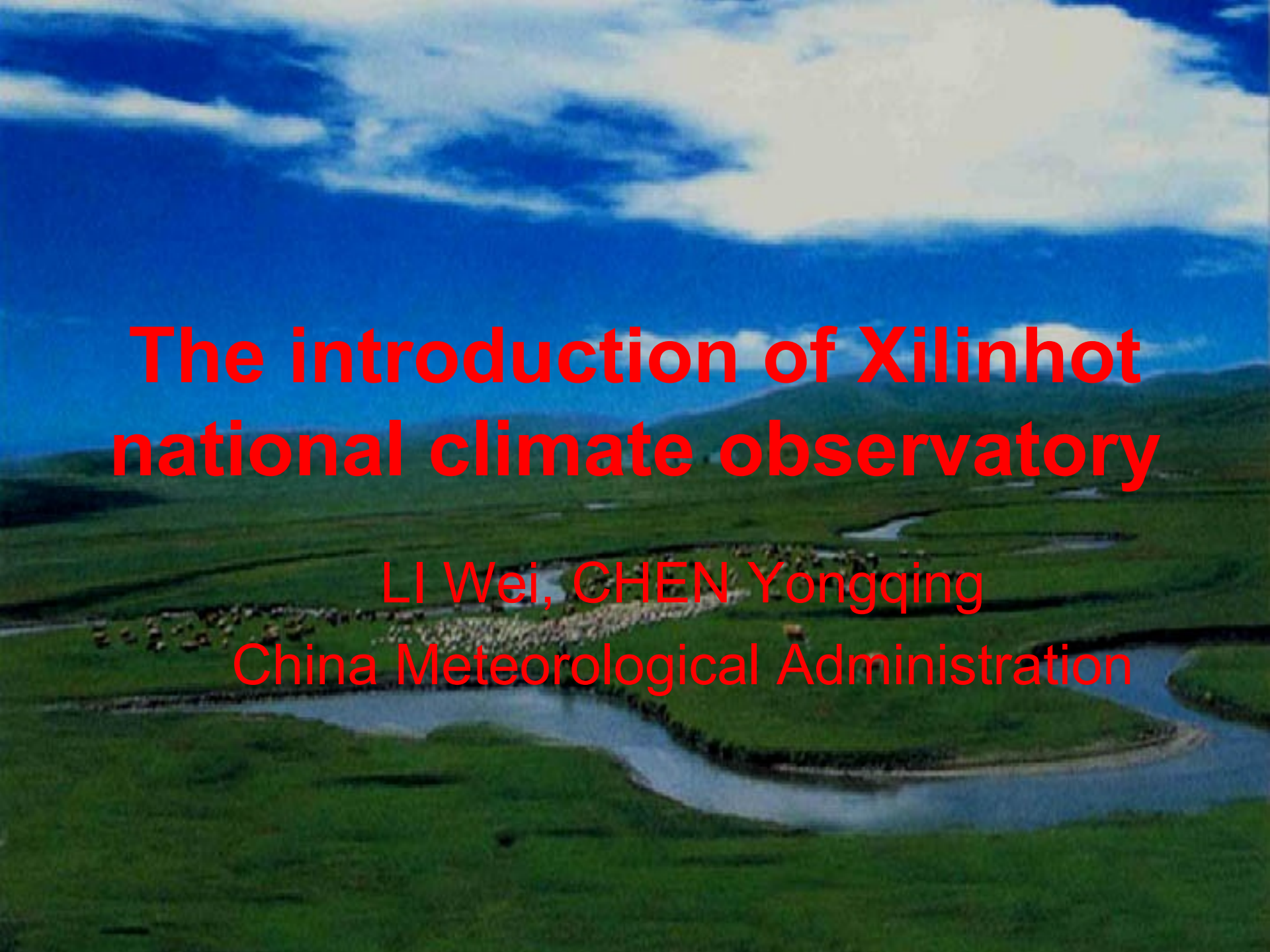
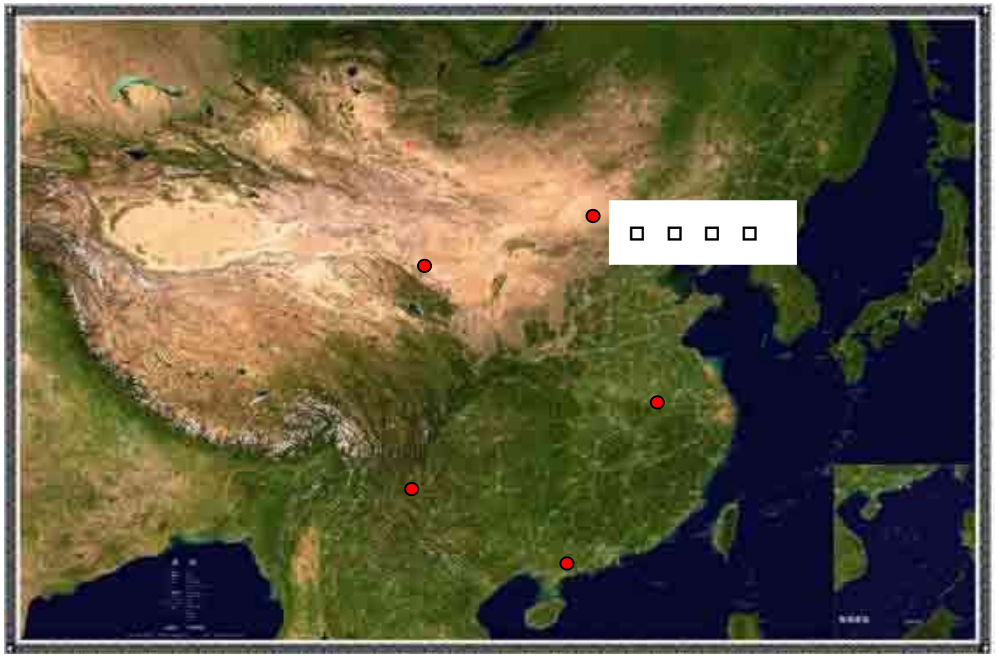


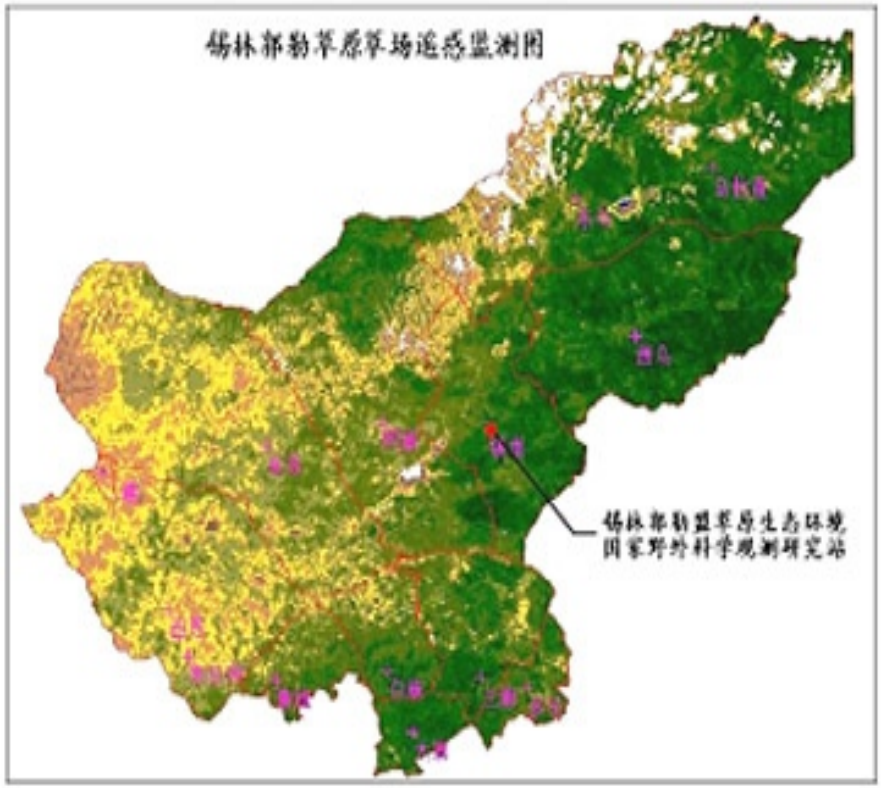
The introduction of Xilinhot national climate observatory

LI Wei, CHEN Yongqing
China Meteorological Administration

Basic information

- WMO code :54102
- Latitude:43.95°N
- Longitude:116.12°E
- Sea level altitude:1013m

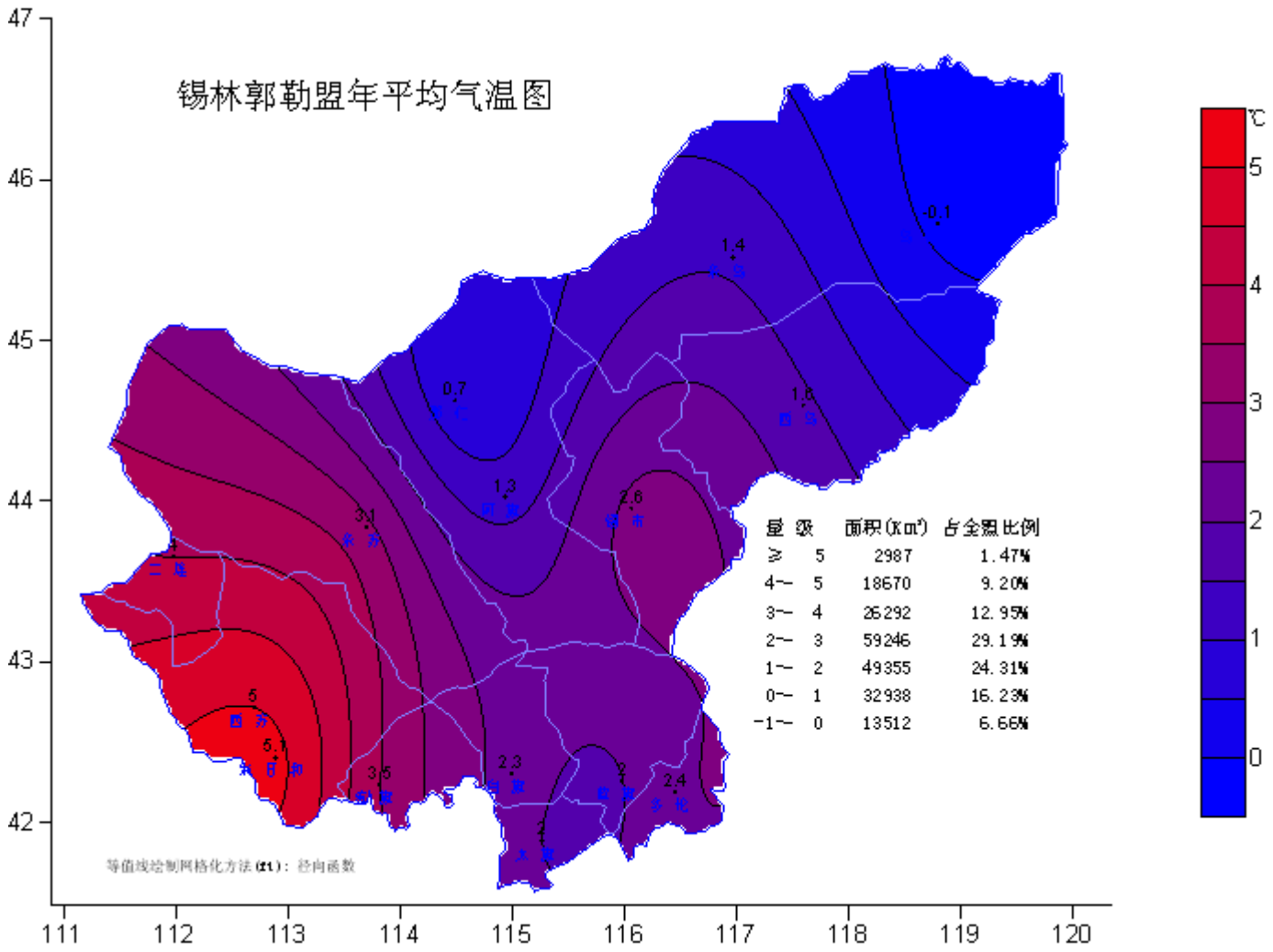



锡林郭勒草原草场遥感监测图
锡林郭勒盟草原生态环境
国家野外科学观测研究站

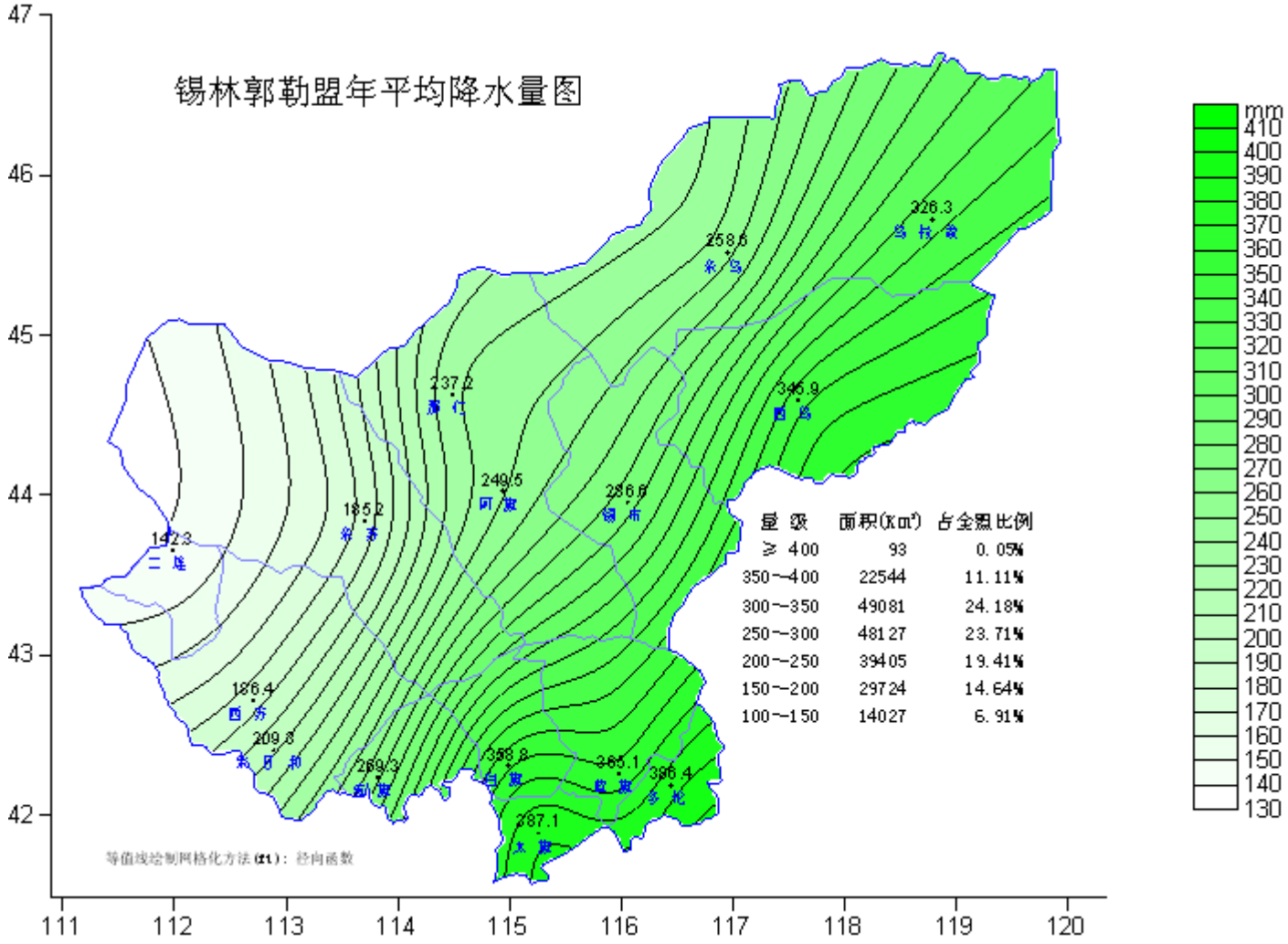
Station description

- Land use
  - Grassland / cropland:85%, open water: 8%, settlements:8.5%
- Climate
  - Typical warm semiarid continental climate , long winter, four seasons separated clearly.
  - The main climate characters: gale, drought and frigid weather.

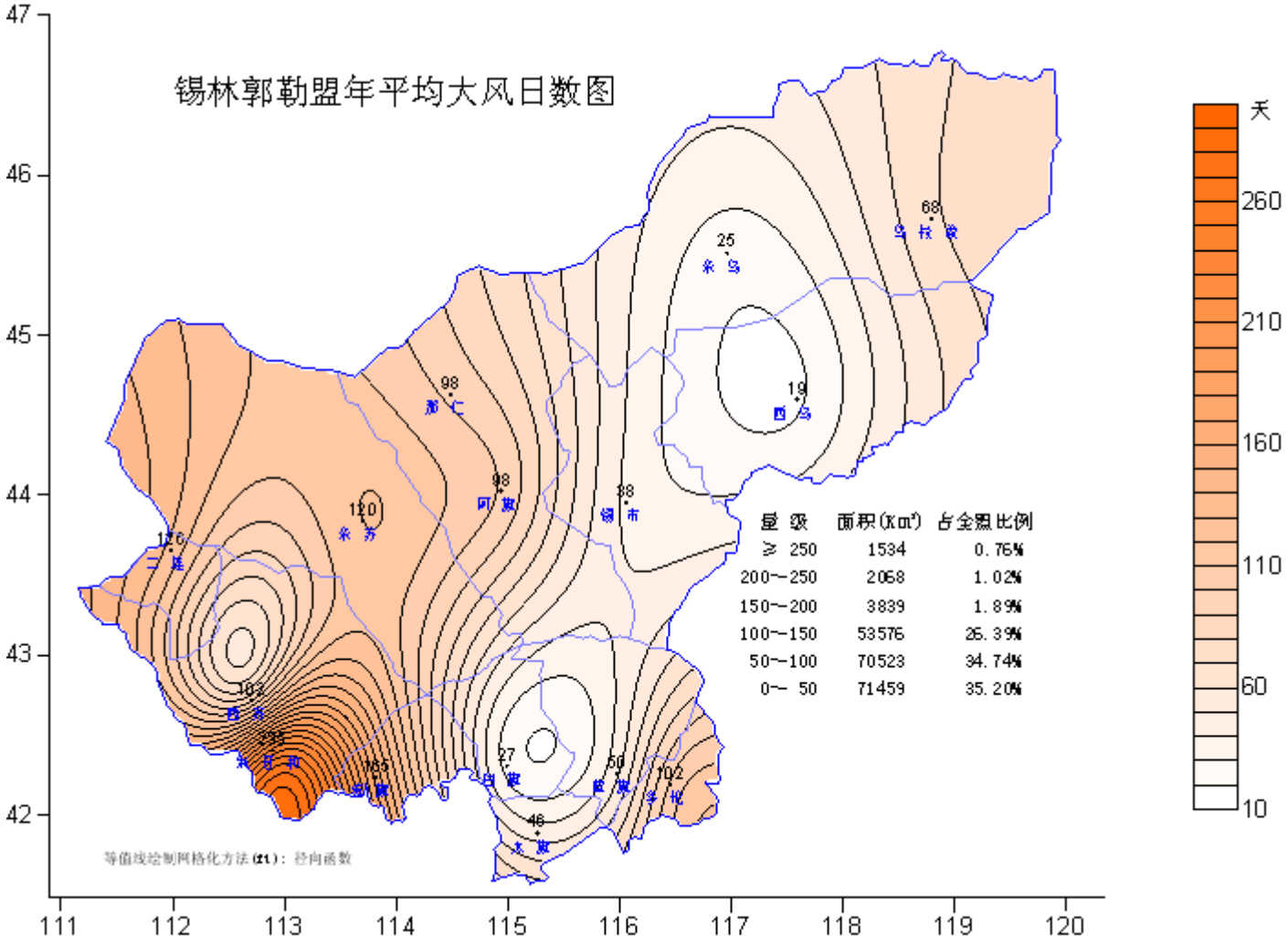
Yearly mean temperature



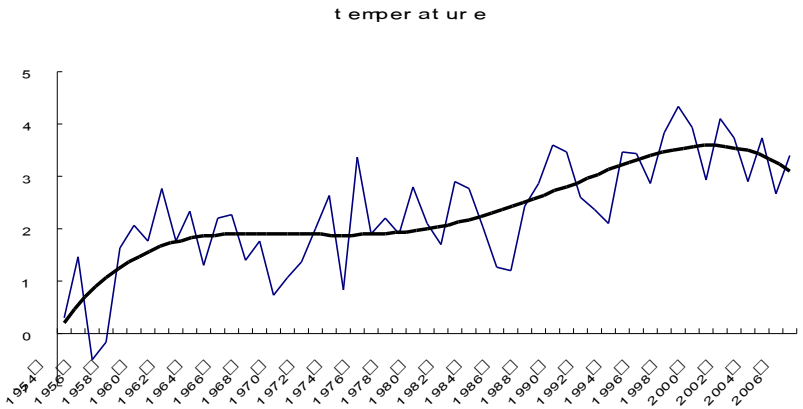
Yearly mean precipitation

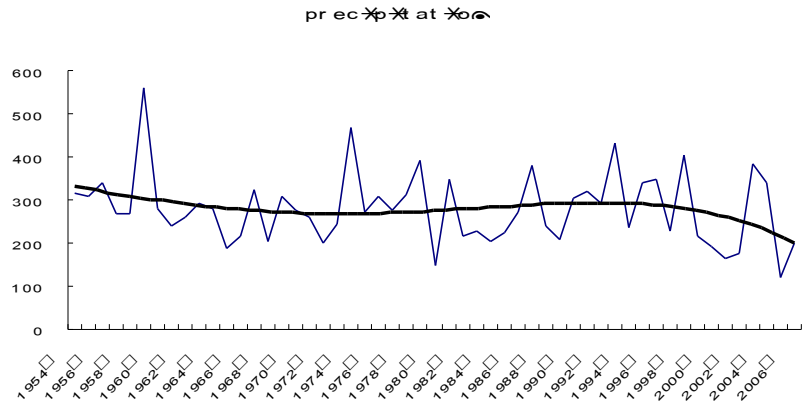


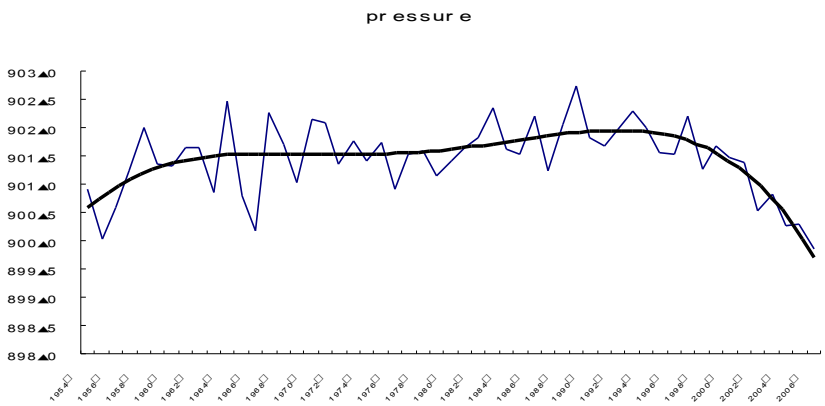
Yearly mean gale days

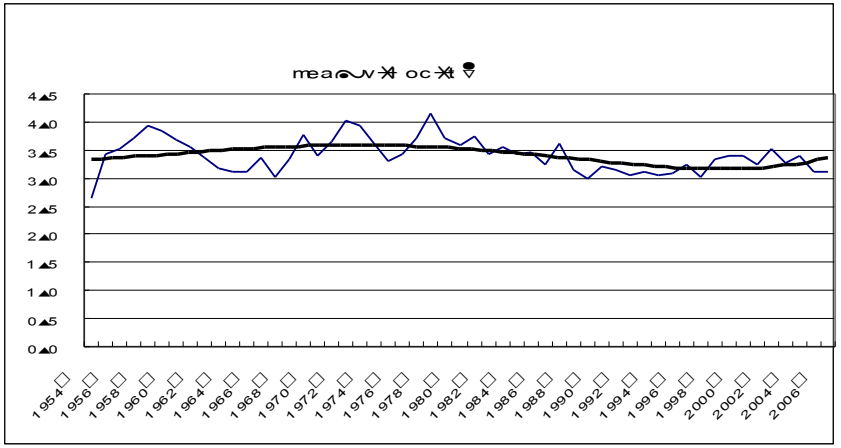


The trend of main climate parameters





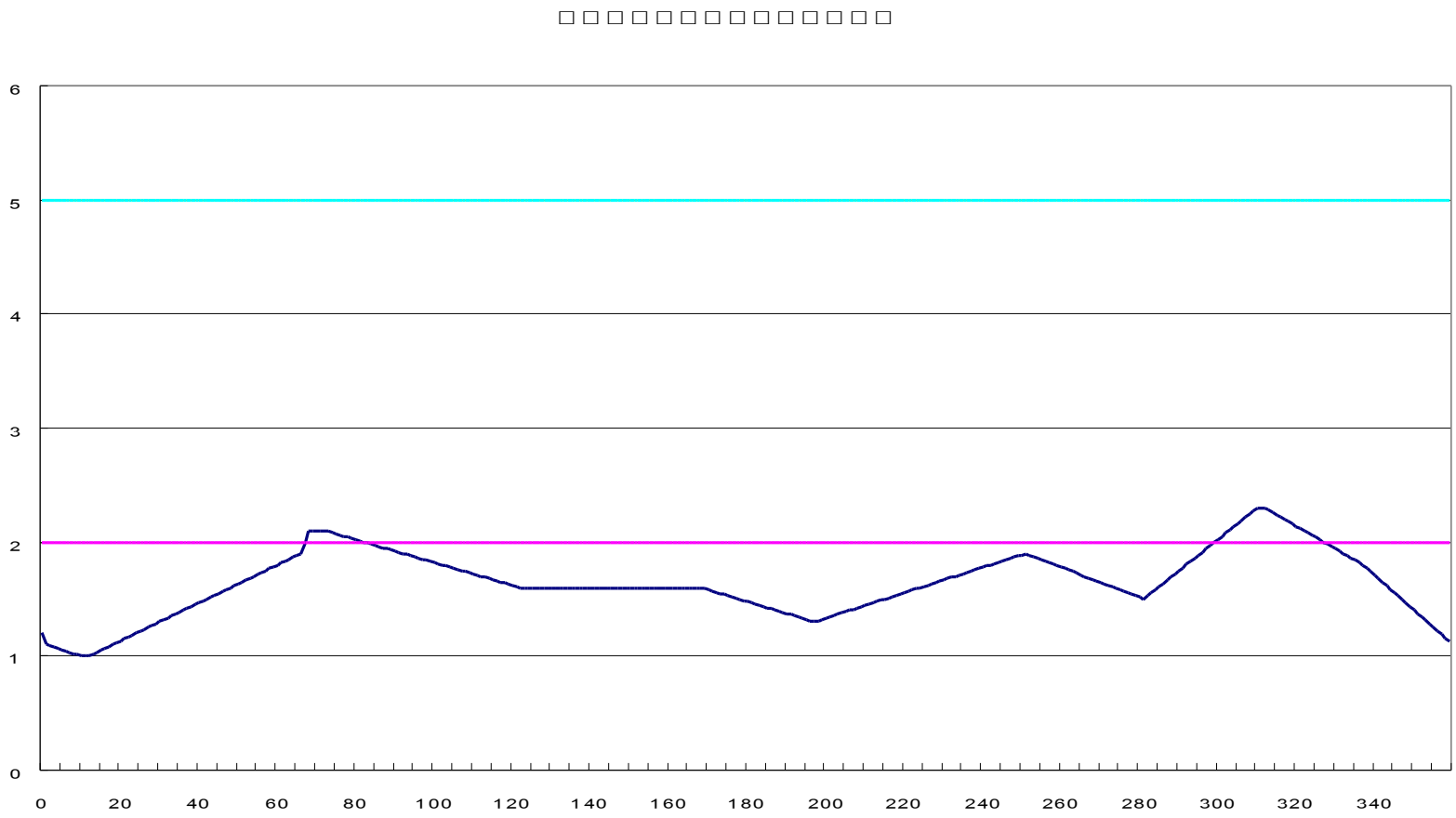




Troposphere characteristics

Season	Mean top height (m)	Mean lowest temperature (□)
Winter	9085	-65.3
Spring	10700	-70.6
Summer	11483	-61.0
Autumn	10491	-67.9

Obstacle angle distribution



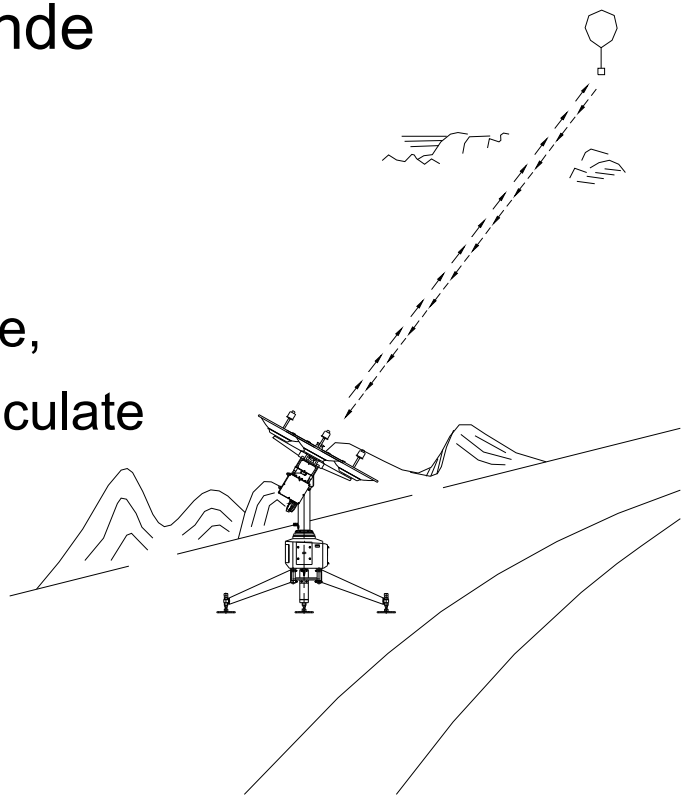
Observation systems

Upper-air observation history

- Built in November of 1954, and carried out the observation work on January 14th, 1955.
- 59-701 mechanical radiosonde was put into operation July 1st,1970.
- GTS1 electronic radiosonde was put into operation in November of 2004.

L band secondary wind-finding system

- Including surface radar and radiosonde
- Surface radar
  - Sending signal to track radiosonde and receiving answer signal from radiosonde, getting radial range and elevation to calculate wind speed and wind direction
  - Receiving signal from radiosonde
- Radiosonde
  - Pressure,temperature,humidity



Radiosonade sensors

- Temperature: clubbed temperature-sensitive resistance sensor
- Humidity: carbon hygristor
- Pressure: solid-state silicon pressure-sensitive resistance

Item	L band meteorological sounding system
Sounding height	Can reach 35km,normal 25-30km
Data sample interval	1.2s
Range precision	20m
Angle precision	0.08 degree
Temperature range	-90 □ 50□
Temperature precision	0.2□
Pressure range	1060 □ 5hpa
Pressure precision	2hpa[8]Above 500hpa[9] 1hpa[8]Below 500hpa[9]
Humidity range	0 □ 100[5]
Humidity precision	5[5] □ Above -25□ □ 10[5] □ Below -25□ □
Wind speed precision	1m[7]s[8]Below 10m[7]s[9] □10[5] [8]Above 10m[7]s[9]
Wind direction precision	5°[8]Above 25m[7]s[9] 10°[8]Below 25m[7]s[9]

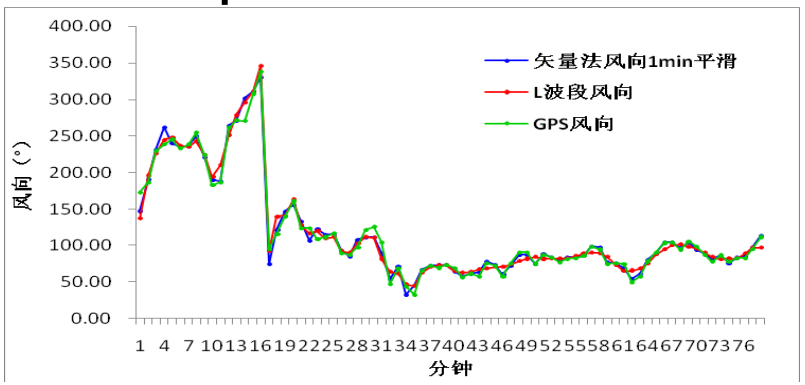
Uncertainty analysis

	Pressure(hPa)				Temperature(□)				Humidity(%)			
	□□□□□	□□□□	RS92□□	L□□□□	□□□□□	□□□□	RS92□□	L□□□□	□□□□□	□□□□	RS92□□	L□□□□□
surface-850hPa	-1.17	0.92	0.27	0.88	0.30	0.26	0.24	0.10	-8.97	8.58	1.68	8.42
850-700hPa	-1.33	0.79	0.25	0.75	0.24	0.20	0.10	0.17	-8.68	11.67	1.15	11.62
700-500hPa	-1.36	0.66	0.21	0.63	0.19	0.32	0.07	0.31	-6.04	4.93	1.00	4.82
500-300hPa	-1.12	0.54	0.17	0.52	0.27	0.23	0.07	0.22	-10.17	7.00	0.90	6.94
300-200hPa	-0.86	0.45	0.13	0.43	0.20	0.26	0.08	0.24	-2.21	12.96	0.79	12.93
200-100hPa	-0.88	0.47	0.10	0.45	0.09	0.25	0.12	0.22	7.85	6.22	0.54	6.20
100-50hPa	-0.91	0.44	0.09	0.43	0.03	0.34	0.08	0.33	7.12	5.37	0.69	5.33
50-20hPa	-0.97	0.44	0.09	0.43	-0.07	0.57	0.14	0.55	6.57	5.72	0.99	5.64
≤20hPa	-1.03	0.35	0.08	0.34	-0.24	0.67	0.21	0.63	3.57	3.65	0.05	3.65
□□□	-1.07	0.59	0.17	0.57	0.11	0.38	0.14	0.35	-1.22	7.92	0.96	7.86

Wind speed	□ □ □ □ □	□ □ □ □	**RS92** □ □	**L** □ □ □ □
0-5m/s	0.3	1.33	0.08	1.33
5-10m/s	-0.36	1.67	0.09	1.67
10-15m/s	-0.94	2.02	0.21	2.01
15-20m/s	-0.48	2.43	0.14	2.42
>20m/s	-0.33	1.48	0.06	1.48

Wind direction	□ □ □ □ □	□ □ □ □	**RS92** □ □	**L** □ □ □ □
0-5m/s	-1.43	39.15	4.88	38.84
5-10m/s	-1.2	16.7	0.84	16.68
10-15m/s	-1.15	14.22	0.77	14.2
15-20m/s	-0.83	13.03	0.47	13.02
>20m/s	0.76	2.73	0.25	2.71

Wind algorithm comparison

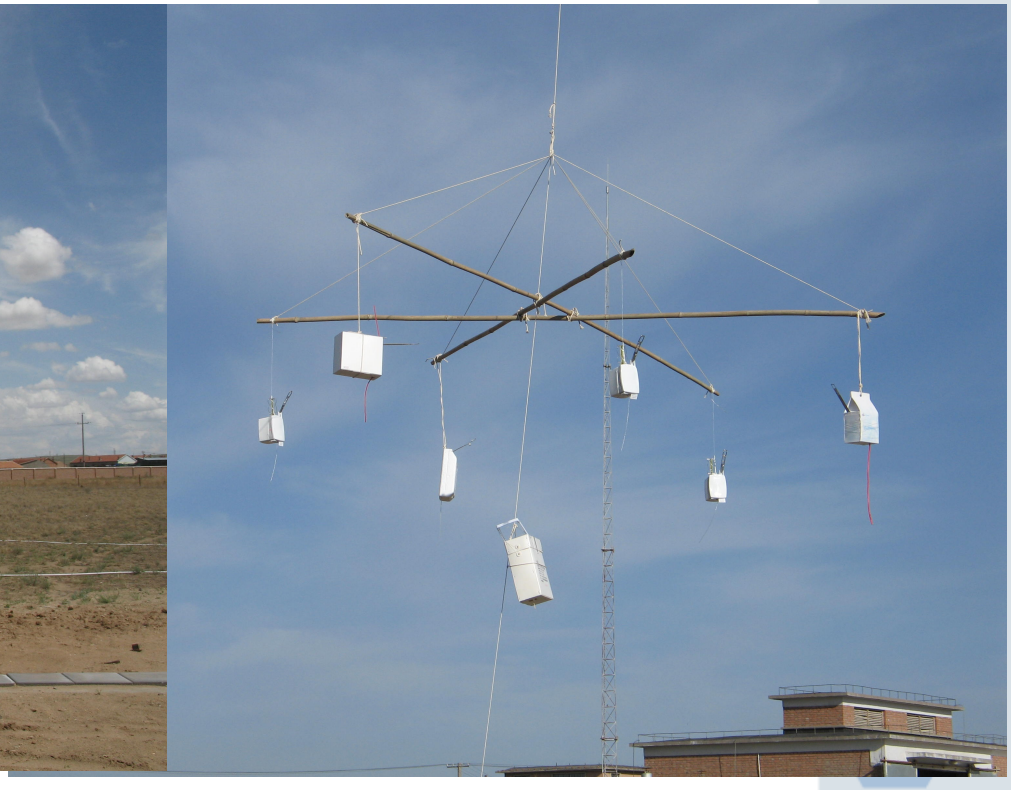


Wind speed	□□ GPS					
	□□□□□			□□□□□		
	X1	*X2*	*X3*	*X1*	*X2*	*X3*
1min □□	0.84	1.01	1.00	-0.18	-0.07	0.02
30s □□	0.77	0.94	1.01	-0.17	0.08	-0.08
10s □□	1.80	1.96	2.14	0.09	0.30	0.38
L □□	2.00	1.73	1.87	-0.26	-0.14	-0.07

Wind direction	□□ GPS					
	□□□□□			□□□□□		
	X1	*X2*	*X3*	*X1*	*X2*	*X3*
1min □□	7.80	7.83	6.31	-0.08	0.15	0.91
30s □□	28.78	9.49	6.54	-4.64	0.54	2.22
10s □□	33.04	15.64	22.75	-5.82	0.55	-3.00
L □□	14.59	9.77	10.15	0.47	0.53	2.27

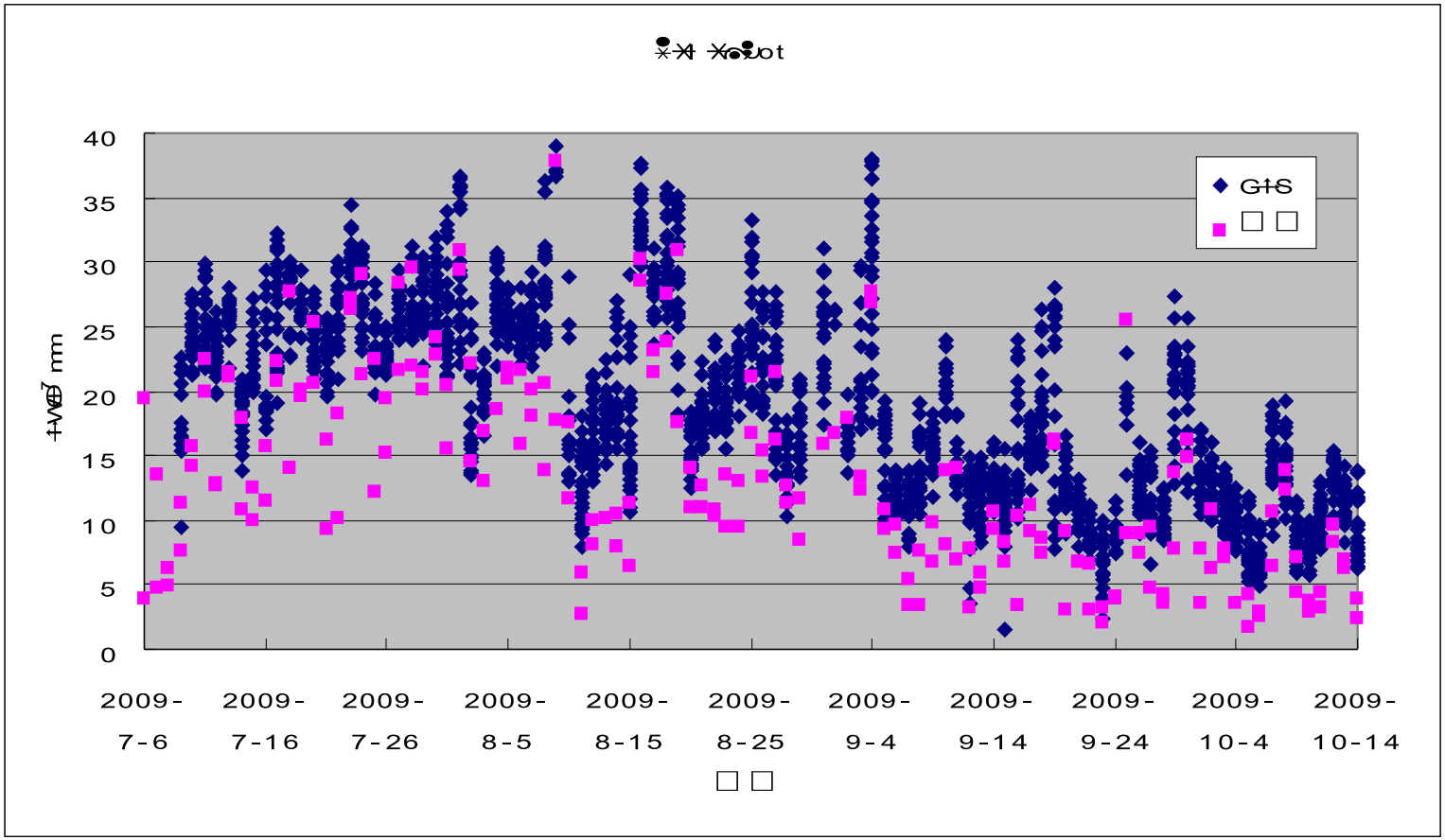
Test for China GPS sounding system

Duo to 2 types for China GPS radiosondes participating in 2010 Yangjiang high quality international radiosonde intercomparison, and it is possible for CMA to choose better one to replace current GTS1 radiosonde.



GPS/MET vapor sensing system

- Absolute error:<3mm
- Compared to upper-air relative humidity, 2-3 staff will be responsible for the comparison



Bias:4.4mm
Deviation:3.1mm

Operational Automatic weather station

- **Air Temperature**
- **Soil temperature**
- **Relative Humidity**
- **Pressure**
- **Wind Direction**
- **Wind Speed**
- **Precipitation**
- **Sunshine**
- **Evaporation**
- **Global Radiation**
- **Net Radiation**
- **Direct Radiation**

Item	Range	Resolution	Precision	Average Time	Data Sample Rate
Temperature	-50—+50□	0.1□	0.2□	1min	6 times/min
Relative Humidity	0—100□	1□	4□□≤ 80□□ 8□□ > 80□□	1min	6 times/min
Pressure	500—1100hPa	0.1hPa	0.3hPa	1min	6 times/min
Wind Direction	0°—360°	3°	5°	3s 1min 2min 10min	1 times/s
Wind Speed	0—60m/s	0.1m/s	(0.5+0.03V)m/s (0.3+0.03V)m/s□ Fiducial Station□		
Precipitation	0—4mm/min	0.1mm	0.4mm□≤ 10mm□ 4□□ > 10mm□	Accumulation	1 times/min
Sunshine	0—24h	60s	0.1h	Accumulation	□
Evaporation	0—100mm	0.1mm	1.5□	Accumulation	□
Soil temperature	50□—+80□	0.1□	0.5□ 0.3□ □ Fiducial Station□	1min	6 times/min
Global Radiation	0-1400 W/m²	1W/m²	5□	1min	6 times/min
Net Radiation	-200-1400 W/m²	1W/m²	15□ -20□	1min	6 times/min
Direct Radiation	0-2000 W/m²	1W/m²	2□	1min	6 times/min

Automatic climate observation station

- Three temperature sensors
  - Steady and high precision
  - In screen and ventilation radiation shield
- two precipitation sensors
  - Liquid and solid precipitation
  - Bucket-tip and weight
- Two surface temperature sensors
  - Platinum and infrared remote sensing
- Solar global radiation

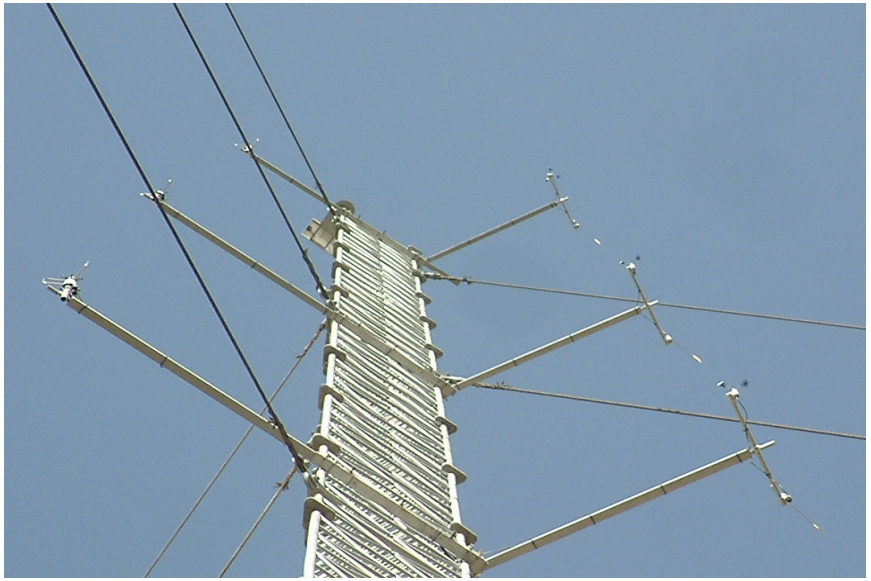
Item	Range	Resolution	Precision	Data Sample Rate	Average Time
Air Temperature	-50 □ 50 □	0 ◢ □	□0 ◢2 □	30 7m ✳	5 m ✳
Surface Temperature	-50 □ 80 □	0 ◢ □	-50 □ 50 □ □ □0 ◢2 □ 50 □ 80 □ □ □0 ◢5 □	30 7m ✳	5 m ✳
Wind Speed	0 □ 60 m·s-1	0 ◢ m·s-1	□8 0 ◢5 ▽ 0 ◢0 3 ⊕ 9 m·s-1	60 7m ✳	2 m ✳ □ 10 m ✳ □ 1 ;
Precipitation	Bucket-type 0 □ 4 mm 7m ✳	0 ◢ mm	□0 ◢4 mm 8≤ 10 mm 9 □4 5 8 □ 10 mm 9	17m ✳	
	Weight	0 ◢ mm	0 ◢ 5 ≡S		
Global Radiation	0 □ 2000 W·m-2	5 W·m-2	□5 5 8 daily accumulation 9	67m ✳	

Reference radiation

- Short wavelength
  - Global , reflective, diffusive, direct
- Long wavelength
- Ultraviolet radiation
- Photosynthesis effective radiation

100m boundary observation system

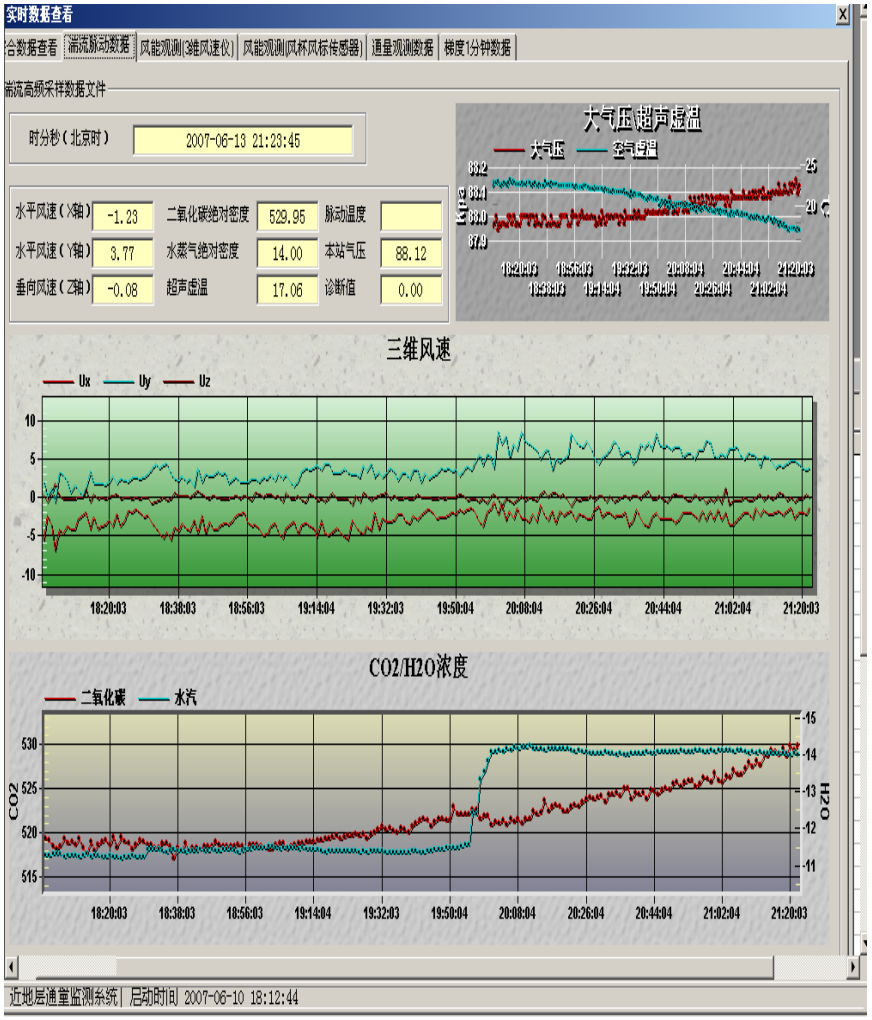
- 0—30m:Gradient observation
  - 2m,4m,10m,20m,30m:temperature,humidity,wind speed
  - 10m: wind direction
- 50—100m:wind energy observation
  - 50m,70m,100m: 3 dimension ultrasonic wind measurement, wind speed and wind direction

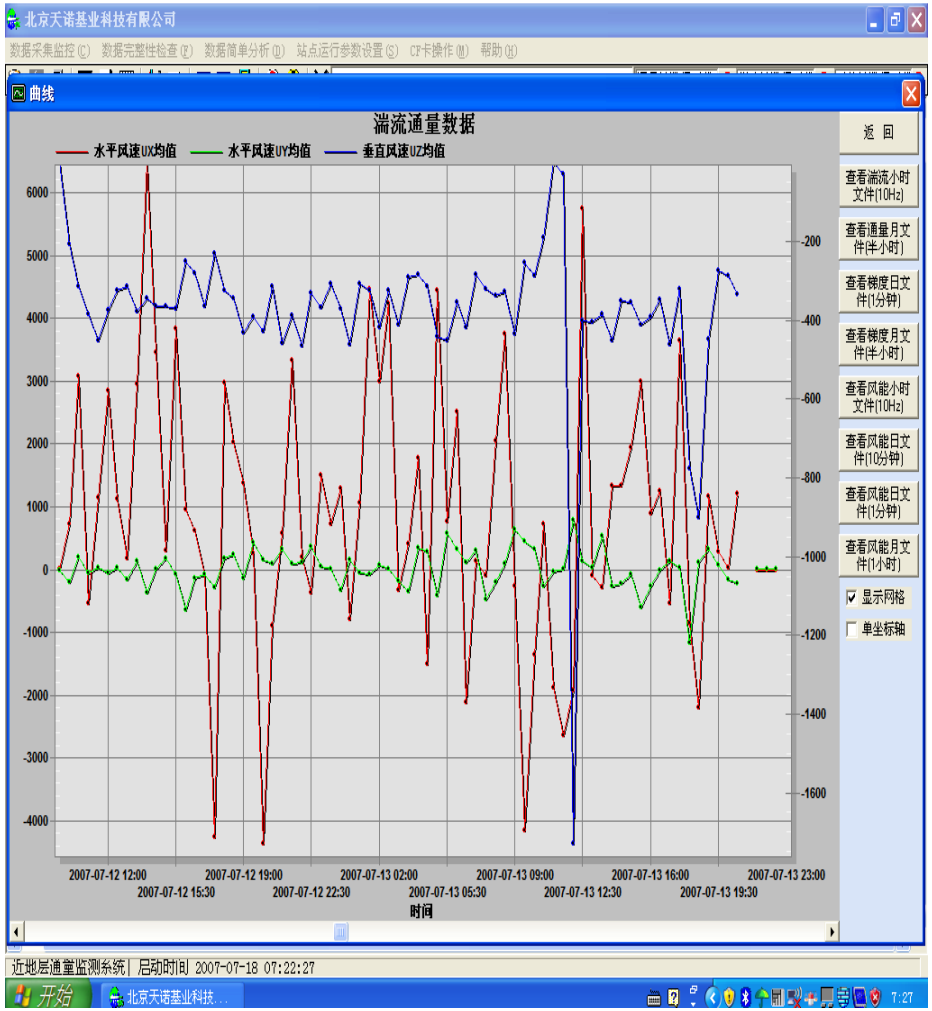


Near surface flux observation

- **Vorticity correlation observation**
- **5cm,10cm,15cm,20cm,40cm: soil temperature observation**
- **10cm,20cm,50cm,100cm,180cm: soil humidity observation**

Turbulence pulse observation





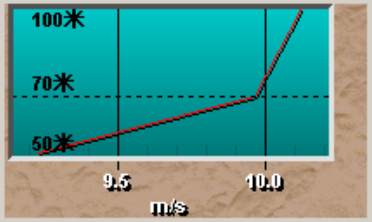
实时数据查看

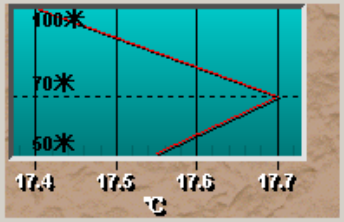
合数据查看 | 湍流脉动数据 | 风能观测(3维风速仪) | 风能观测(风杯风标传感器) | 通量观测数据 | 梯度1分钟数据

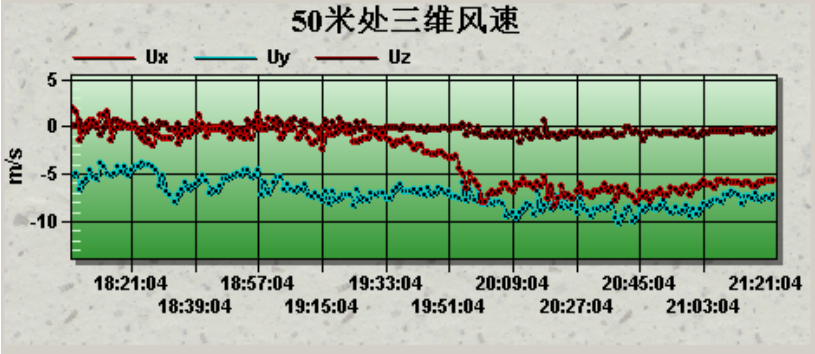
三维超声风温仪高频数据文件

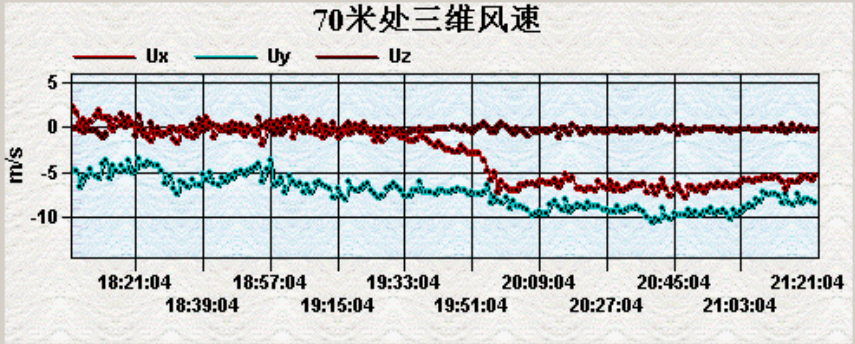
时分秒（北京时） 2007-06-13 21:24:46

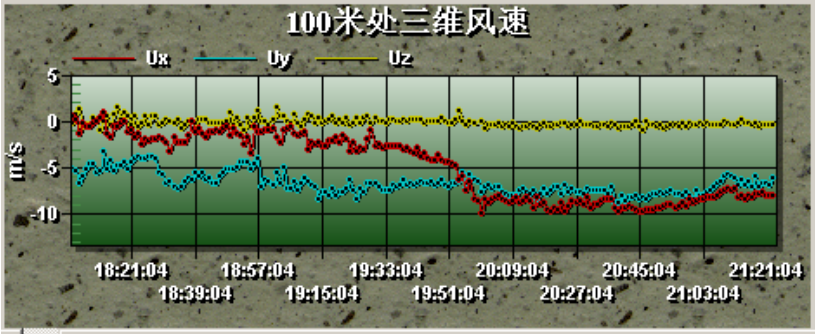
	50米	70米	100米
水平风速(X轴)	-5.76	-5.44	-8.02
水平风速(Y轴)	-7.21	-8.35	-6.18
垂向风速(Z轴)	-0.36	-0.43	-0.47
超声虚温	17.55	17.70	17.40
传感器诊断值	0.00	0.00	0.00

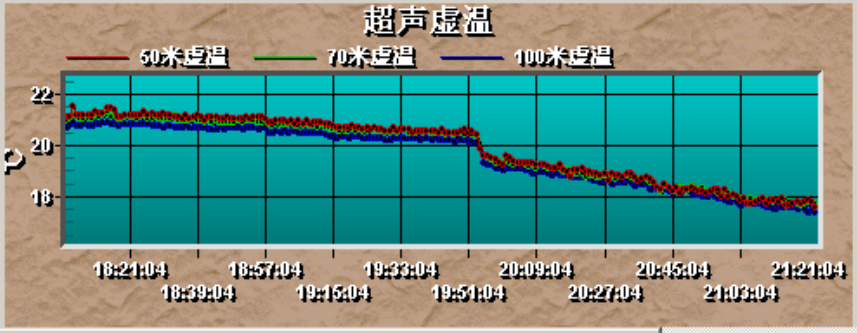












近地层通量监测系统 | 启动时间 2007-06-10 18:12:44

Concerned issues

2. Which ground based measurements can you provide in addition to the mandatory GPS total water vapour column (microwave, FTIR, lidar) and how can you use these additional observations to make sure that measurement uncertainty estimates will be consistent?

GPS receiver for integrated water vapor is in operation since 2008, we have carried out the comparison between GPS/MET integrated water vapor and radiosonde humidity, and 2-3 staff will be responsible for the comparison.

Can the uniform evaluation procedure be provided?

4. Do you have any limitations regarding the development of uniform GRUAN data processing schemes for remote sensing observations?

There should be no limitations.

But it will need the relevant manufacturers help, so it is suggest that the uniform data format should be provided early.

7. For remote sensing observations: Will you be able to archive all raw data for possible future reanalysis and reprocessing?

It depends on CMA data policy.

We need to know which kind of remote data, then we will consult with relevant department of CMA and make the decision. So we suppose that GRUAN should provide the lists of remote data category firstly.

8. What help do you need from the Lead Centre / WGARO / GCOS Secretariat in moving forwards?

1)The recommendation for reference sonde
2)The mandatory requirements for sonde comparison launch such as fixed launch time
3)The uniform data format for both sonde and remote sensing instrument
4) The recommendation lists and requirements for remote sensing instrument
5)The uniform data evaluation method.

10. Are there any special infrastructure needs that should be addressed?

Currently there is no stratospheric water vapour observation, it is supposed that help should be needed from GRUAN committee. And we want to know requirements for reference sonde, and what kind of sonde can be used as reference sonde? Are there any recommendations for reference sonde from GRUAN committee?

Thanks for your attention