



Analysis of the Characteristics of Dust Event Occurred in Hexi Corridor, China

Wu ZHANG¹ Qingyun ZHAO² Jianping Huang¹

¹ Key Laboratory for Semi-Arid Climate Change of the Ministry of Education ,
Lanzhou University, Lanzhou, 730000, China

² Lanzhou Central Meteorological Observatory, Lanzhou 730020, China

wzhang@lzu.edu.cn

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Outline

- *Introduction of SACOL*
- *Dust Events in Hexi Corridor, China*
- *Cases of Dust Events*



■ Introduction of SACOL

- ◆ Arid and Semi-Arid areas comprise about 30% of the Earth surface.
- ◆ Changes in climate and climate variability likely will have a significant impact on these regions. The semi-arid region over Northwest China is a special semi-arid land surface and part of the dust aerosol sources.



■ Introduction of SACOL

- To better understand and quantify human-induced climate effect, more comprehensive observatories and international cooperation are required.
- A variety of global climatic observation networks have been established recently to characterize the physical and chemical properties and processes of aerosols. (*BSRN*, *AERONET*, *MPLNET*, and so on)

BSRN-Baseline Surface Radiation Network

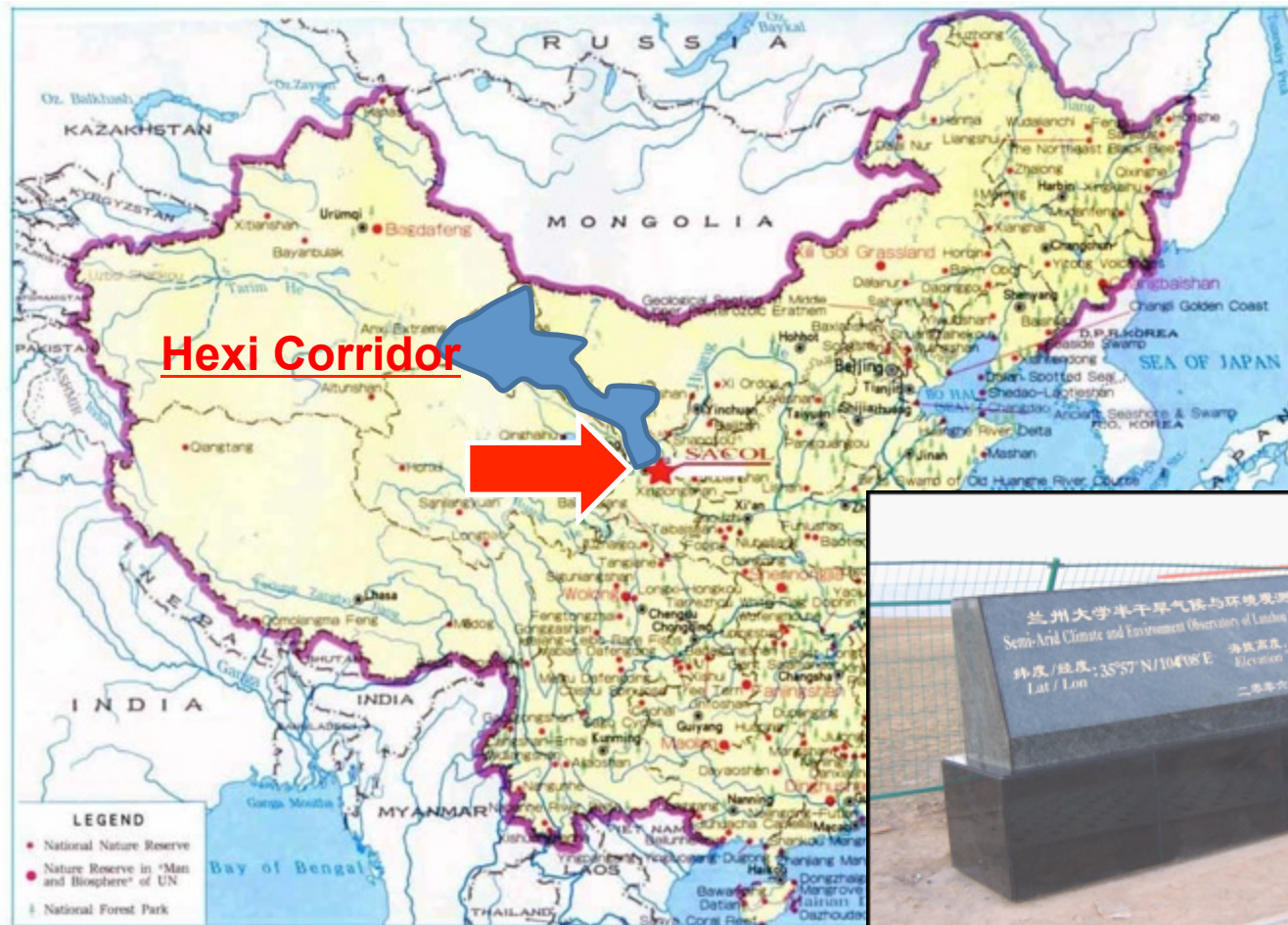


■ Introduction of SACOL

- However, there are few such observation sites over Loess Plateau---a special semi-arid land surface and part of dust aerosol source.
- To fill the gap, improve understanding and capture the direct evidence of the impact of human activities on the semi-arid climate over the Loess Plateau, Semi-Arid Climate and Environment Observatory of Lanzhou University-SACOL was established in 2005.



Introduction of SACOL



Map of SACOL's location.



■ Introduction of SACOL

Climatology and Environment

Climate and Environment:

Geography location:

35.95N /

104.14E

Elevation: 1965.8 m

Land Cover: moderation

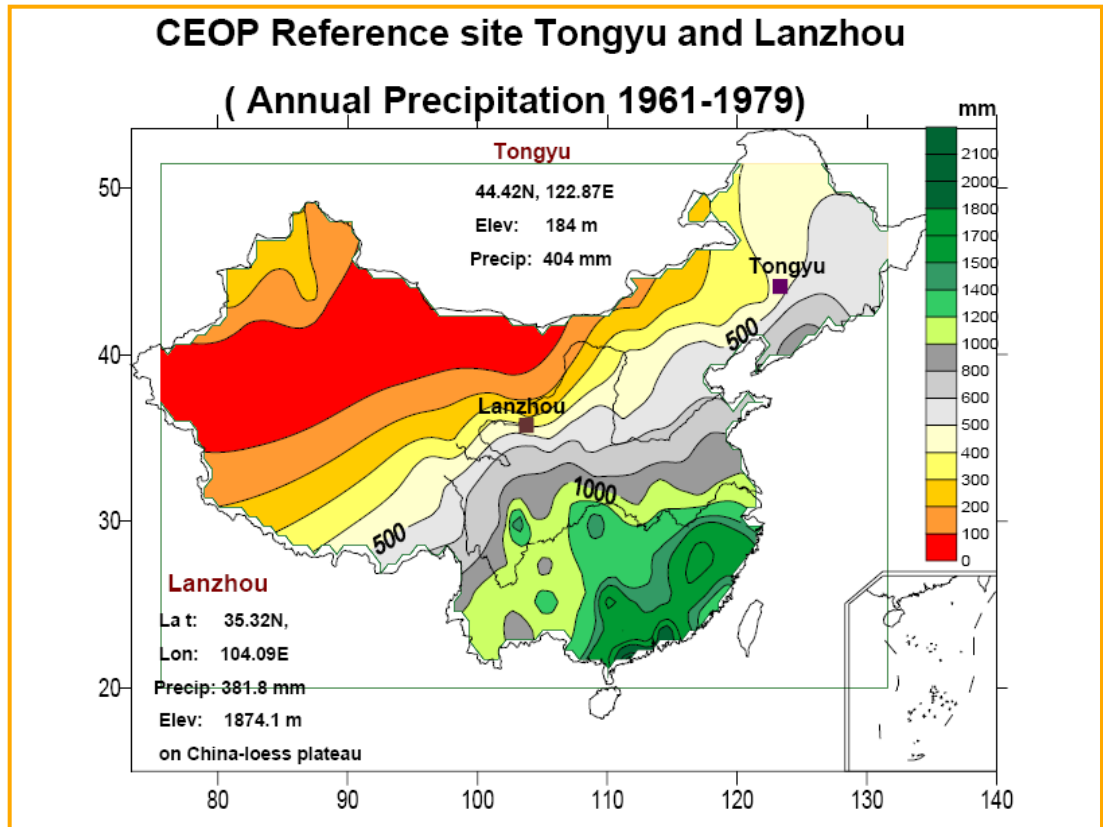
Annual Mean Parameters:

Precipitation: 381.8 mm

Evaporation: 1528.5 mm

Wind Speed: 1.6 m/s

Sunshine hours: 2607.2 h



Huang, J. P., W. Zhang, J. Q. Zuo, J. R. Bi, J. S. Shi, X. Wang, Z. L. Chang, Z. W. Huang, S. Yang, B. D. Zhang, G. Y. Wang, G. H. Feng, J. Y. Yuan, L. Zhang, H. C. Zuo, S. G. Wang, C. B. Fu, and J. F. Chou, 2008: An overview of the semi-arid climate and environment research observatory over the Loess Plateau. *Adv. Atmos. Sci.*, 25 (6), 906-921, doi: 10.1007/s00376-008-0906-7.

Introduction of SACOL



■ Introduction of SACOL



■ *Introduction of SACOL*

The major scientific objectives

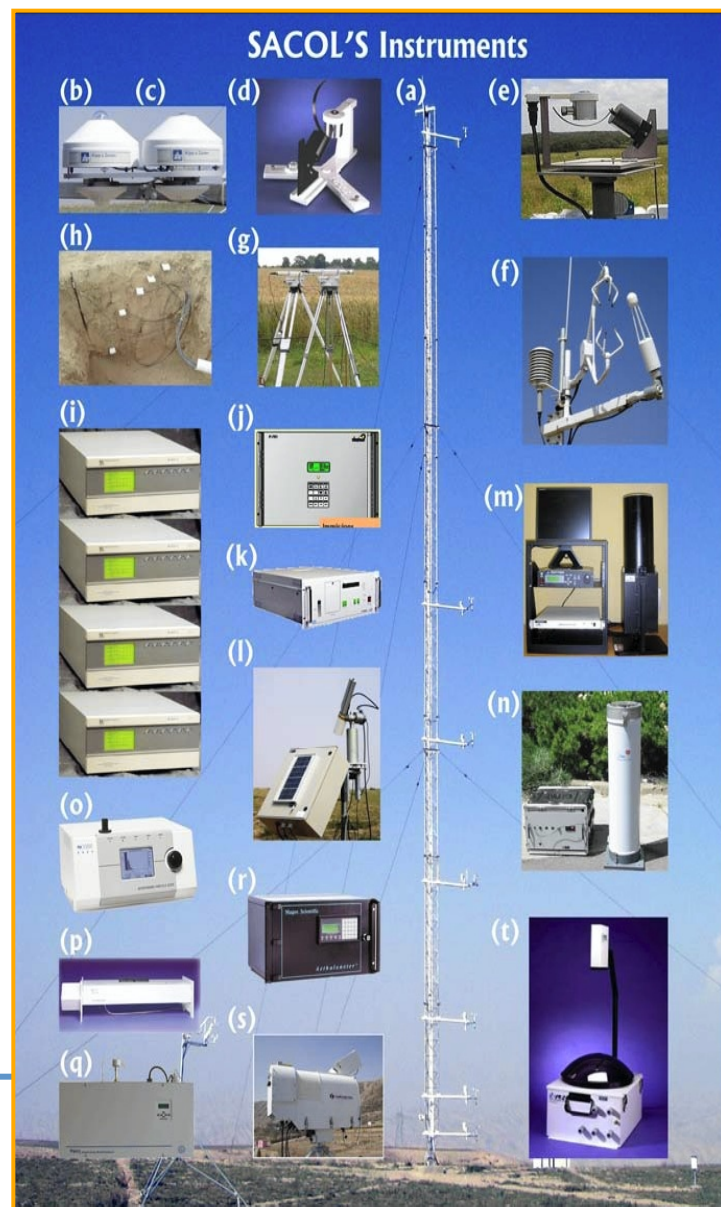
- Monitoring of long term tendencies in semi-arid climate changes;
- Monitoring of the Aerosol Effect on water cycle;
- Studies of interaction between land surface and atmosphere;
- Improving the land surface and climate model;
- Validation of space-borne observations.



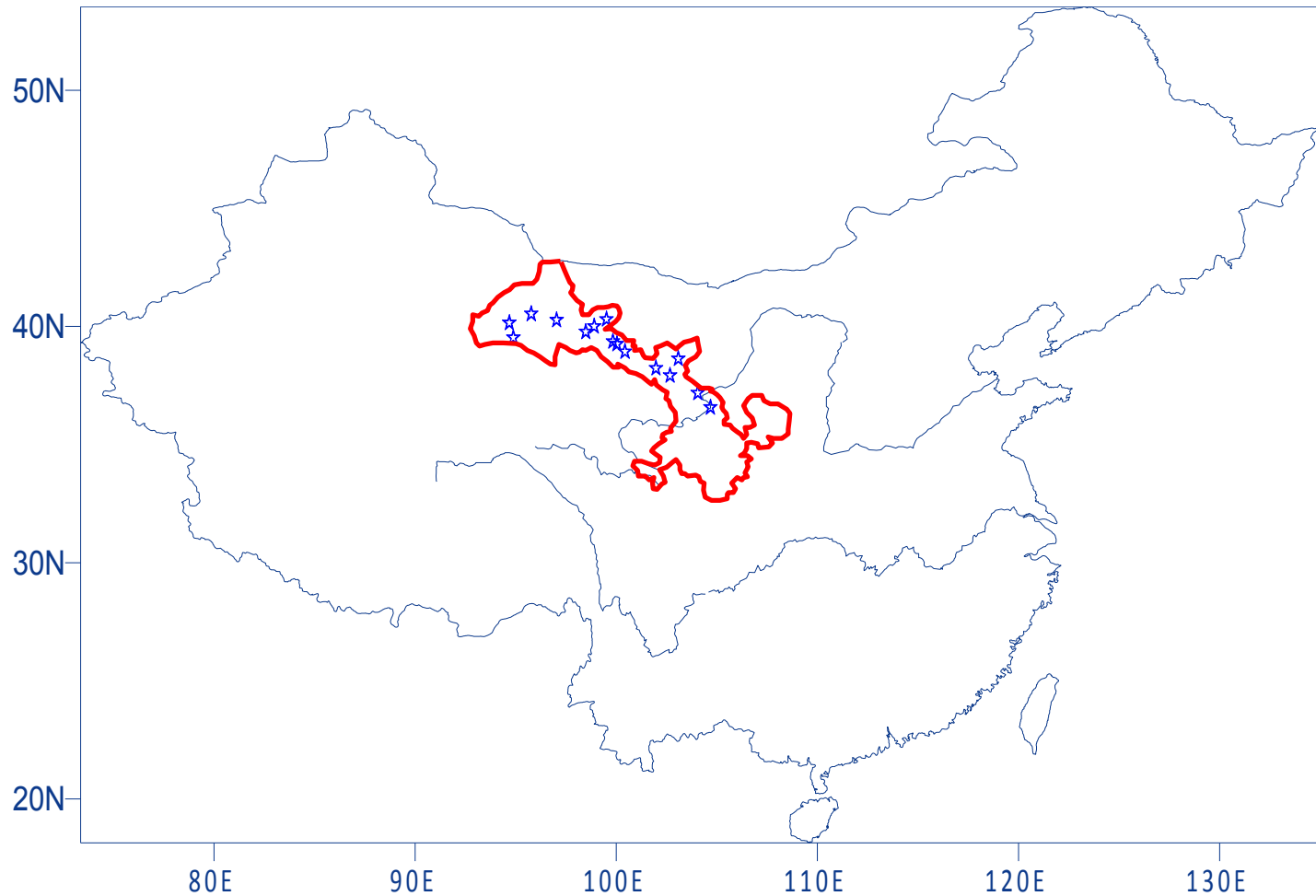
■ Introduction of SACOL

Observatory Facility

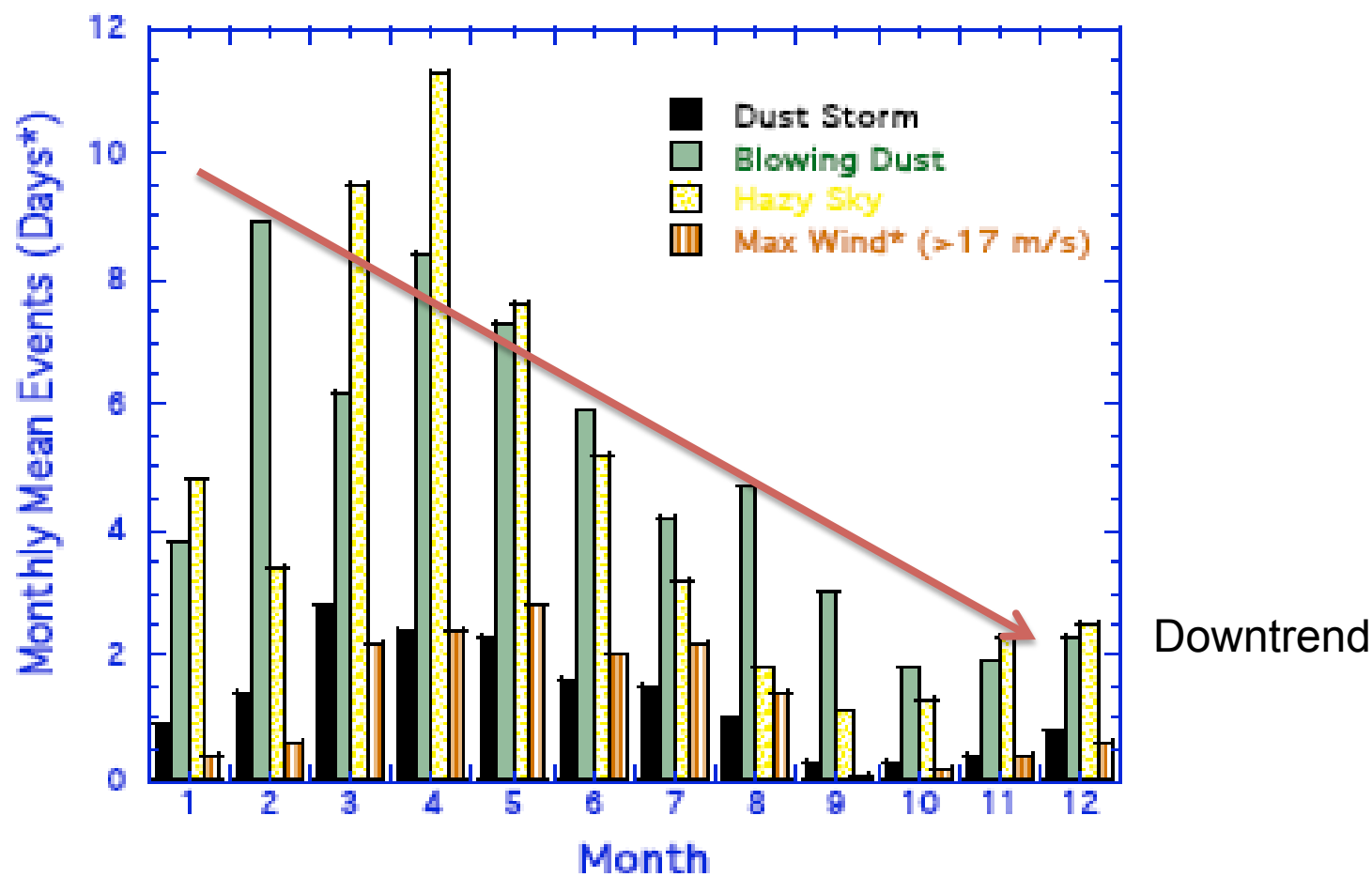
- 1) Boundary layer meteorological parameters (a);
- 2) Surface radiation (b-e);
- 3) Surface fluxes (f, g);
- 4) Soil heat and water moisture (h);
- 5) Ambient air quality (i-k);
- 6) Aerosol optical properties (l-r);
- 7) Temperature and water vapor profiles (s);
- 8) Sky conditions (t)



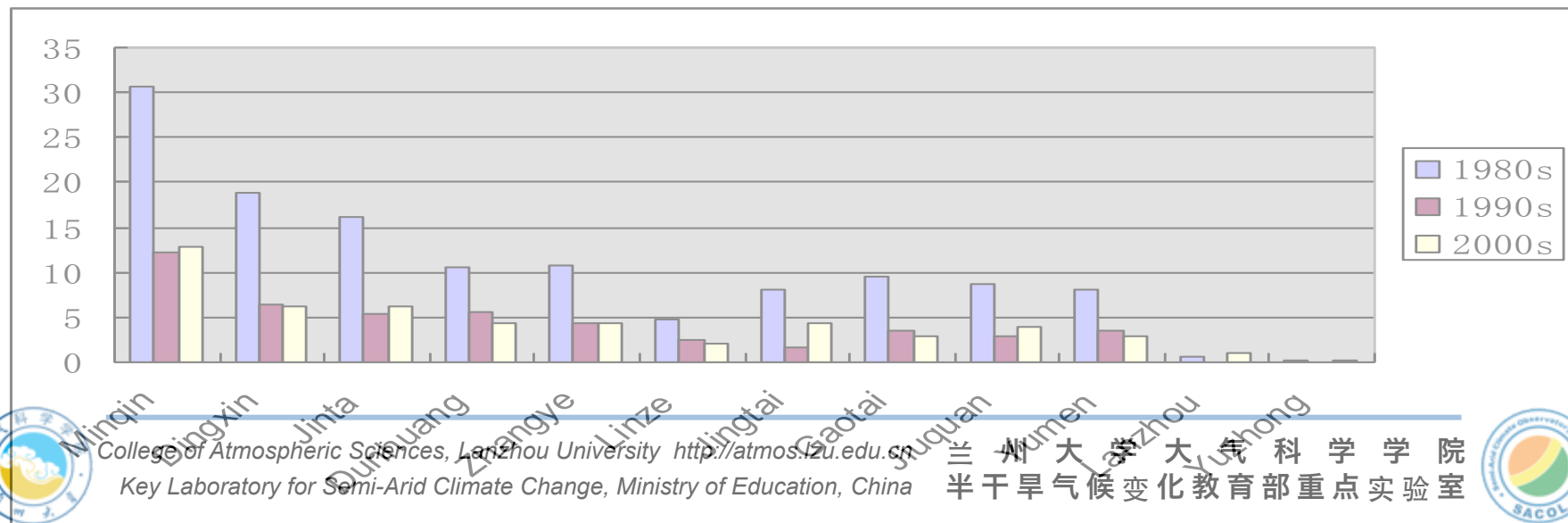
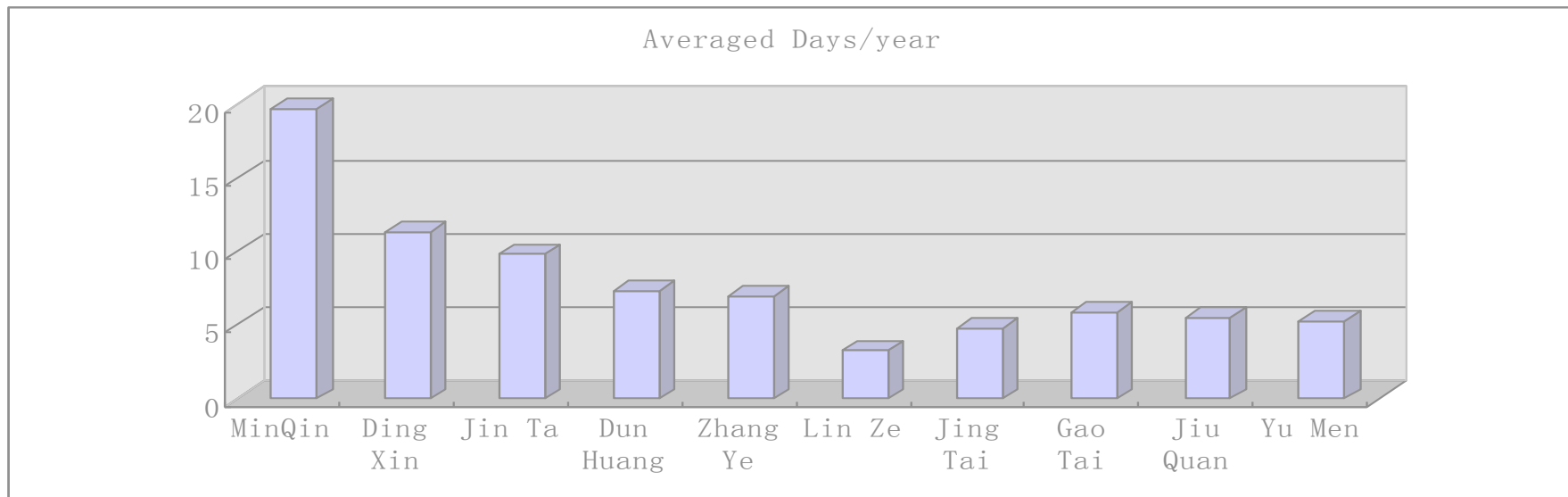
■ *Dust Events in Hexi Corridor, China*



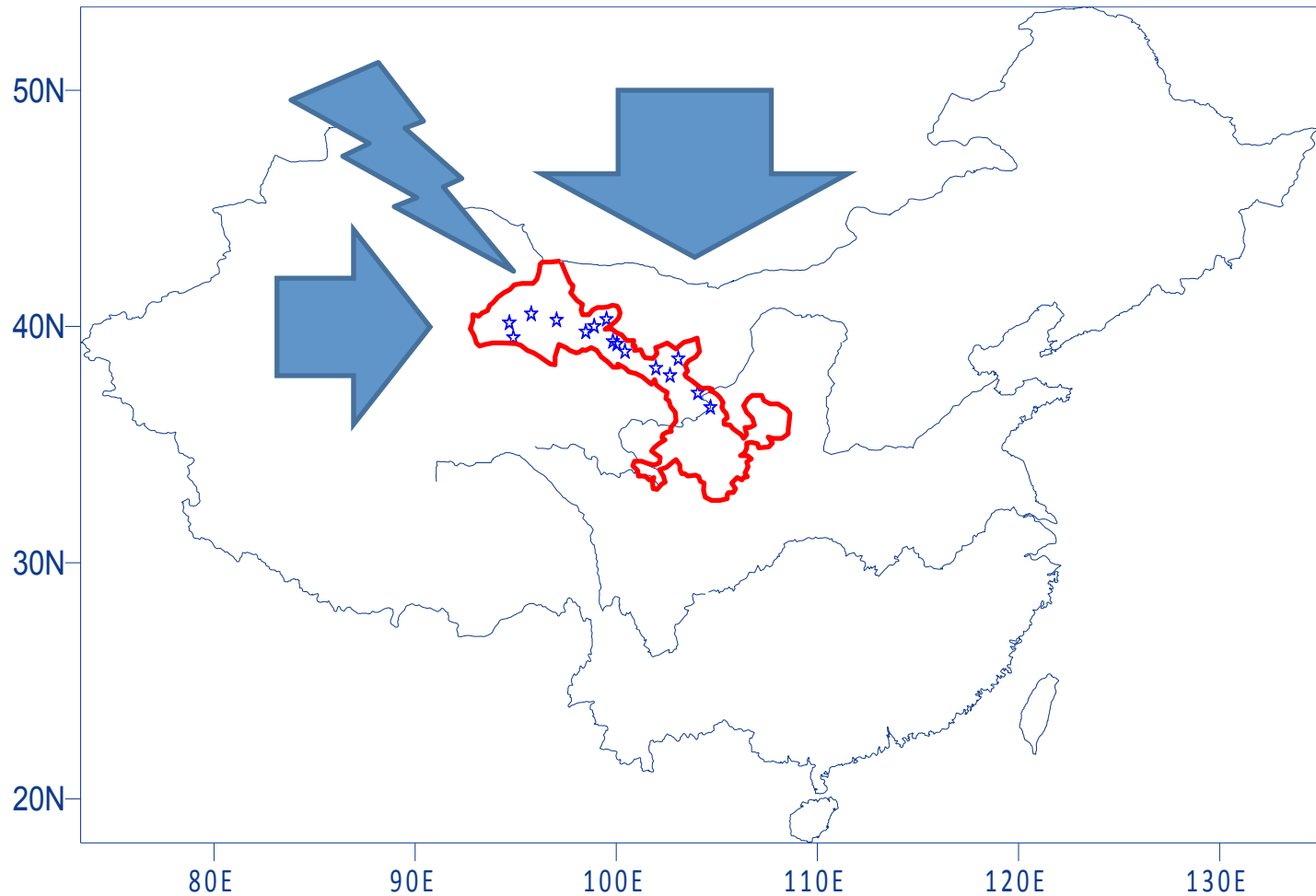
■ *Dust Events in Hexi Corridor, China*



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■ Cases of Dust Events

● China-USA Joint Experiment

In order to study the properties of regional aerosols and their potential climate impact, in spring 2008, a field campaign jointly conducted

by **This marks the first time such comprehensive observations were made in** Sciences, and the Atmospheric Radiation

Measurement (ARM) program of the U.S.

Department of Energy was carried out in

northwestern China.



■ Cases of Dust Events

● China-USA Joint Experiment

Three sites were involved in this campaign, including:

One permanent site at the Semi-Arid Climate & Environment Observatory of Lanzhou University (SACOL) located in Yuzhong, 35.95°N / 104.1°E ;

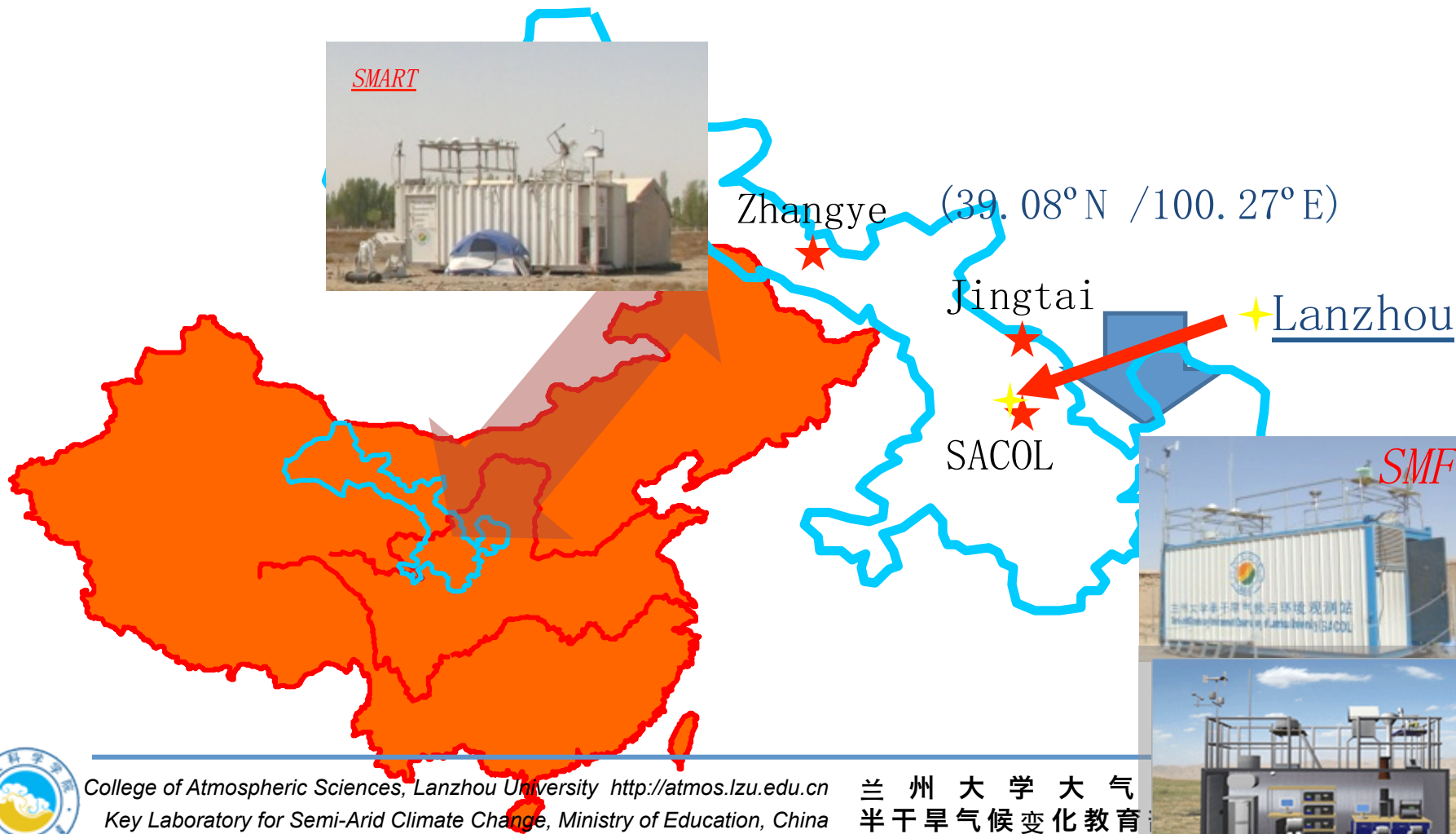
One SACOL's Mobile Facility (SMF) deployed in Jingtai, 37.57°N / 104.23°E ; and

The U.S. Department of Energy (DoE) Atmospheric Radiation Measurements (ARM) Ancillary Facility (AAF mobile laboratories, SMART-COMMIT) deployed in Zhangye, 39.08°N / 100.27°E .



Cases of Dust Events

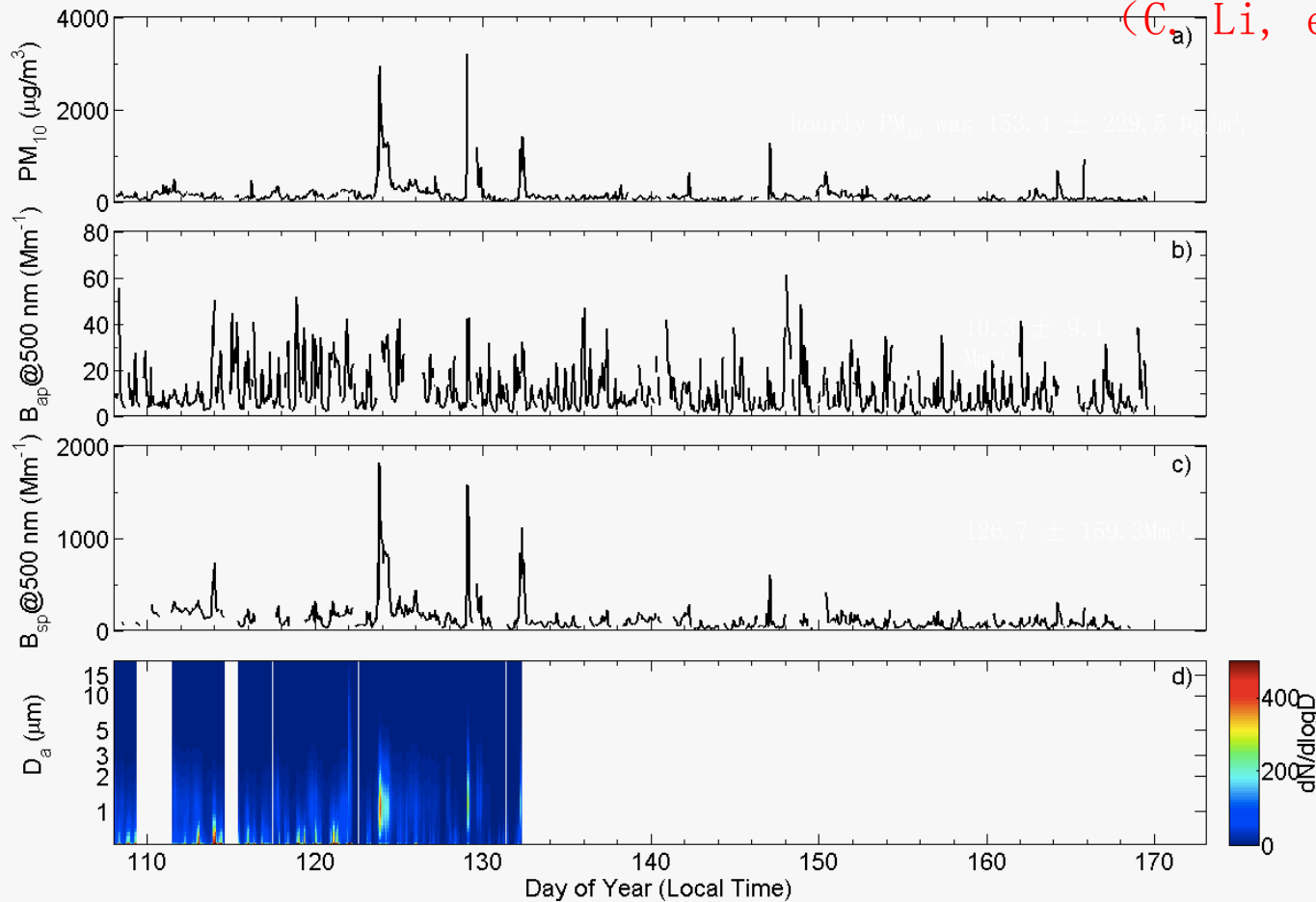
● China-USA Joint Experiment



Cases of Dust Events

Zhangye, 2008

(C) Li, et al, JGR, 2010



Hourly average concentrations of a) PM_{10} , b) aerosol absorption coefficient at 500 nm, c) aerosol scattering coefficient at 500 nm, and

■ Cases of Dust Events

This event damaged equipment and was only sampled for half an hour before power was interrupted to the site

● China-USA Joint Experiment *on June 13th*

Before



After



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■ *Cases of Dust Events*

● China-USA Joint Experiment

Events: There are several severe convections, such as thunderstorm, hail, gale, duststorm during 09:00-12:00(UTC), the moment wind speed was up to 22 m/s (wind force scale : 8 or 9).

System: trough (high level) and surface shear line

Causes:

The shortwave trough, split from mother trough, was moving eastward, affected the area of Zhangye. The station was under the controlling of low pressure system. There was a big difference of pressure between the station and the other lying upwind , a shear line presented on the surface map.

Affected by both the trough and shear line, thundershower occurred in the aera of east Jiuququan, Zhangye and Wuwei. The gale (8 to 9 wind force scale) and duststorm were observed in Zhangye station .)



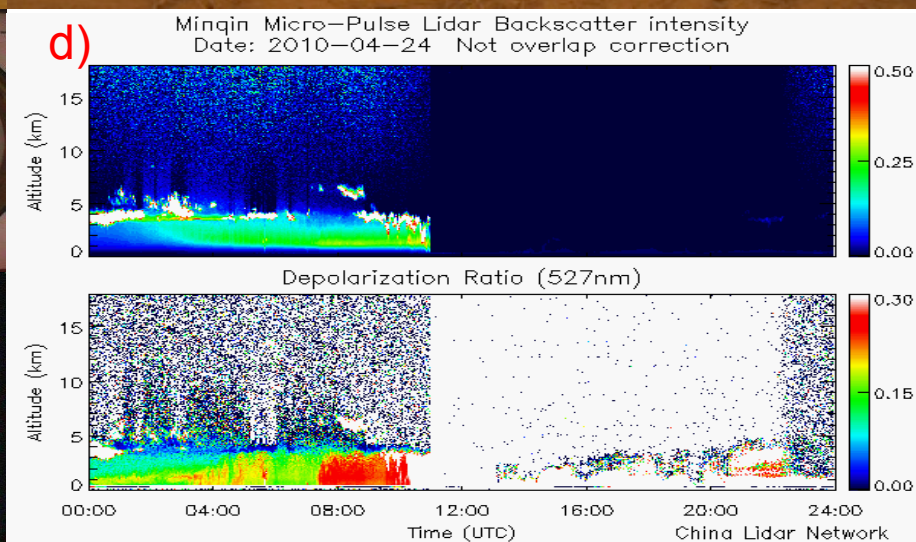
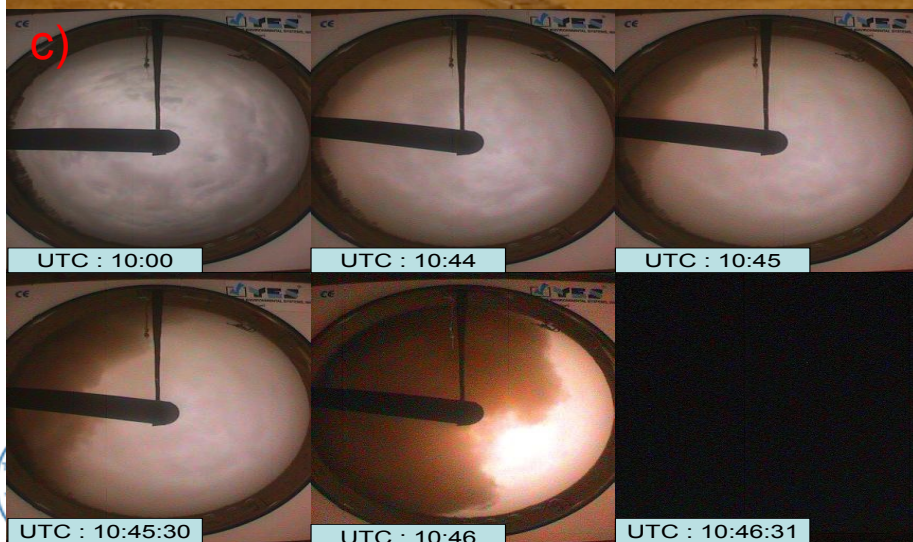
■ Cases of Dust Events

April 24th, 2010 Severe Dust Storm



Cases of Dust Events

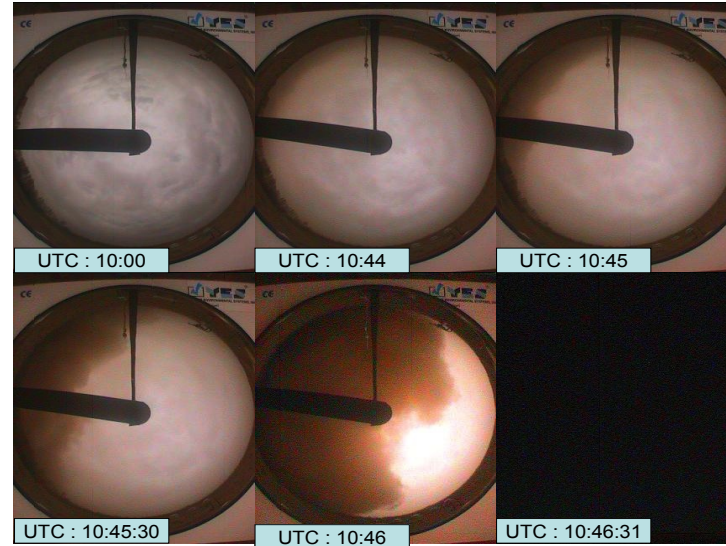
April 24th, 2010 Severe Dust Storm



Cases of Dust Events

➤ There was a dust event occurred on April 24th of 2010 in the Hexi corridor. The characteristics of it were analyzed using the data measured by Total Sky Imager (TSI), routine surface and upper air measurements, NWP products and NCEP/NCAR reanalysis data. The results show that, it only took about 2 minutes from the bright sky to be totally covered by dust.

➤ The northerly wind, from middle Siberia to north Xinjing, with strong polar cool air, caused the severe dust storm.



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on environmental observations,
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24 июня – 2 июля 2012
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по измерениям, моделированию
и информационным системам для изучения
окружающей среды

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for your attention**

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Спасибо 