Research plan of a new CEOP reference site over Loess Plateau

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Introduction of new CEOP Reference site

Objective & Research Plan

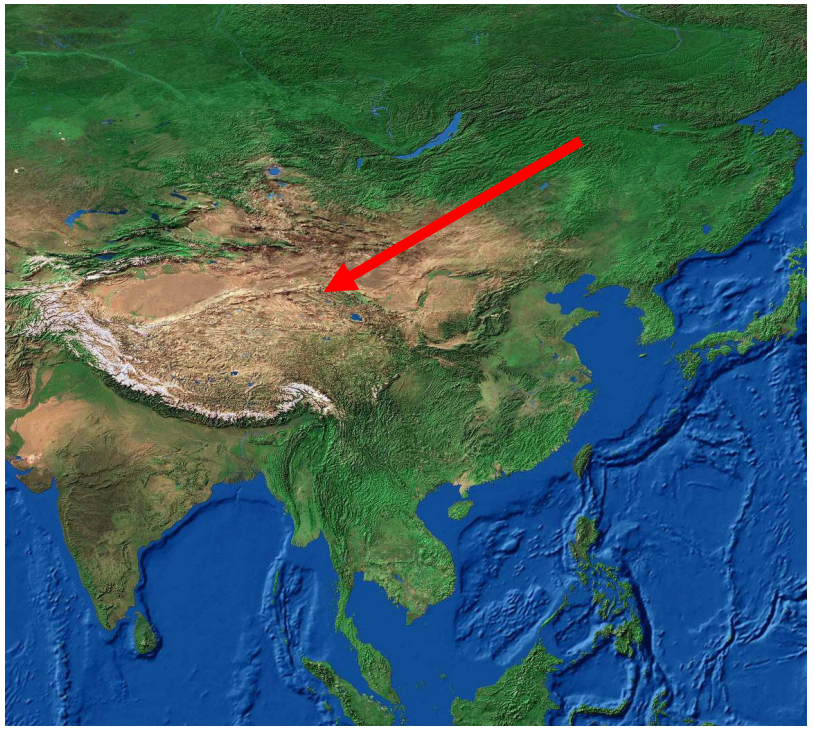
- Monitoring of long term tendencies in climate changes;
- Monitoring of the aerosol effect on water cycle;
- Studies of interaction between land surface and atmosphere;
- Improve the climate model;
- Validation of space-borne observations;
- Development and implementation of new measurement techniques;
- Training of young scientists at post-doc, PhD and master level.

Introduction of new CEOP Reference site

Why do we develop a climate-environment observatory in semi-arid region of Loess Plateau?

- Fill the gap of global climate monitoring network

  There is no any international network (such as CEOP, BSRN, Aeronet) site in Loess Plateau yet;
- Loess Plateau is a special semi-arid land surface; & part of dust aerosol source and close to the desert.



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Climate and Environment:

Elevation: 1874.1 m

Surface Type: loess tableland, ridge, hillock and gully

Land Cover: moderation

Annual Mean Parameters:

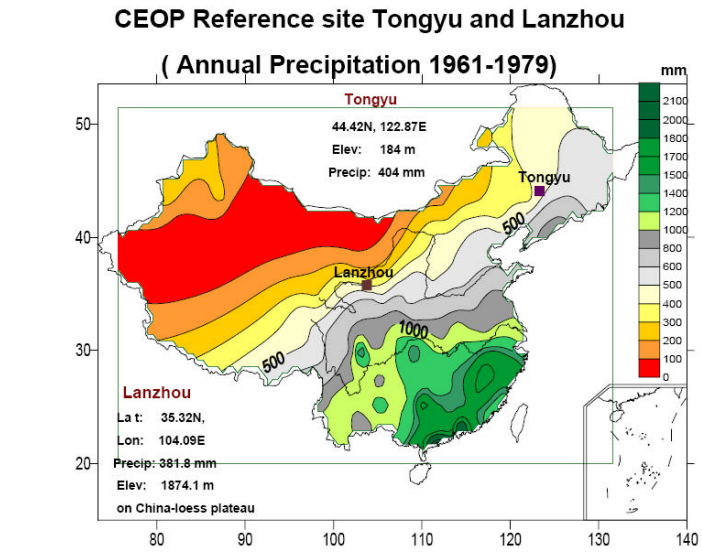
Precipitation: 381.8 mm

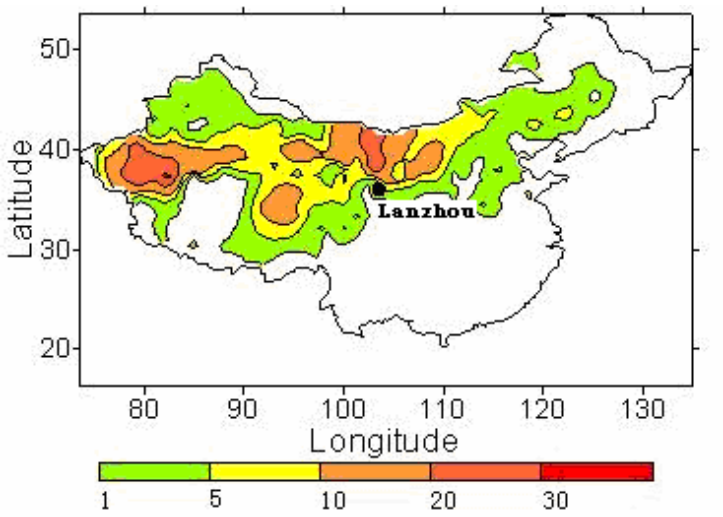
Evaporation: 1326.3 mm

Relative Humidity: 63%

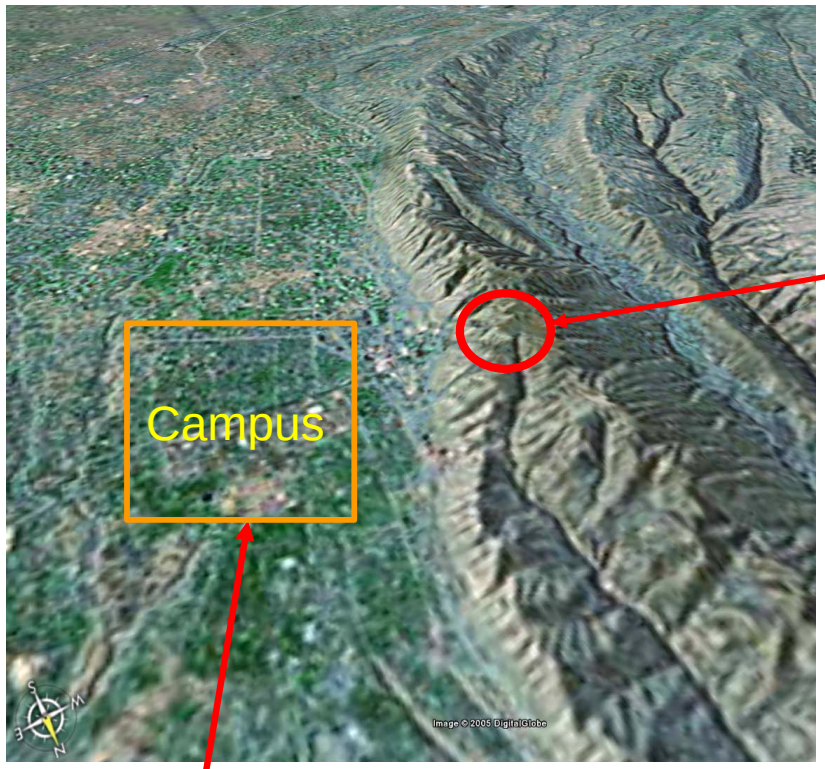
Wind Speed: 1.6m/s

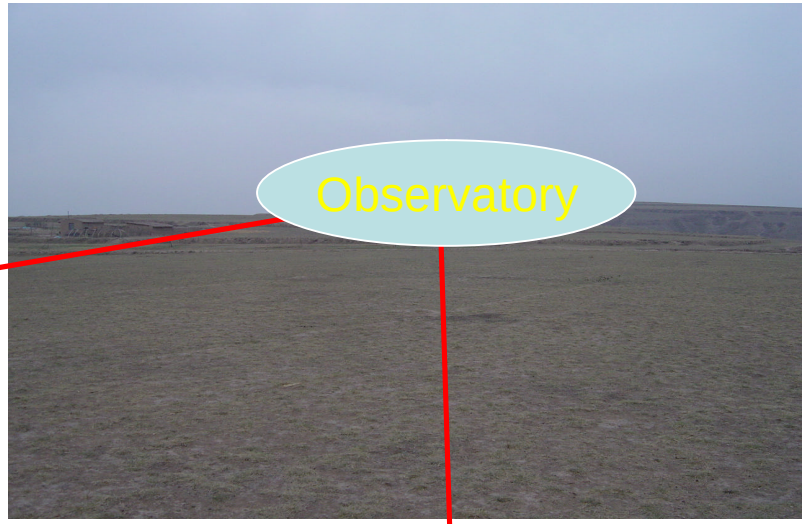
Sunshine hours: 2607.2h

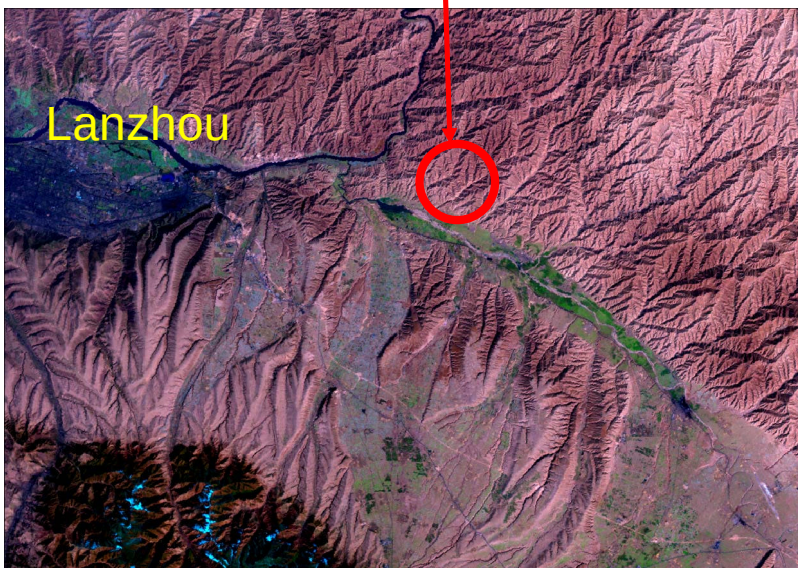




Location: Yuzhong Campus of Lanzhou University (35.32N, 104.09E)







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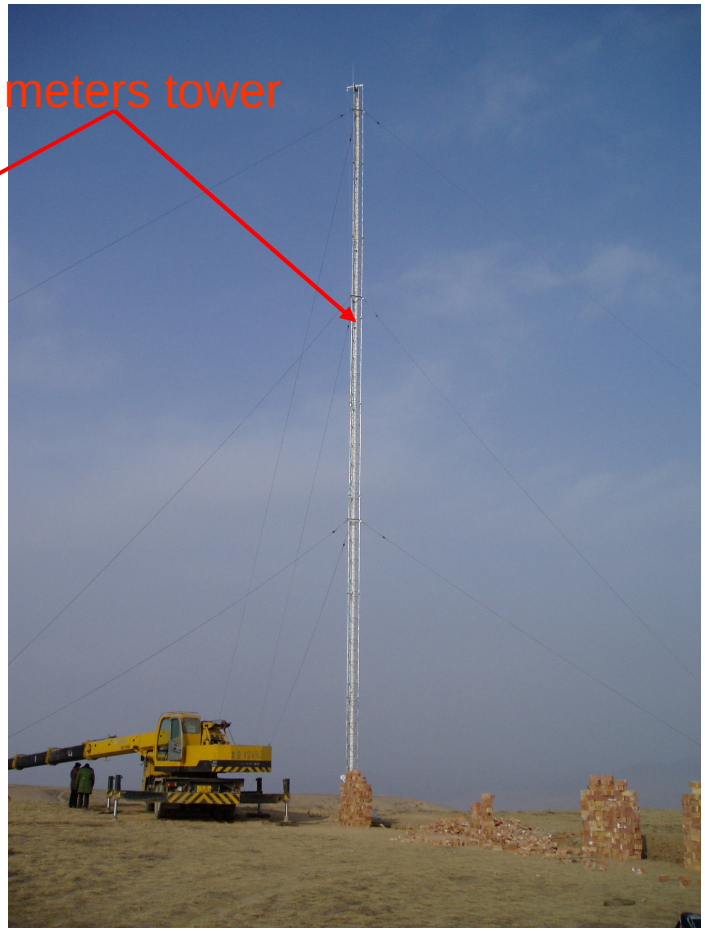
Observatory Facility



Phase I 2005 - 2006:

- To be a CEOP Reference Site &
- Start CEOP Required Measurements

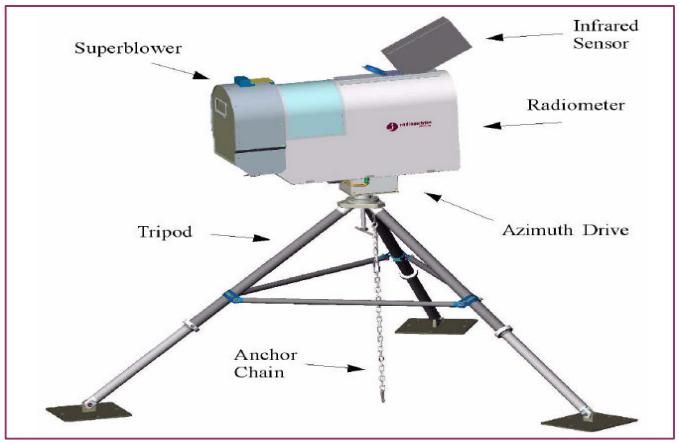
Station Pressure	Air Temperature
Specific Humidity	Wind Speed/direction
Precipitation	Soil
Temperature/Moisture	
Sensible Heat Flux	Latent Heat Flux
CO_2 Flux	Soil Heat Flux
Incoming LW Radiation	Incoming SW Radiation
Outgoing LW Radiation	Outgoing SW Radiation

and so on …….

Basic Instruments

Parameter	Model	Manufacturer
Soil Temperature	STP01_L50	HUKSEFLUX
Soil Moisture	CS616_L	CAMPBELL
Sensible Heat Flux	LI-COR CS7500	CAMPBELL
Latent Heat Flux	FW05	CAMPBELL
CO2_Flux	CSAT3	CAMPBELL
Soil Heat Flux	HFP01Sc_L50	HUKSEFLUX
Aerosols	CE 318-1I	CIMEL ELEC
Wind Direction	014A_L	Met One
Skin Temperature	IRTSD-P	APOGEE
Specific Humidity	45C_L	VAISALA
Incoming Shortwave	CM21	Kipp & Zonen
Outgoing Shortwave	CM21	Kipp & Zonen
Incoming Longwave	CG4	Kipp & Zonen
Outgoing Longwave	CG4	Kipp & Zonen
Station Pressure	CS105	TEXAS ELECT
Air Tenperature	HMP	VAISALA
Precipitation	TE525MM_L	TEXAS ELECT
Wind Speed	034A_L	Met One

Three Additional Instruments Bought in Phase I:

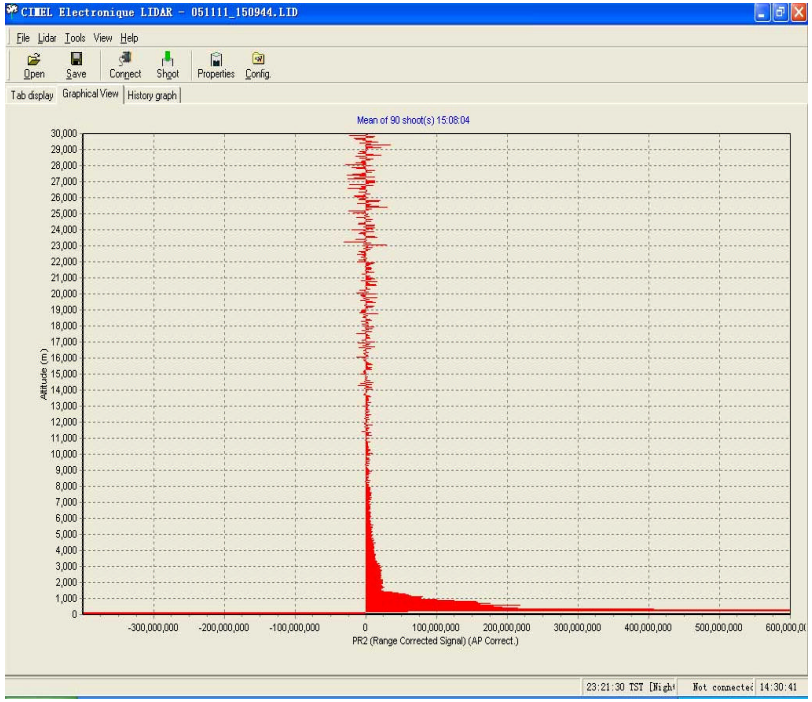


1. Microwave Temperature, Humidity& Liquid Water Profiling Radiometer

2. Cimel Sunphotometer

It is a multi-channel, automatic sun-and-sky scanning radiometer that measures the direct solar irradiance and sky radiance at the Earth's surface.

3. CAMELTM CE370-2 Lidar, Wavelength = 532 nm



Winter, Clear Sky, Lanzhou 03：52：03(UTC), Nov 11, 2005

Phase II: 2006-2007

- **To Build up:**

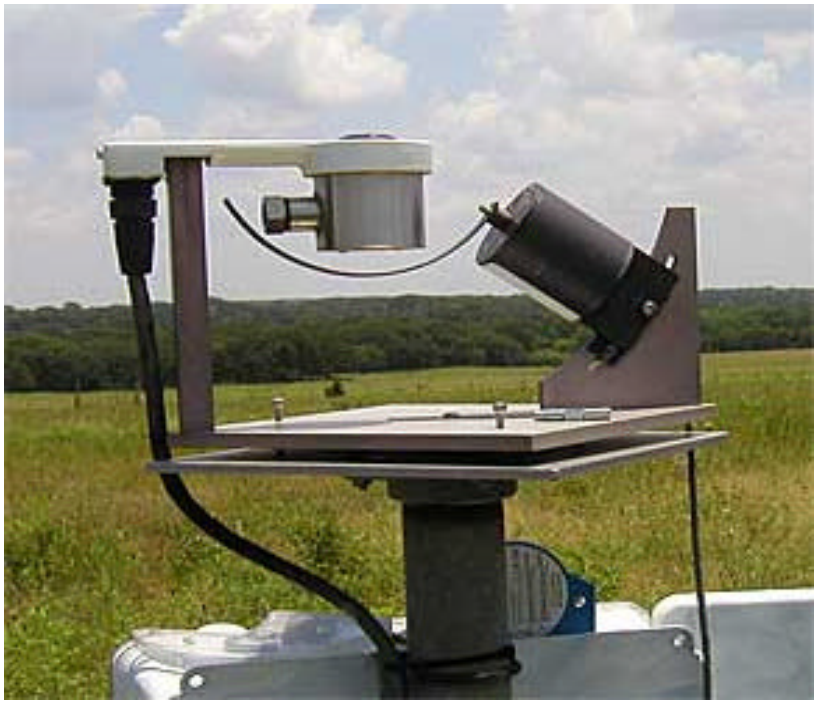
  Aerosol & Clouds Observation System

  Surface Radiation Observation System

  Atmosphere-Land Interaction Observation System

  Raman Lidar System.

Major Instruments in Phase II



Multi-Filter Rotating Shadowband Radiometer (MFRSR)

Diffuse shortwave irradiance
Direct shortwave irradiance
Shortwave irradiance

Multi-Filter Radiometer (MFR)

It is simply the head from a multi filter rotating shadowband radiometer (MFRSR) mounted on a tower pointing at the surface.

Major Instruments in Phase II

Micropulse Lidar (MPL)

- Aerosol exctinction
- Backscatter profile
- Cloud decks Cloud layer
- Lidar backscatter
- Relative backscatter

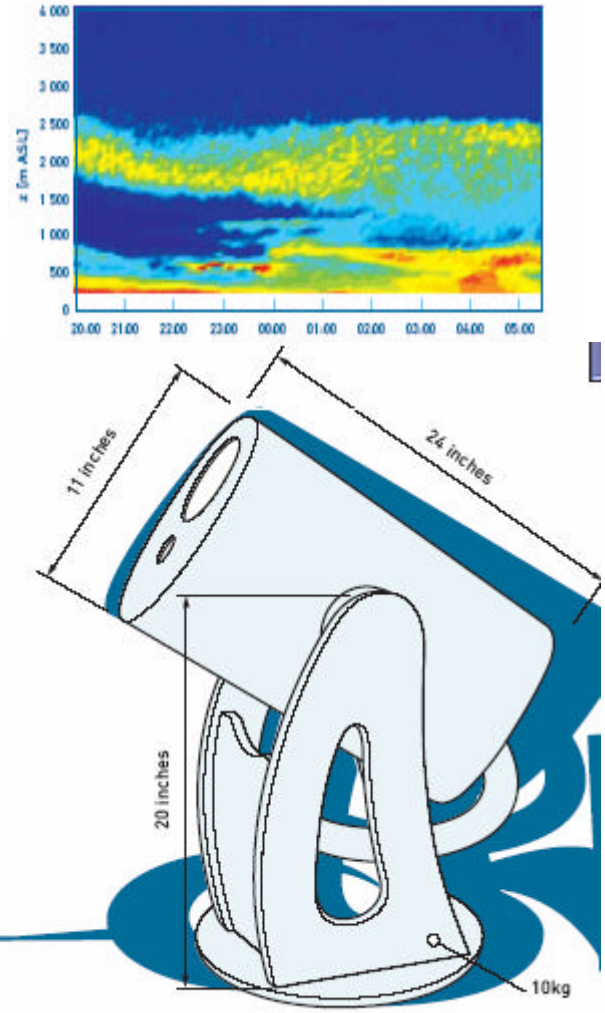
Vaisala Ceilometer

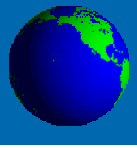
- Backscatter profile
- Cloud-bottom height
- Lidar backscatter

Major Instruments in Phase II

Raman Lidar

The Raman Lidar (RL) is an active, ground based laser remote sensing instrument that measures vertical profiles of water-vapor mixing ratio and several cloud- and aerosol-related quantities.





Research Plan:

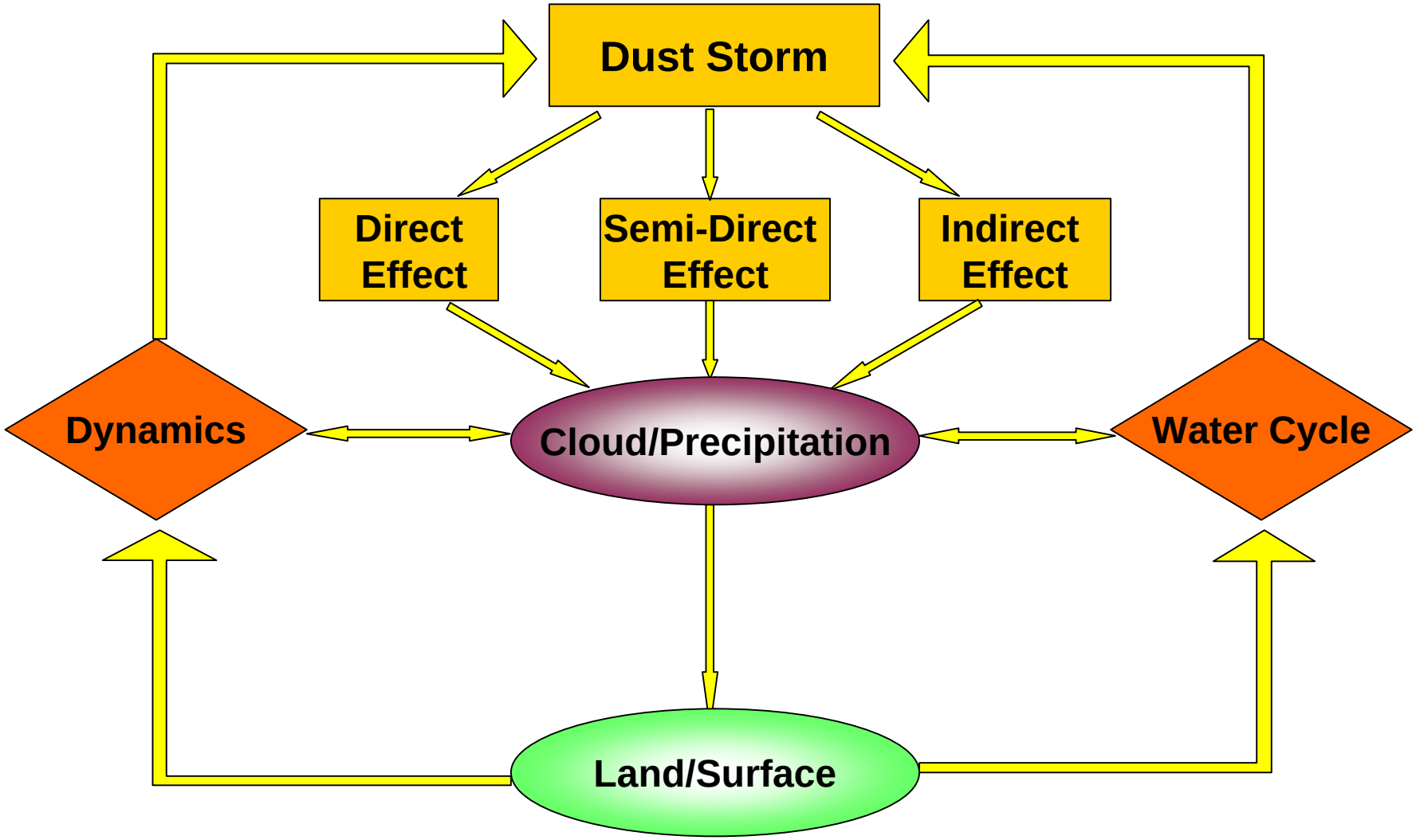
As other CEOP reference site, we are going to follow the CEOP Phase II research plan, especially to support the semi-arid region study project.

Focus:

We also will focus to find the directly observed evident of the aerosol effect on energy and water cycle, such as effect on:

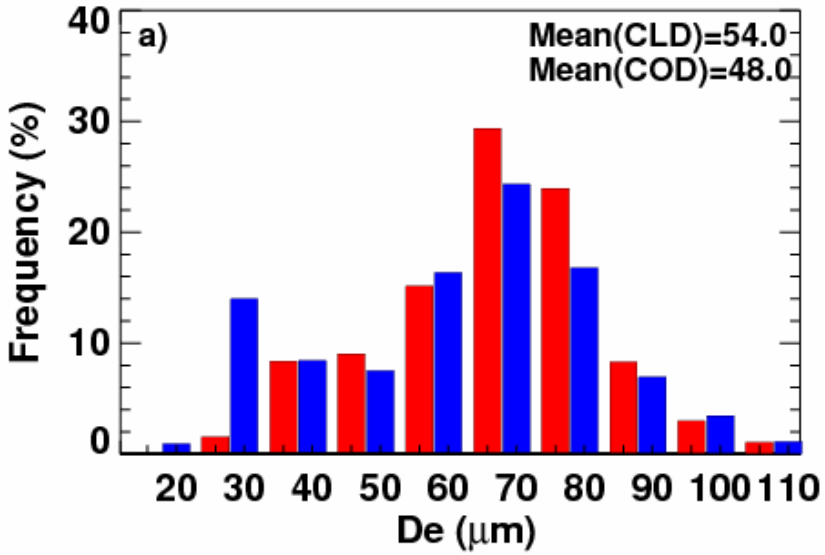
- surface radiation budget;
- surface Fluxes;
- humidity and cloud water path
- other microphysical parameter;

Research Plan:

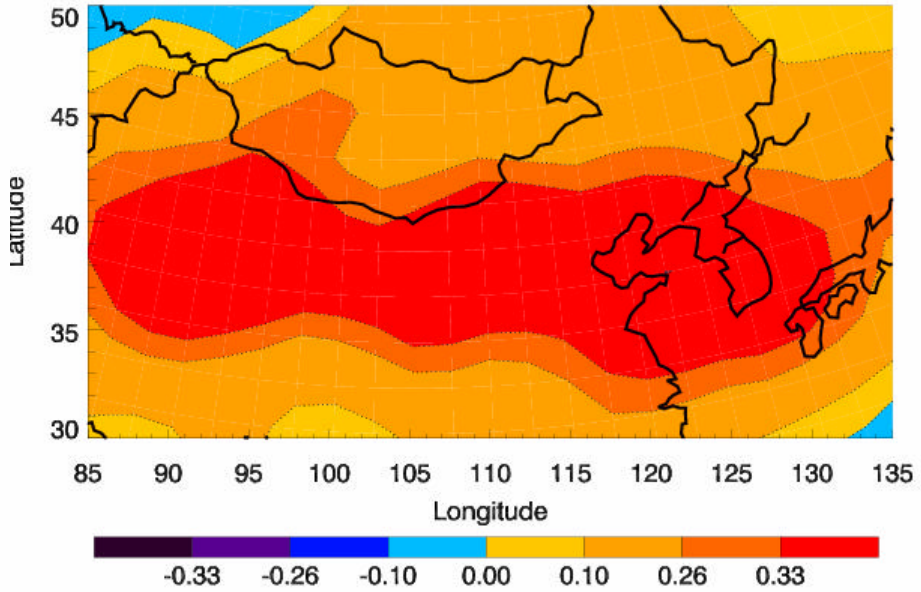


Preliminary Results: Indirect Effect of Dust Aerosol

Reduce the ice diameter and increase high cloud cover
Huang et al., GRL, 2006



Comparison of ice cloud diameter over the dust-free cloud (CLD) and clouds over the dust (COD) region.



Correlation between Taklamakan dust storm index and ISCCP high cloud amount

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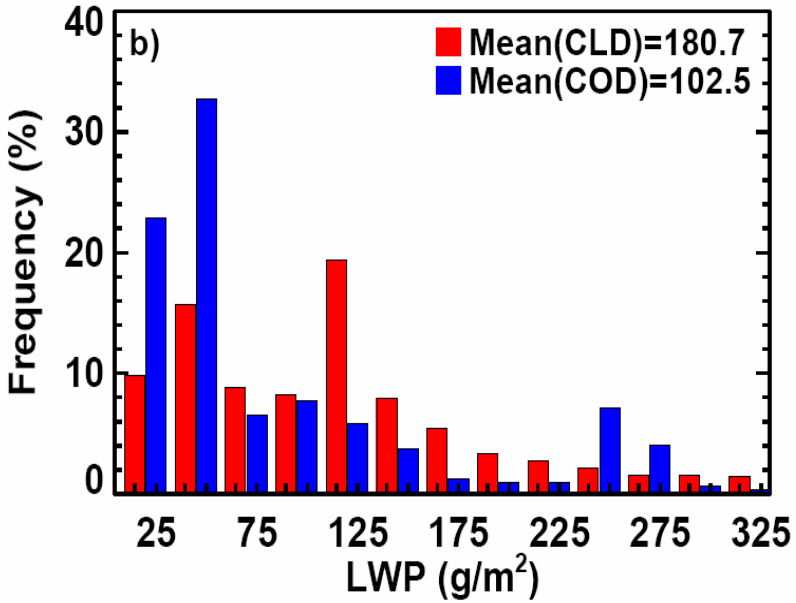
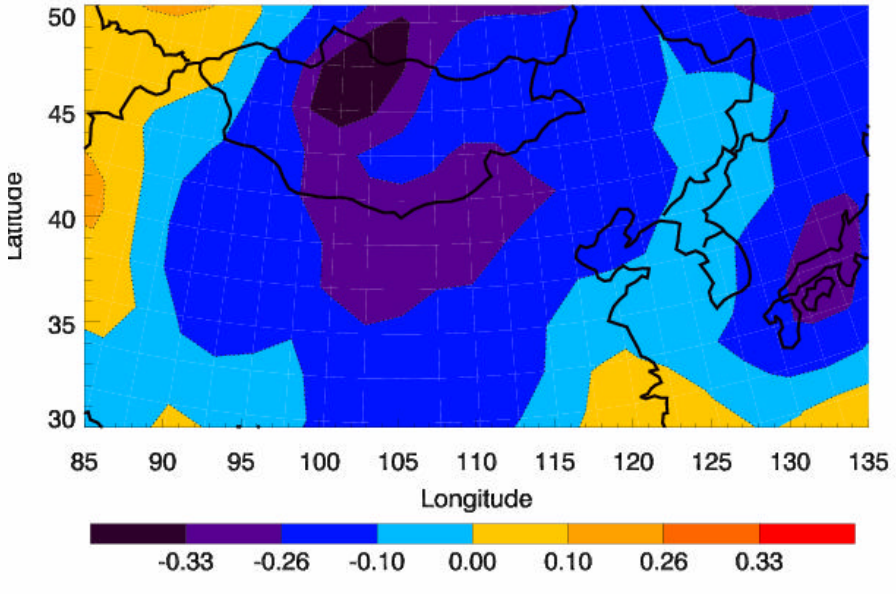
Preliminary Results: Semi-direct Effect of Dust Aerosol

Reduce low cloud water Path
Hauang et al., GRL, 2006



Comparison of low cloud water path over the dust-free cloud (CLD) and clouds over the dust (COD) region.



Correlation between Taklamakan dust storm index and ISCCP low cloud LWP

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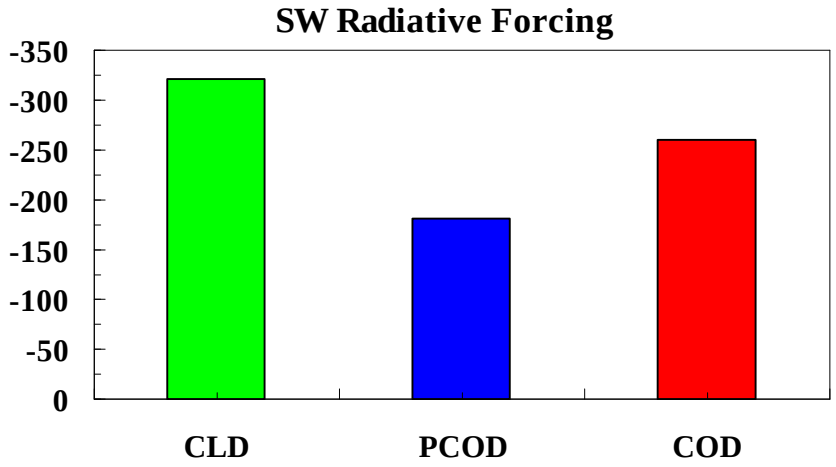
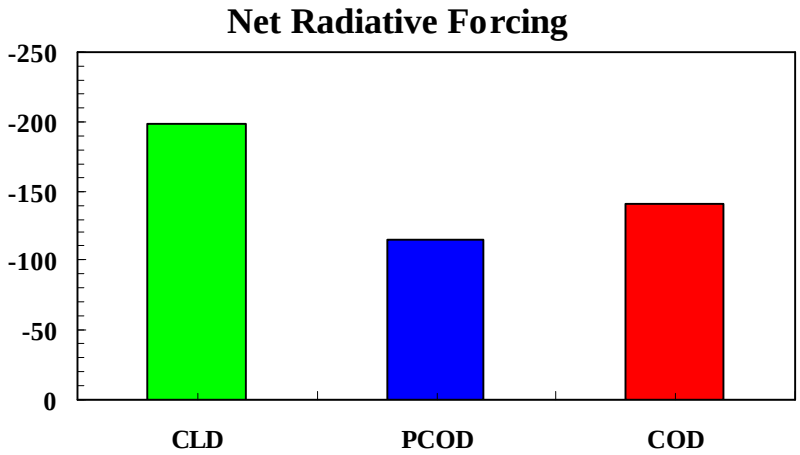
Preliminary Results: Radiative Effect of Dust Aerosol





Due to changes in cloud microphysics by dust aerosol, the instantaneous net radiation forcing is increased from -200 W/m^2 for dust-free clouds to -150W/m^2 for dust contaminated clouds. The reduced cooling effects of dust may lead to a net warming effect.

International Workshop on Semi-Arid Land Surface-Atmosphere Interaction

2007 Summer, Lanzhou, China

Key areas will be discussed：

- **Land surface-atmosphere interactions**
- **Dust aerosol effect on hydrological cycle**
- **Climate change monitoring in semi-arid environment**
- **International cooperative field campaign over Northwest China**

Organizer:

Prof. Jianping Huang ,
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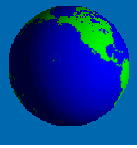
Scientific Committee:

Prof. Congbin Fu(Chair)
Institute of Atmospheric Physics,
Chinese Academy of Sciences
email: fcb@tea.ac.cn



Thank You &

See You in Lanzhou Next Year!

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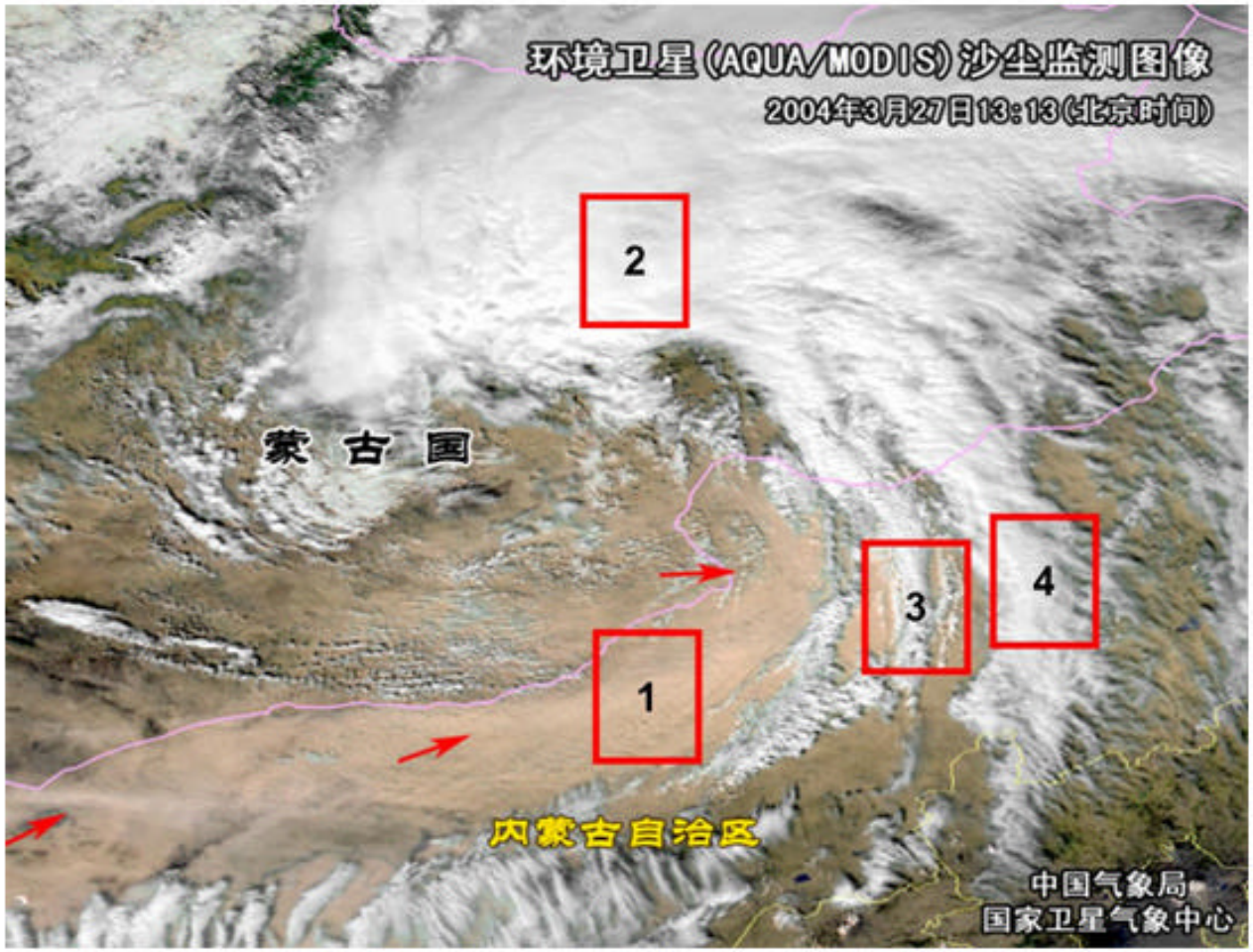
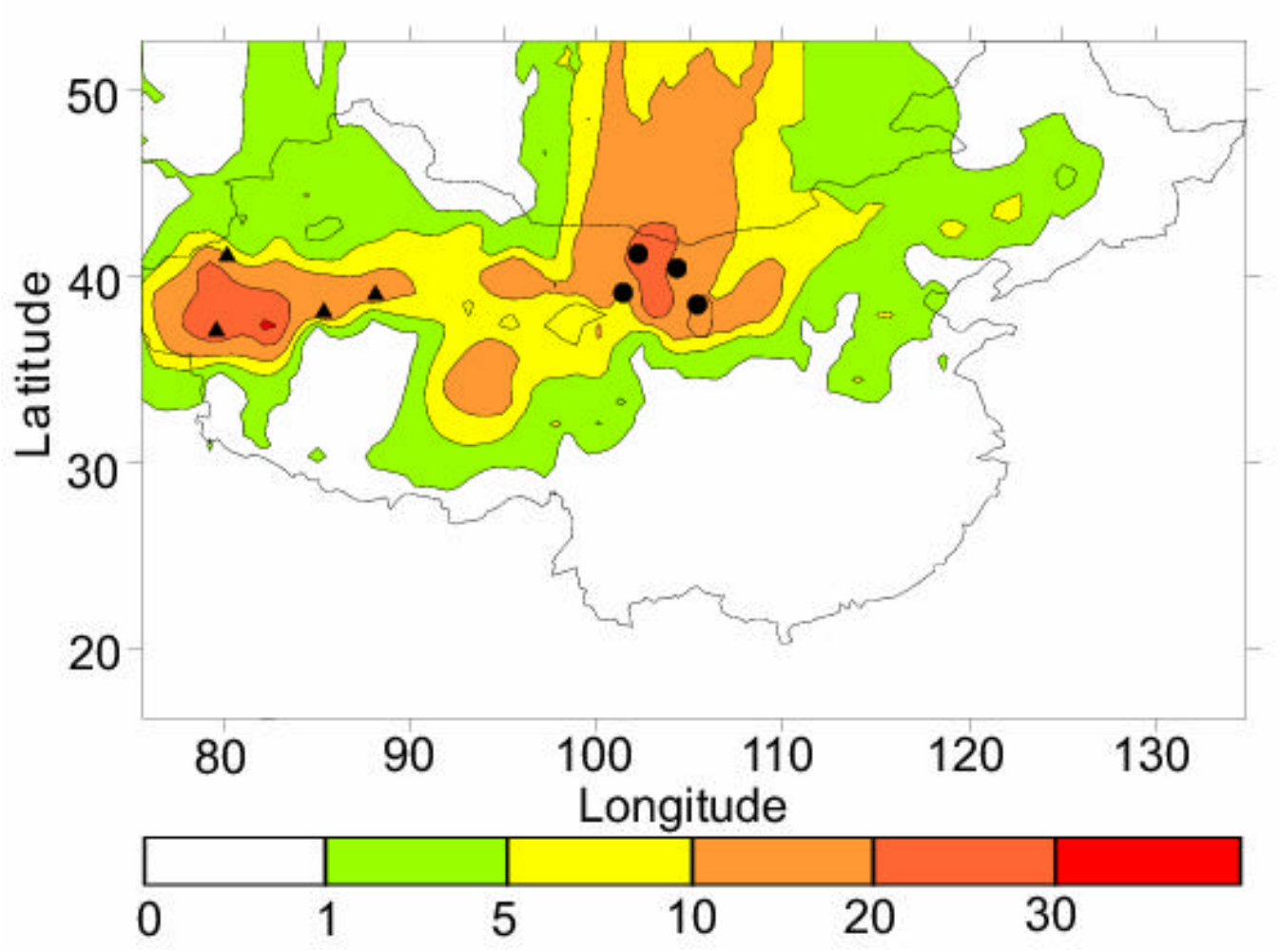
Region 1: Pure Dust
Region 2: Pure Cloud
Region 3: Partial Cloud over Dust
Region 4: Cloud over Dust

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