Using field observations and satellite data for the energy and water cycle study over heterogeneous landscape: from Tibetan Plateau to Third Pole region and Pan-Third Pole region

THIRD POLE ENVIRONMENT

Yaoming Ma (ymma@itpcas.ac.cn)

1. Institute of Tibetan Plateau Research, Chinese Academy of Sciences
2. CAS Center for Excellence in Tibetan Plateau Earth Sciences, CAS
3. University of Chinese Academy of Sciences
4. Qomolangma Station for Atmospheric and Environmental Observation and Research, CAS

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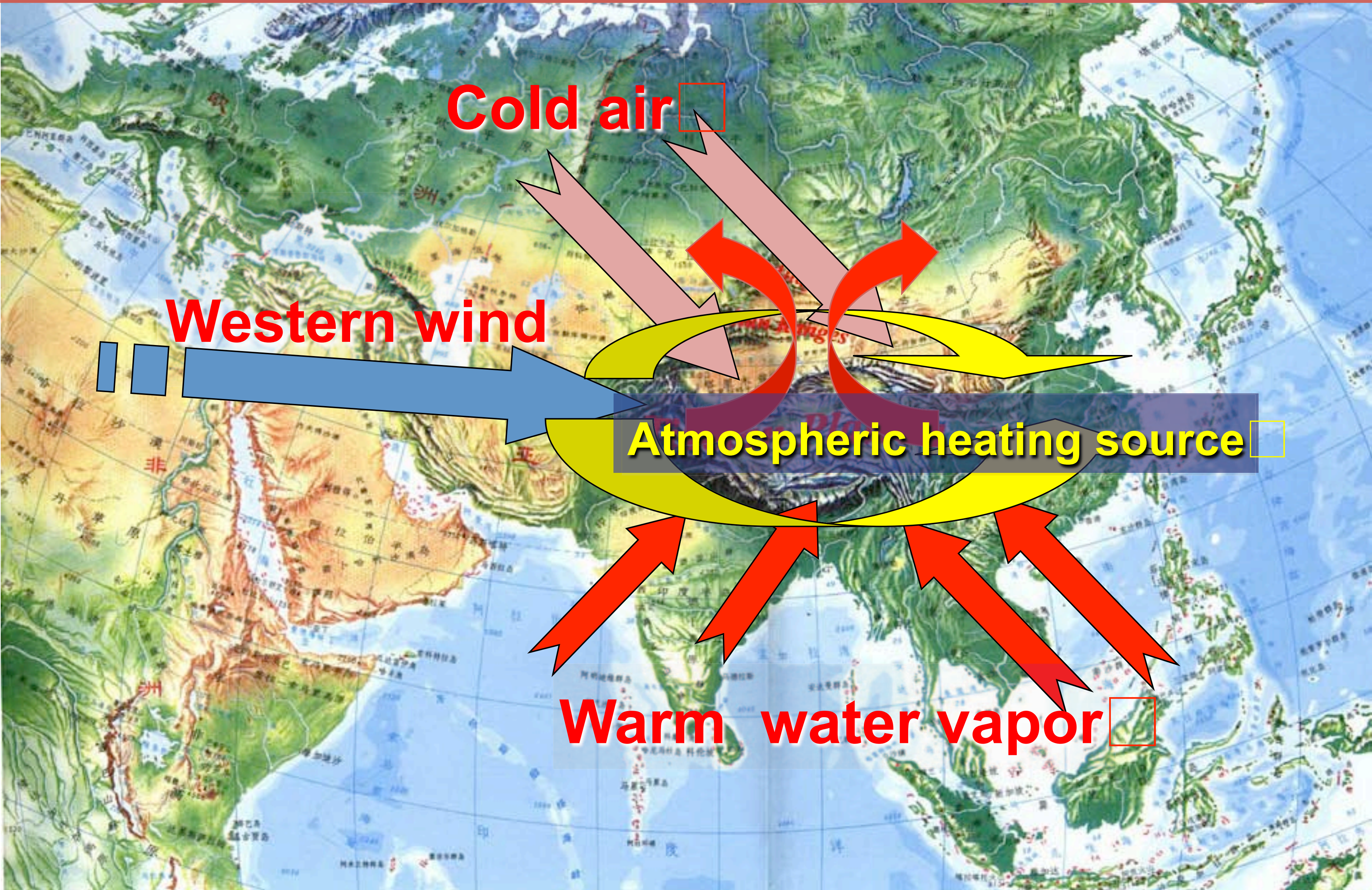
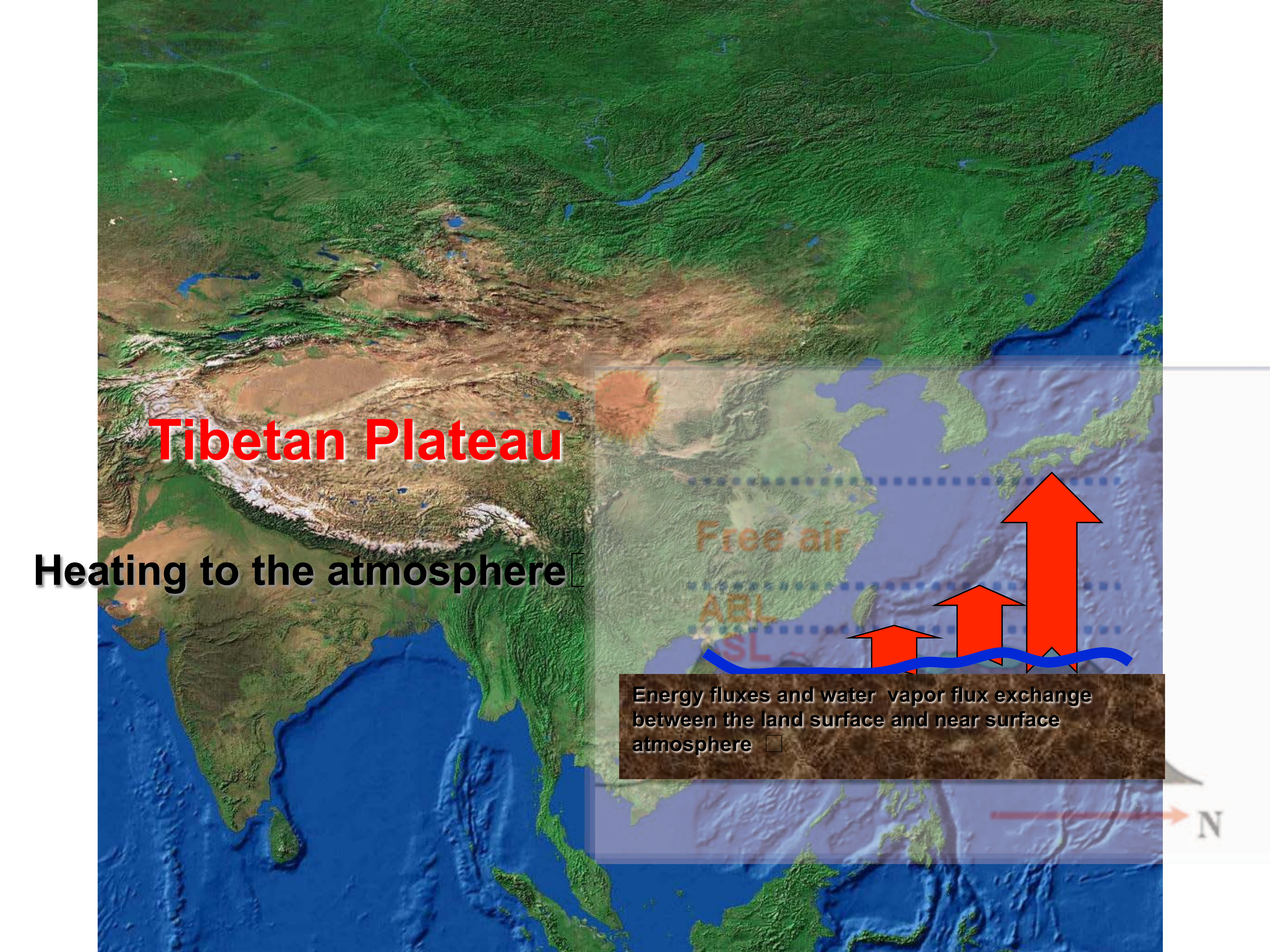
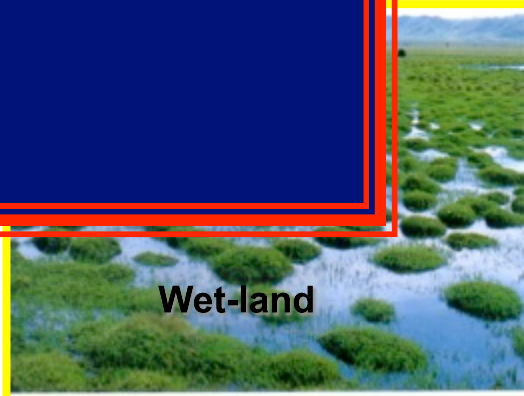
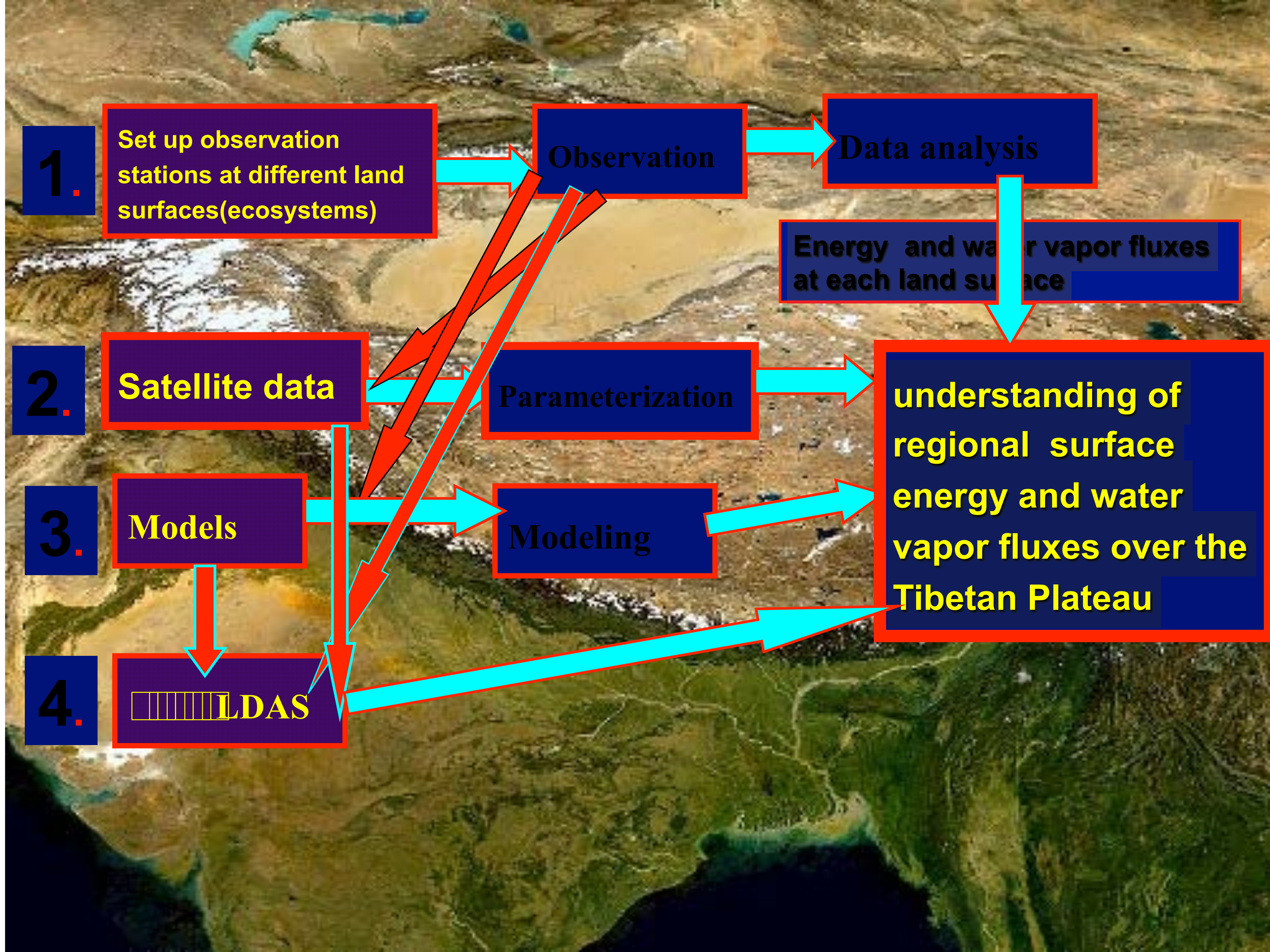
Why do we have this kind of study?




Tibetan Plateau
Heating to the atmosphere
Free air
ABL
SL
Energy fluxes and water vapor flux exchange between the land surface and near surface atmosphere
N

How to get the regional surface heat and water vapor fluxes over the Tibetan Plateau ????????????




1.
Set up observation stations at different land surfaces(ecosystems)
Observation
Data analysis
Energy and wa r vapor fluxes at each land su ace
2.
Satellite data
Parameterization
understanding of regional surface energy and water vapor fluxes over the Tibetan Plateau
3.
Models
Modeling
4.
LDAS

Comprehensive observation of the multi-sphere land-atmosphere interaction in the TP

Local characteristic parameters (C_D, C_H, C_q, z_{om}, z_{oh}, d_0 and kB^{-1} etc.)

Taking multi-scale topographic impacts into account

Effective parameters for the typical area (mountain, forest, alpine meadow, desert grassland, etc.) in the TP

Satellite remote sensing

The land-atmosphere interaction parameters, surface albedo, vegetation coverage and land surface temperature in the TP

RS Parameterization

Validation

Long-term temporal variation and spatial distribution of energy and water flux in the TP

Understanding the long-term variation of surface energy fluxes and water fluxes in the TP region

Tibetan Observation and Research Platform

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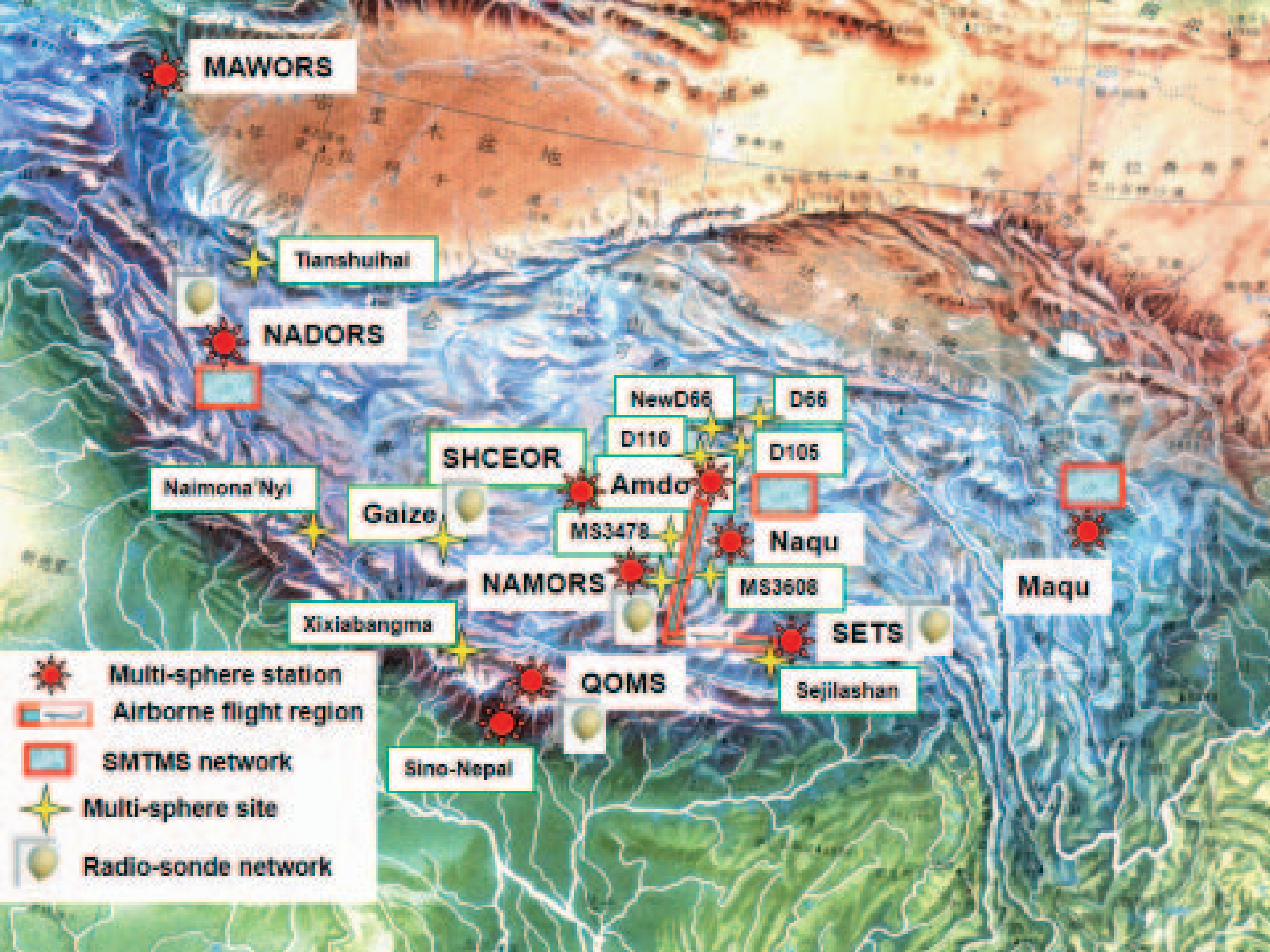
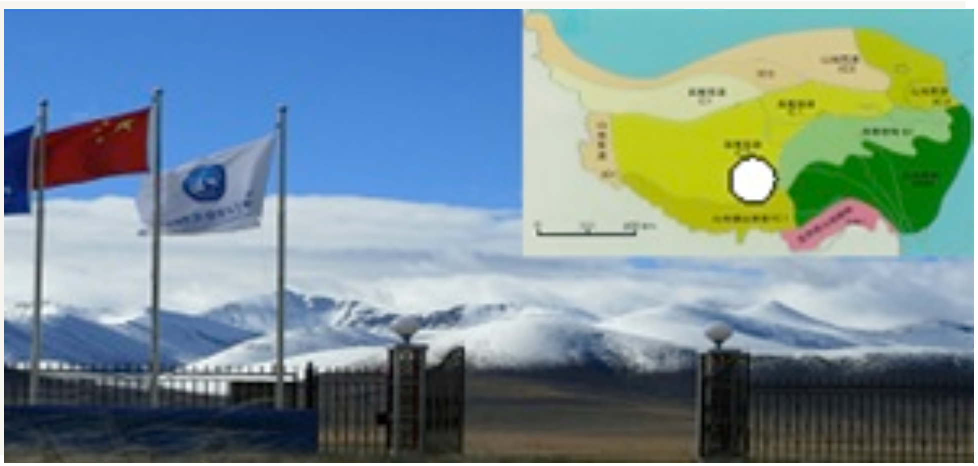


MAWORS
Tianshuihai
NADORS
NewD66
D66
D110
D105
SHCEOR
Amdo
Naimona'Nyi
Gaize
MS3478
Naqu
NAMORS
MS3608
Maqu
Xixiabangma
SETS
QOMS
Sejilashan
Sino-Nepal
Multi-sphere station
Airborne flight region
SMTMS network
Multi-sphere site
Radio-sonde network

7 ITP/CAS comprehensive observation stations in TP

Qomolangma Station for Atmospheric and Environmental Observation and Research (QOMS/CAS)

Nam Co Station for Multisphere Observation and Research (NAMORS/CAS)



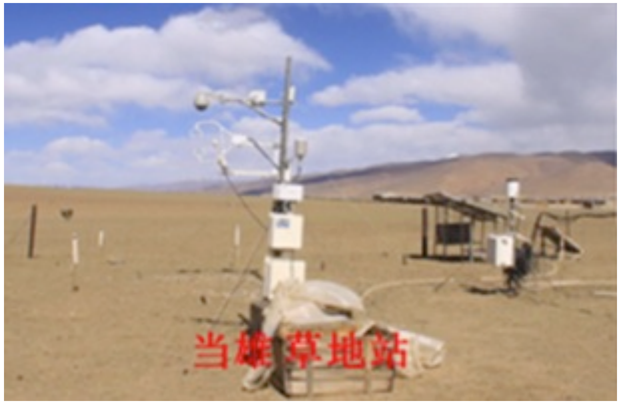
Southeast Tibet Station for Alpine Environment Observation and Research (SETS/CAS)

Naqqu Station of Plateau Climate and Environment (NPCE)

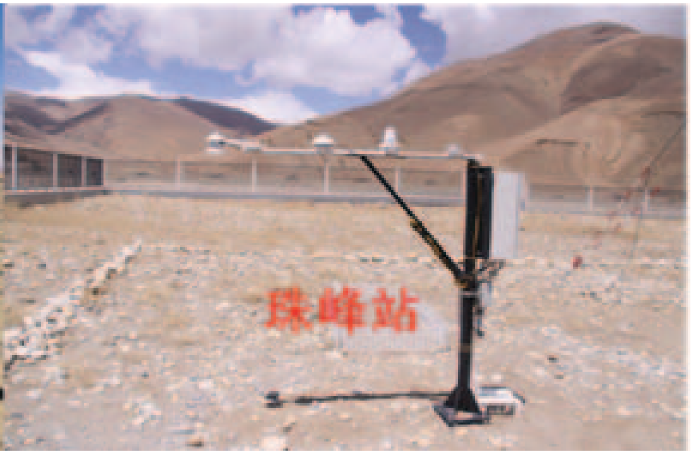
Kekexili Station（Shuanghu）


MAWORS
NADORS
Haibei
NewD66
Amdo
D105
Shuanghu
Selinco
Naqu GL
Naqu
Maqu
NAMORS
Namco lake
Damxung W
Damxung GL
QOMS
Lhasa
Arzha glacier
SETS
Nepal
Yadong

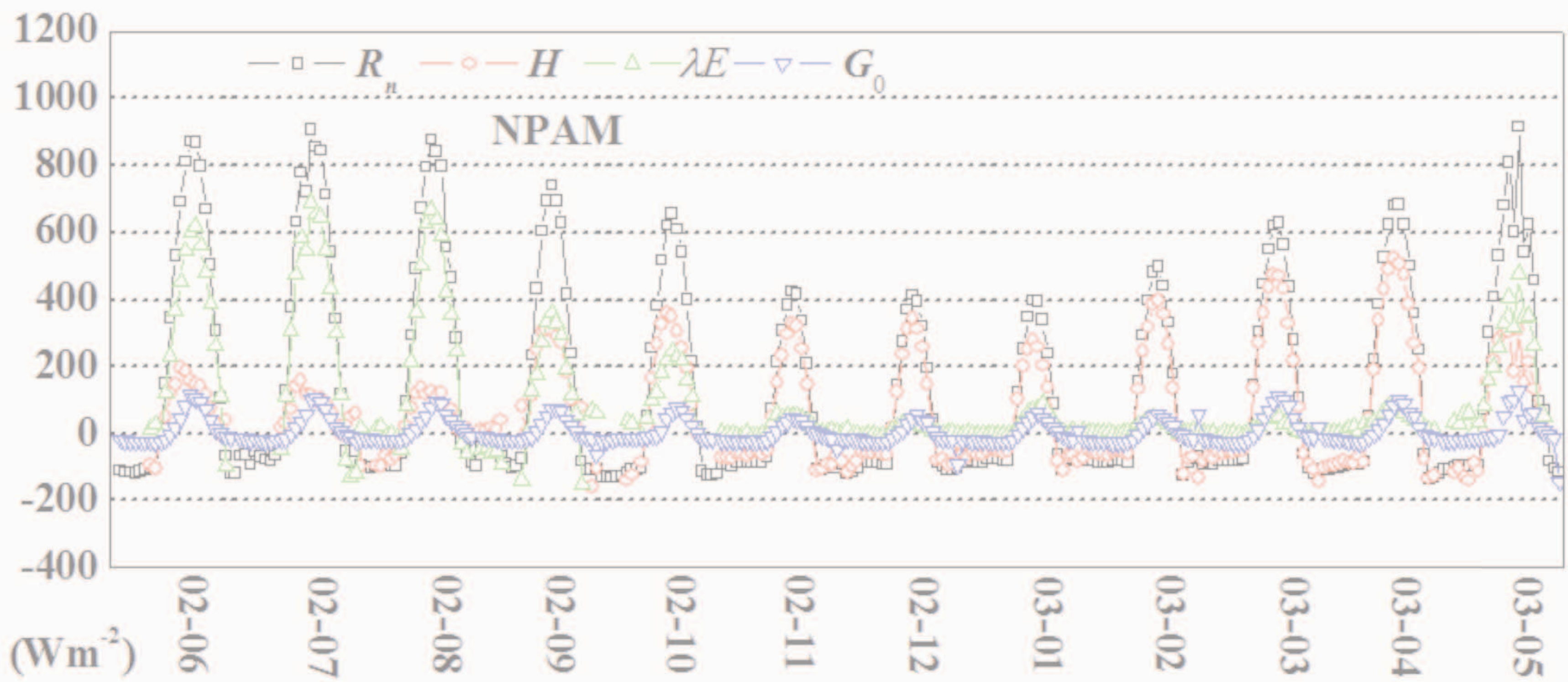
Flux stations over the different land surfaces



Radiation Stations (19)

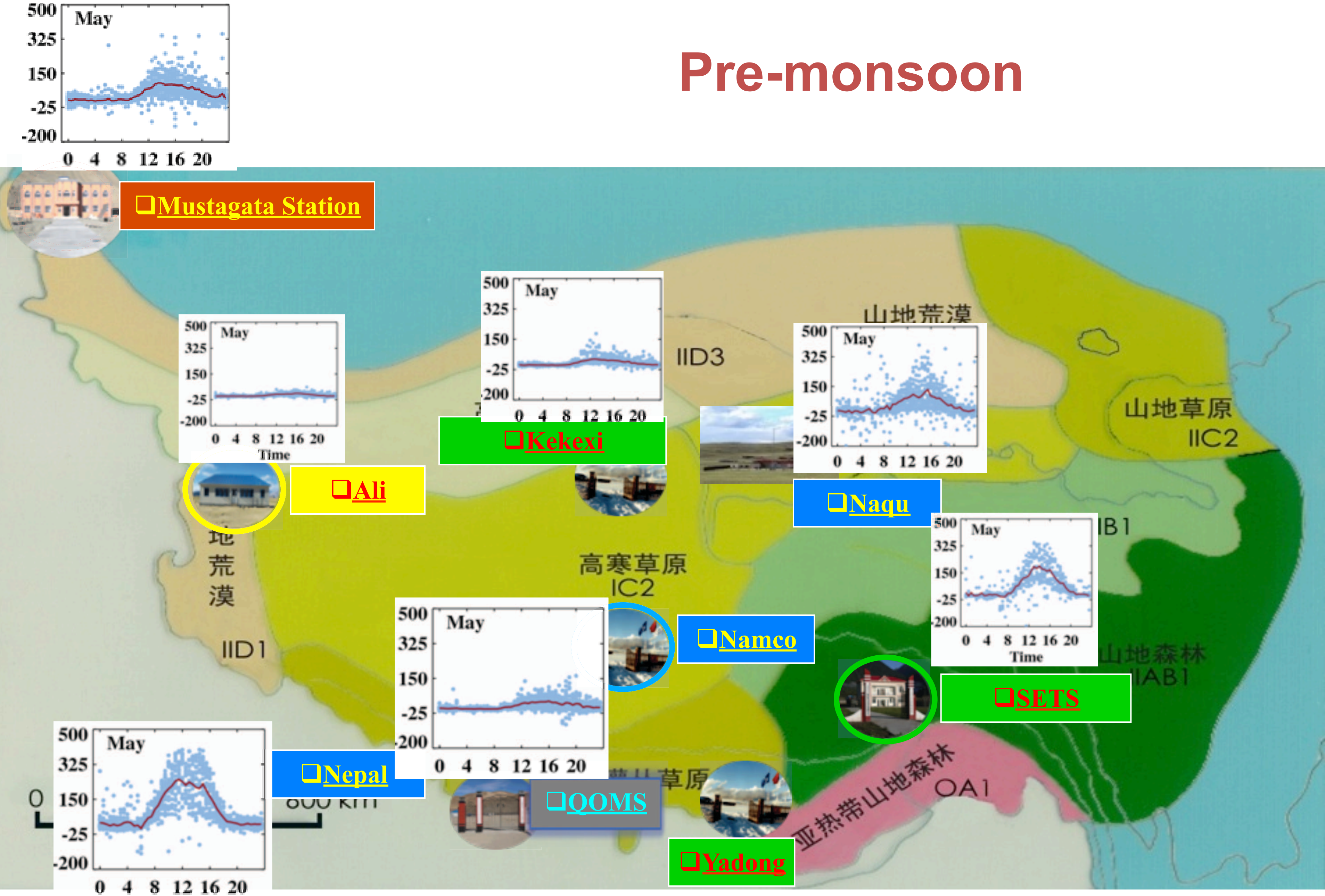


Land surface heat fluxes

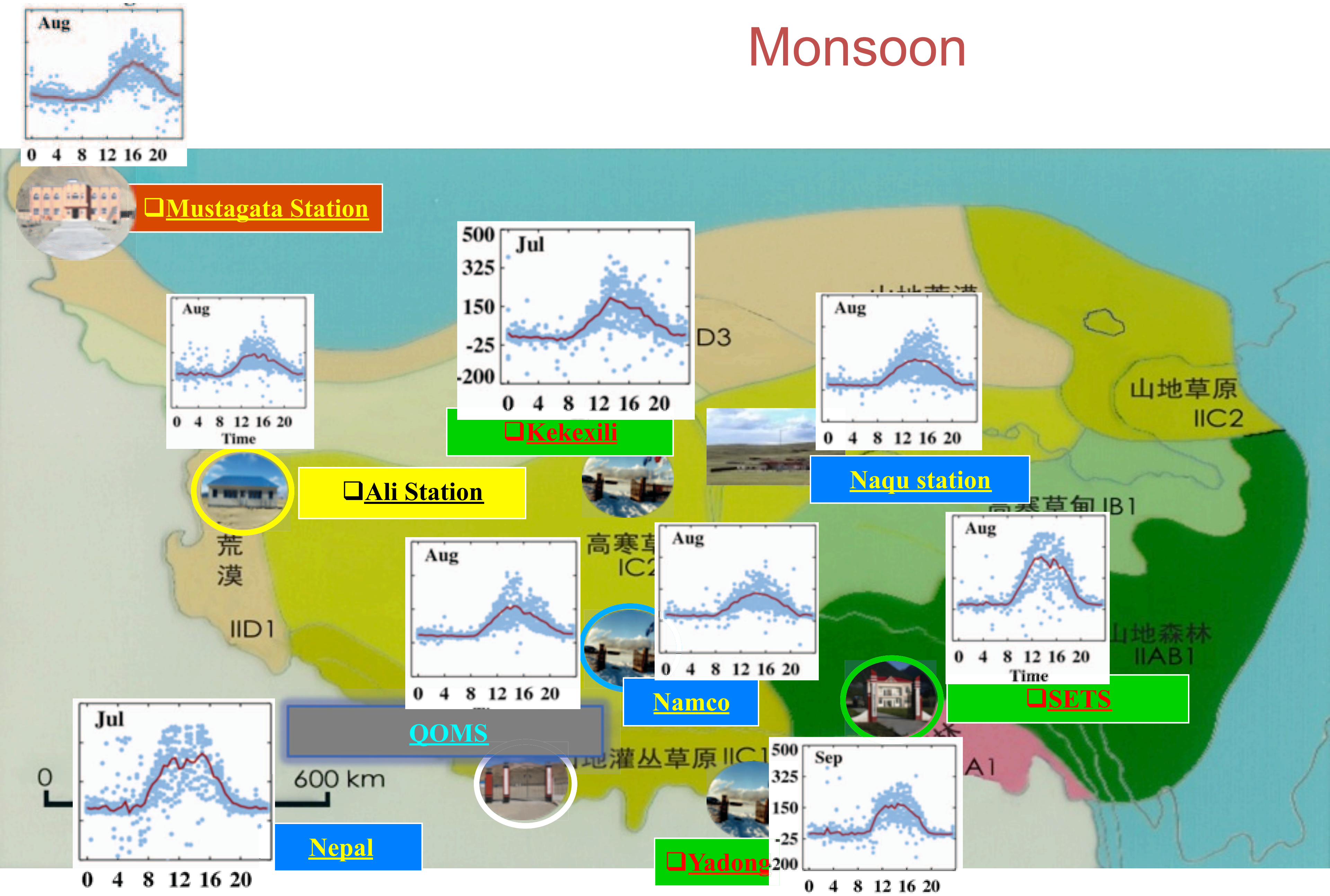


ET-by eddy covariance system

Pre-monsoon

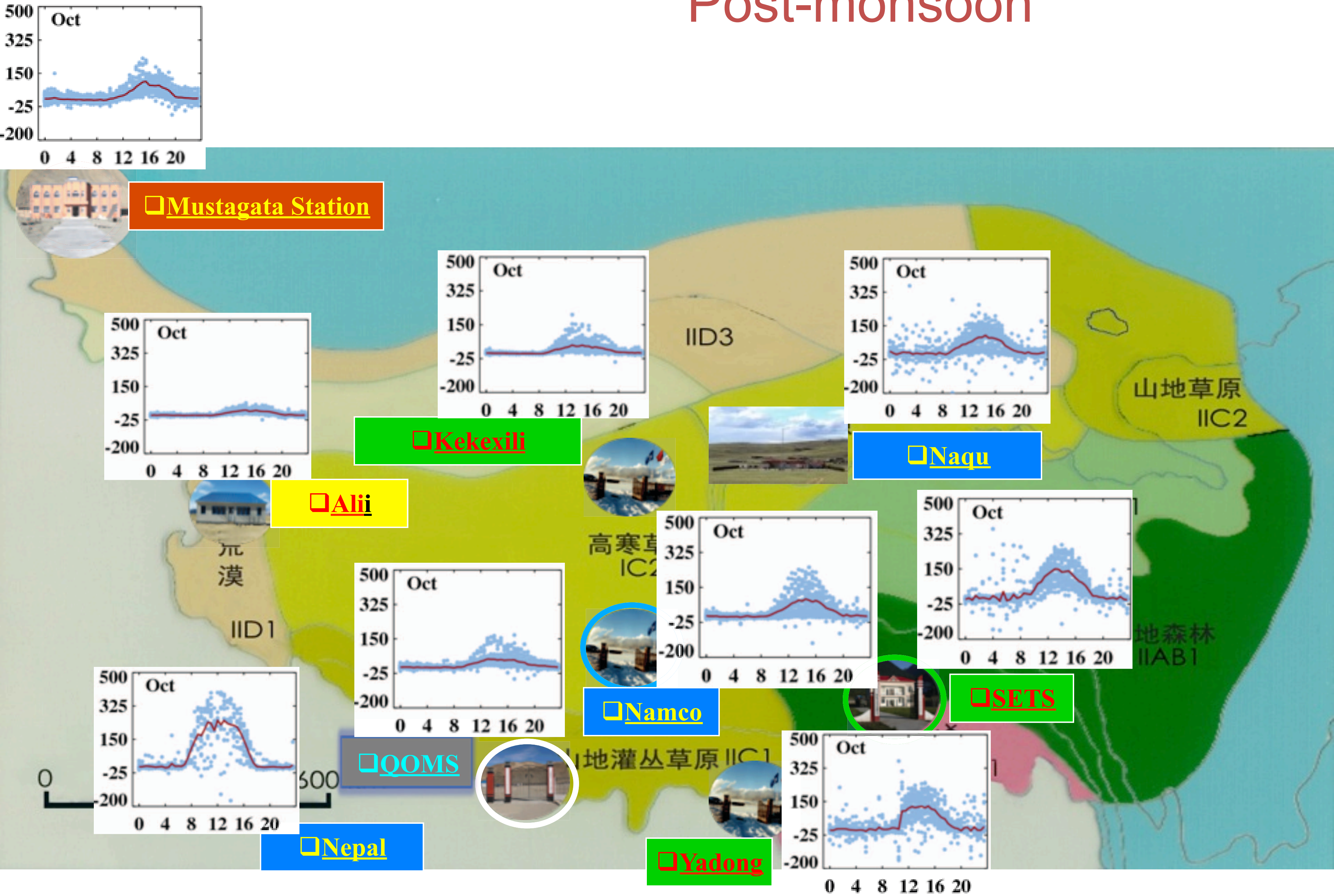


Monsoon



Aug
0 4 8 12 16 20
❑Mustagata Station
500
325
150
-25
-200
Jul
0 4 8 12 16 20
❑Kekexili
D3
Aug
0 4 8 12 16 20
Time
❑Ali Station
Aug
0 4 8 12 16 20
Naqu station
山地草原
IIC2
高寒草甸 IB1
荒
漠
IID1
Aug
0 4 8 12 16 20
高寒草
IC2
Aug
0 4 8 12 16 20
Namco
Aug
0 4 8 12 16 20
Time
❑SETS
山地森林
IIAB1
QOMS
Jul
0 4 8 12 16 20
0
600 km
Nepal
地灌丛草原 IIC1
500
325
150
-25
-200
Sep
0 4 8 12 16 20
❑Yadong
A1

Post-monsoon



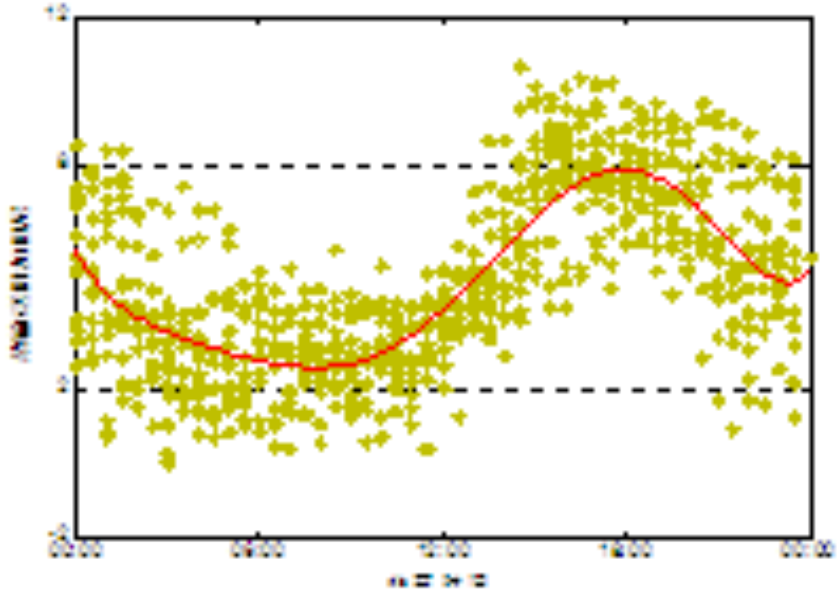
Aerodynamic and thermodynamic roughness Length

Table 1. Aerodynamic Roughness Length z_{0m} Der… …ifferent Land Surfaces by Using the Independent Method

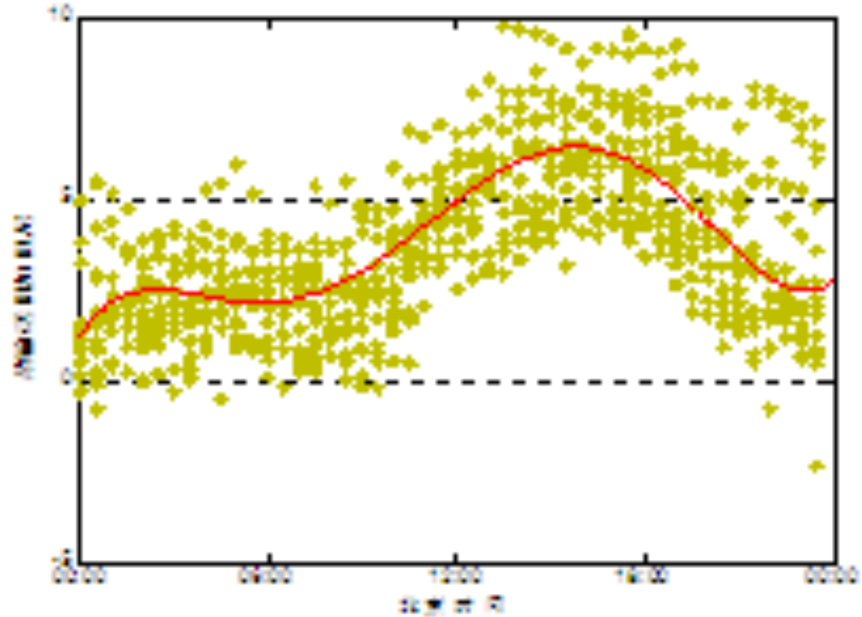
Land surface	Grass land	Grass land	Sand desert	Gobi	bean	wheat	corn
	~5 cm	~15 cm		vegetation (Gobi)			
Observation height	2.90	5.60	2.90	2.90	2.90	2.90	4.90
z_{0m}, m	0.00436	0.0139; 0.0139 (July), 0.0324 (August)	0.00267	0.0028	0.061	0.168	0.302

Table 2. Thermodynamic Roughness Length z_{0h} Derived From Different Land Surfaces

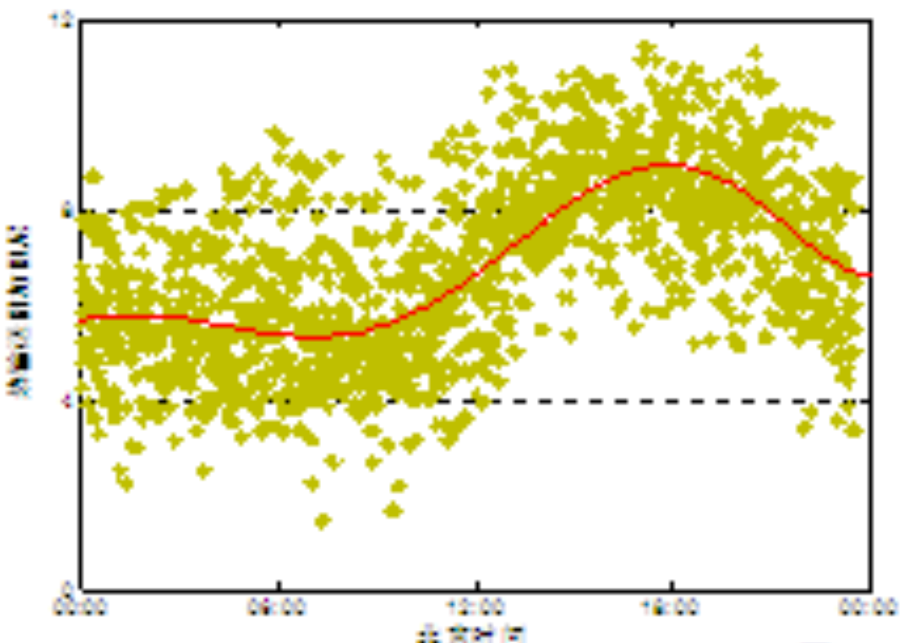
	Amdo	NPAM	HEIFE	HEIFE	HEIFE	HEIFE	AECMP'95
Land surface	Grass land	Grass land	Sand desert	Gobi	bean	wheat	corn
Height of observation, m							
z_{0h}, m	0.00041	0.00114	0.000049	0.000011	0.000685	0.00132	0.00227



Mt.Everest



Namco



Linzhi

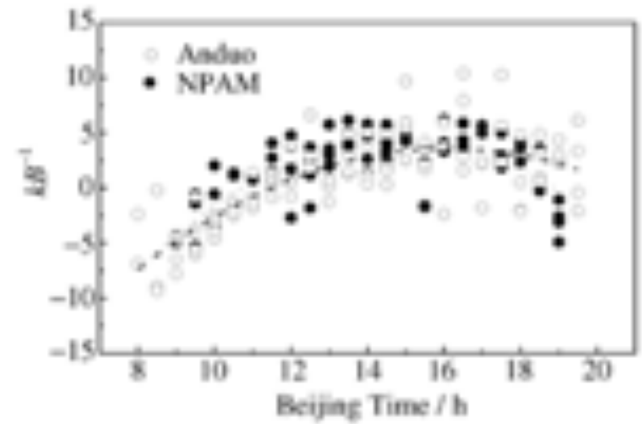


Fig. 2. Diurnal variations of the excess resistance to heat transfe
kB^{-1} of Anduo Station and NPAM Station.

Excess resistance to heat transfer (kB-1)