From planning to implementation

Update information of Monsoon Asia Integrated Regional Study (MAIRS) (January of 2007)
The formal launch of MAIRS in Earth System Science Conference in November of 2006.
Officially recognizing the MAIRS as an ESSP program

Recognising that there are issues special to regions, the Beijing Conference initiated the Monsoon Asia Integrated Regional Study to examine the threats posed to populations and ecosystems in Monsoon Asia.

The Statement of the Beijing Conference on Global Environmental Change

November of 2006
MAIRS – an New Element of Earth System Science Programs
MAIRS SSC members as October of 2006

Congbin FU (Chair, CEOP and AAMP, China);
M. Manton (vice-chair, WCRP, Australia)
J. Matsumoto (vice-chair, MAHASRI, Japan)
A.P. Mitra (vice-chair, ABC, India)
S. Anold (START-SEA, Thailand)
A. Chen (GCP, LOICS, China Taipei)
P. Kabat (IGBP-iLEAPS, Netherlands)
T. Koike (CEOP and GEOSS, Japan)
L. Lebel (IHDP, Thailand)
K. Seto (IHDP, USA)
Li Qin Shao (MOST, China)
S. Liu (IGAC, China Taipei)
Frits Penning De Vries (IPO, Netherlands).
MAIRS International Program Office

MAIRS IPO located at the Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, supported by CAS and Ministry of Science and Technology of China;

Staff:
Frits Penning de Vries, director
Ai Likun, deputy director
Yang Ying, information officer
Liqin Shao, science advisor

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To significantly advance understanding of the interactions among the human–natural components of the overall environment in the monsoon Asian region and implications for the global Earth System, in order to support the strategies for sustainable development.
Institution     Policy
Law      Education
Mitigation and Adaptation

Region
Industrialization Urbanization Intensive Agriculture

Global Human Development

Economic Issues

Environment

Earth System

Conceptual Framework of MAIRS

Natural Forcing
Solar Radiation
Land/Ocean

Atmospheric Chemistry
Physical Processes
Biogeochemical Processes

Asian Monsoon System

Tibetan Plateau

Physical Processes

Biogeochemical Processes

Emissions

Land/water Use

Mitigation and Adaptation

Institution
Policy
Law
Education

Environmental Issues

Biodiversity Water Food Energy Disaster

Earth System

Environmental Issues

Biodiversity Water Food Energy Disaster

Regional human development

Industrialization Urbanization Intensive Agriculture

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Biogeochemical Processes

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Lead questions for research

- Is the Asian monsoon system resilient to this human transformation of land, water and air?
- Are societies in the region becoming more, or less, vulnerable to changes in the Asian monsoon?
- What are the likely consequences of changes in the monsoon Asia region on the global system?
4 critical zones in monsoon Asia

- Coastal
- Mountain
- Semi-arid
- Urban
Research themes in critical zones

**Coastal**
- Rapid transformation of land and marine resources

**Mountain**
- Multiple stresses on ecosystem and biophysical resources

**Semi-arid**
- Vulnerability of ecosystem due to changing climate and land use

**Urban**
- Changes in resources use and emission due to rapid urbanization
Main issues in implementation

- Data availability and relevance
- Observation
- Modeling
- Capacity building
- Regional and international links
- Contributions to sustainable development
Development of Tools for Integrated Study

- Coordinating enhanced multidisciplinary filed observations in key areas;

- Development of Regional Earth System Models.
Selected key areas for coordinated enhance-observation
Examples of Potential Pilot Projects in 2007-2009

- MAIRS-CEOP Joint integrated study on land – atmosphere - *hydrosphere* interaction in semi-arid Asia;
- Atmospheric chemistry-monsoon interaction integrated study in city cluster of Yangtze Delta;
- Global warming-deglaciation-*river system* integrated study over the Tibetan Plateau as well as Asia;
- Development of an Regional Earth System Model for Monsoon Asia.
MAIRS-CEOP Joint integrated study on land–atmosphere–hydrosphere interaction in semi-arid Asia

- Water resource and ecosystem service goods are very crucial to the people living in semi-arid regions.
- Semi-arid regions are sensitive to monsoon variability and human perturbations.
- Semi-arid areas in monsoon Asia are one of the major sources of dust aerosol.
Main research themes

- Interactions among global warming, monsoon variability and aridity
- Atmosphere, land surface and ecosystem interaction
- Dust aerosols, hydrological cycle and climate

Leading research question:
How will semi-arid zones change in the next decades with respect to water resource, air quality, provision of ecosystem goods and services, extreme events and hazards?
CEOP/MAIRS coordinated enhanced observation in arid /semi-arid region of Northern China
Tongyu CEOP reference site, Northeastern China
Lanzhou station over Loess Plateau

560 M² Space for daily operation and instruments storage

30 meters tower
Urbanization is a major driver, and outcome of economic and social development.

Urban zones are the major sources of all pollutants.

Urbanization is occurring at very rapid rate and is expected to continue in next decades.
Main research themes

- Energy, emissions and urban air quality
- Urbanization, flood regimes, disaster management
- Urbanization and water security

Leading research question:

What are the impacts of urban landscape change and emissions on the climate system, ecosystem, agriculture and human health?
Coordinated observation in city cluster of Yangtze delta

- Emissions of atmospheric pollutants;
- Observation of physics and chemistry of atmospheric aerosols and their pre-bodies;
- Remote sensing of aerosols distribution and their radiative characters, in cooperation with surface stations;
- Other meteorological and land surface elements.
Observation network in city cluster of Yangtze Delta
Regional Model Inter-comparison Project for Asia (RMIP)

- USA: CU: A. Lynch; ASU: W. Gutowski
- Japan: NIES: S. Emori; CRIEPI, H. Kato; MRI: Sato
- Australia: CSIRO, J. McGreger
- R. Korea: SNU, D. Lee; YU, J. Kim
- China: TEA-RC, C. Fu; NU, B. Su

A Joint effort of 10 research groups of 5 countries

(Fu et al, Bulletin of AMS, Feb. 2005)
Tasks of RMIP for AISA

- Phase I, 18 months run, annual cycle and extreme
- Phase II, 10 years run, statistical behaviors
- Phase III, nesting with GCM, projection of climate change in 21 Century,
MAIRS related meetings in future

• Symposium on Global Change: Asia monsoon, extreme weather and climate, in Pacific Science Congress (PSC), 13-17, Jun. 2007, Okinawa, Japan;
• MAIRS Workshop on Anthropogenic effects on Asia monsoon, Taipei, China, Fall of 2007;
• Regional Modeling workshop in 2007 - 2008;
• An MAIRS session in AGU 2007;
In the present era, global environmental changes are both accelerating and moving the earth system into a state with no analogues in the previous history.
Thank you very much!

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