Activities of MAVEX, IORGC and RAISE Projects

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Outline

1. Background and purposes
2. Some results of the projects
3. Future plans

MAVEX, IORGC and RAISE projects

> MAVEX project: Mongol AMSR/AMSR-E/ALOS Validation Experiment project (2005 – 2007) by Hiroshima Univ., JAXA, IMH, Univ. of Tokyo, Chiba Univ.(CEReS), etc. (AMPEX:2000-2004, CEOP in Mongolia:2003-)

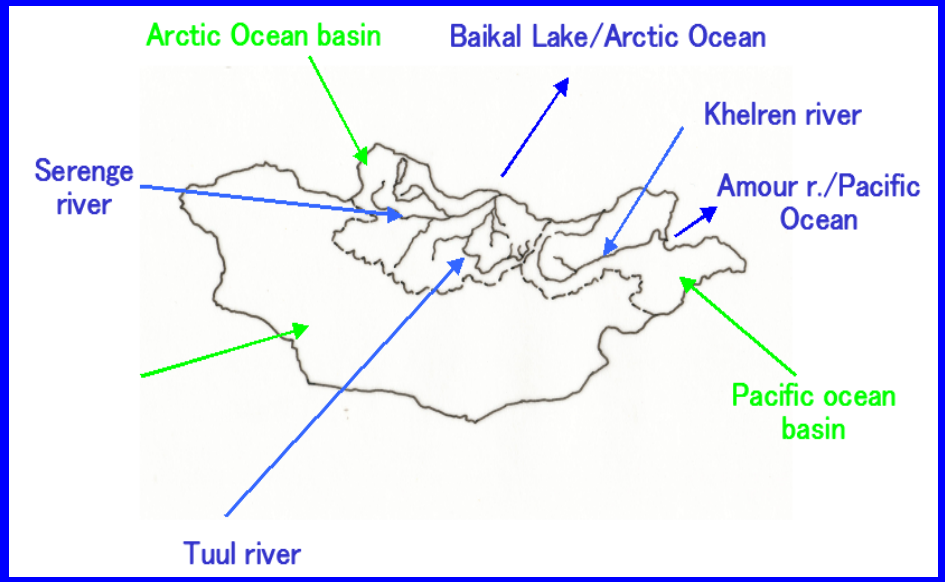
> IORGC project : Inst. of Observational Res. for Global Change study project (2002-) of JAMSTEC

> RAISE project (JST-CREST project) : Rangelands Atmosphere-Hydrosphere-Biosphere Interaction Study Experiment in Northeastern Asia project (2002-2007) by Univ. of Tsukuba, IMH, etc.

Importance to study water cycle in Mongolia

> Boundary zone between Asian monsoon and Polar climate areas
– Remarkable and big changes of precipitation, soil moisture, permafrost soil, thawing and various vegetation distribution in the area of several hundred km in the north to south in Mongolia–

> Two international river basins and inner drainage basin
– Tuul river basin (Arctic Ocean basin), Kherlen river basin (Pacific Ocean basin), Mongolian plateau –



> Model area for water cycle and water resources management studies in arid/semi-arid region

Purposes

- Making clear effects of soil moisture change to water cycle in arid/semi-arid region (MAVEX project)

- Long-term ground-based monitoring of water cycle with satellite observation (MAVEX project)

- Clarifying the characteristics of regional water cycle with special stress on the influence of vegetation and snow/ice conditions (IORGC project)

- Assessment and prediction of the atmosphere-water cycle-ecosystem interaction under the influence of human activities in Northeastern Asia (RAISE project)

Strategy

- Observation
  - Long-term ground-based monitoring
  - Intensive observation
  - Satellite and aircraft observations

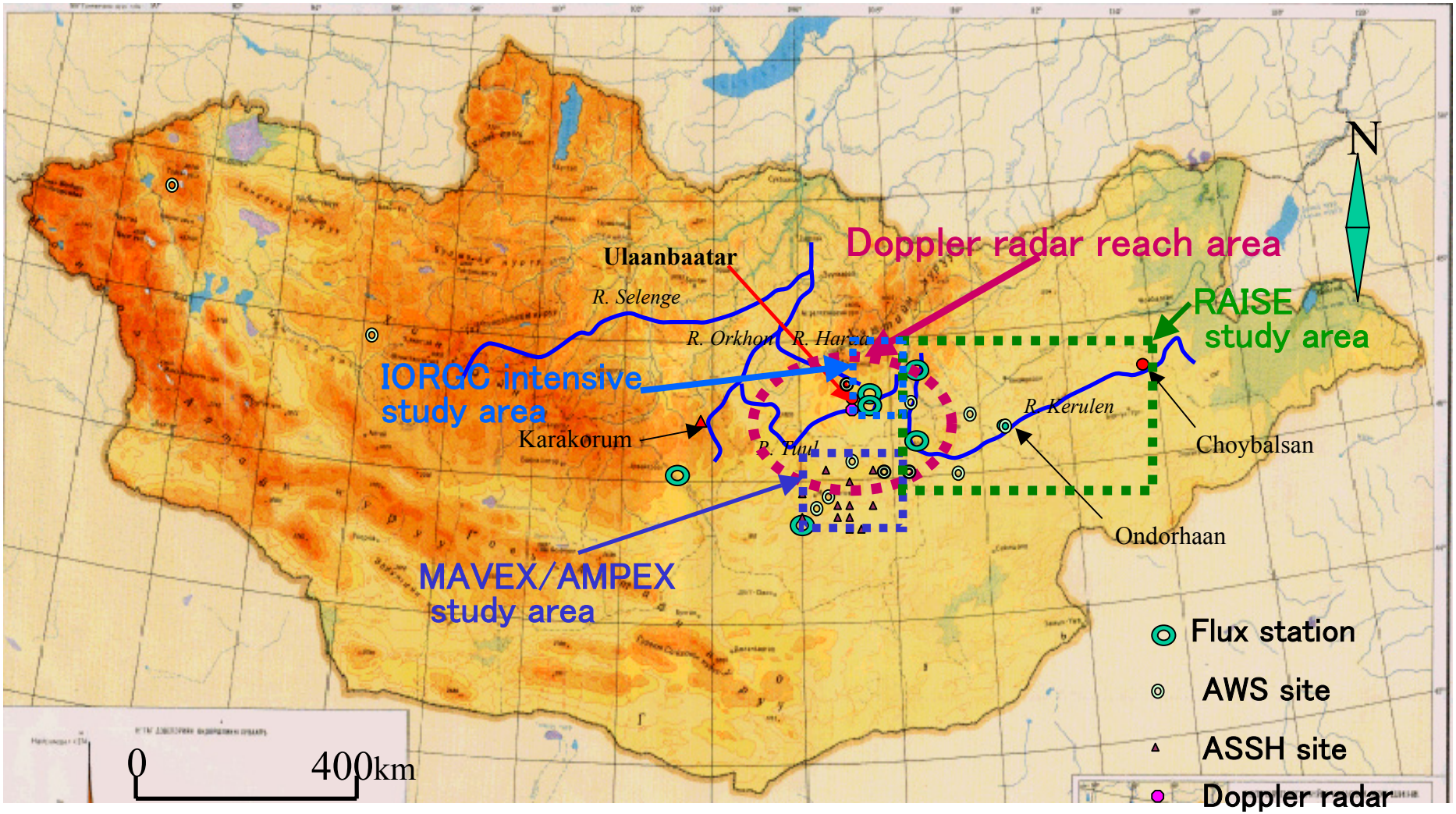
- Various routine data analysis

  Routine data of NAMHEM (Natural Agency for Meteorology, Hydrology and Environment Monitoring in Mongolia), etc.

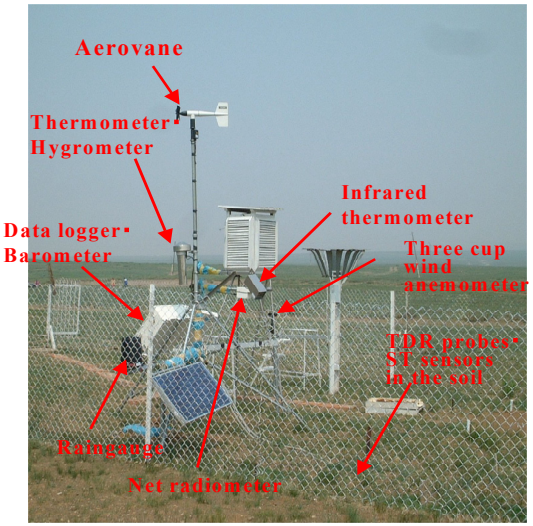
- Modeling

  Regional climate model, Distributed hydrological model, Terrestrial plant ecological model etc.

Study area and stations of MAVEX, IORGC and RAISE projects

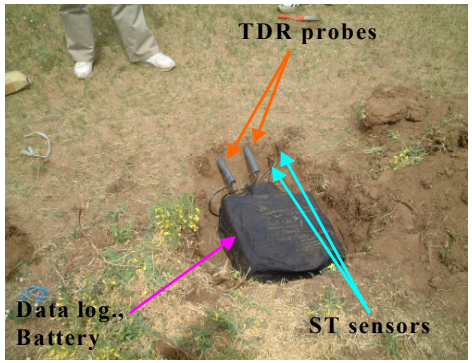


Ground-based monitoring of water cycle

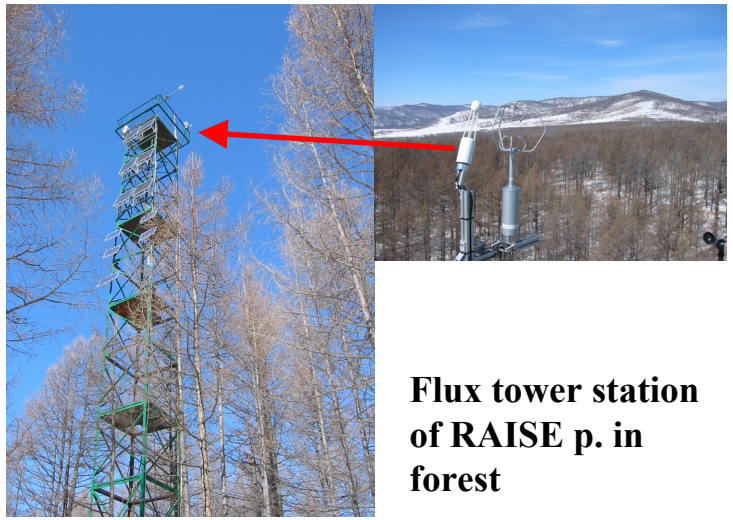


AWS in BTS

AWS/ASSH (Automatic Station for Soil Hydrology) of MAVEX p.

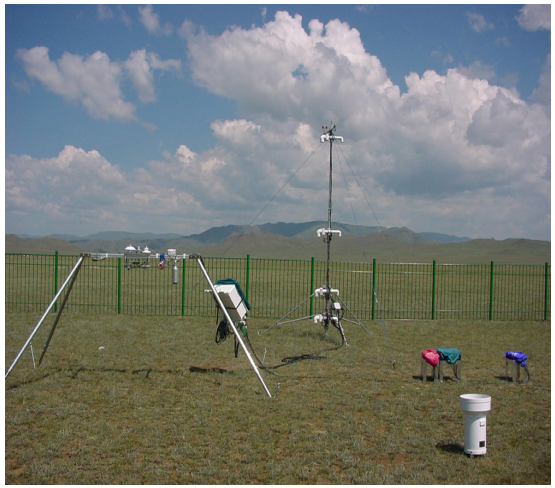


ASSH



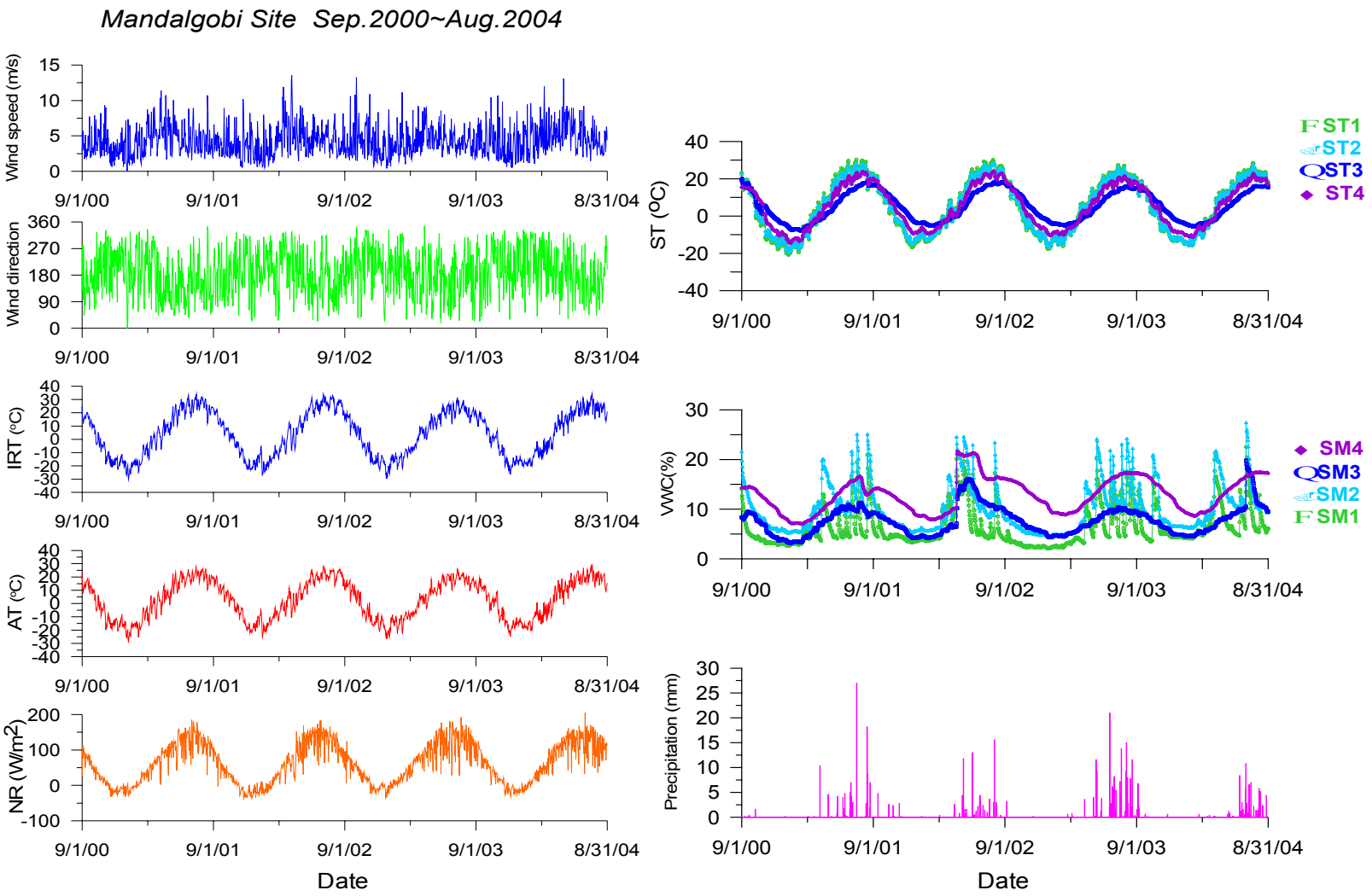
Flux tower station of RAISE p. in forest

AWS in Terelj (IORGC p.)



AWS in Nalaikh (IORGC p.)

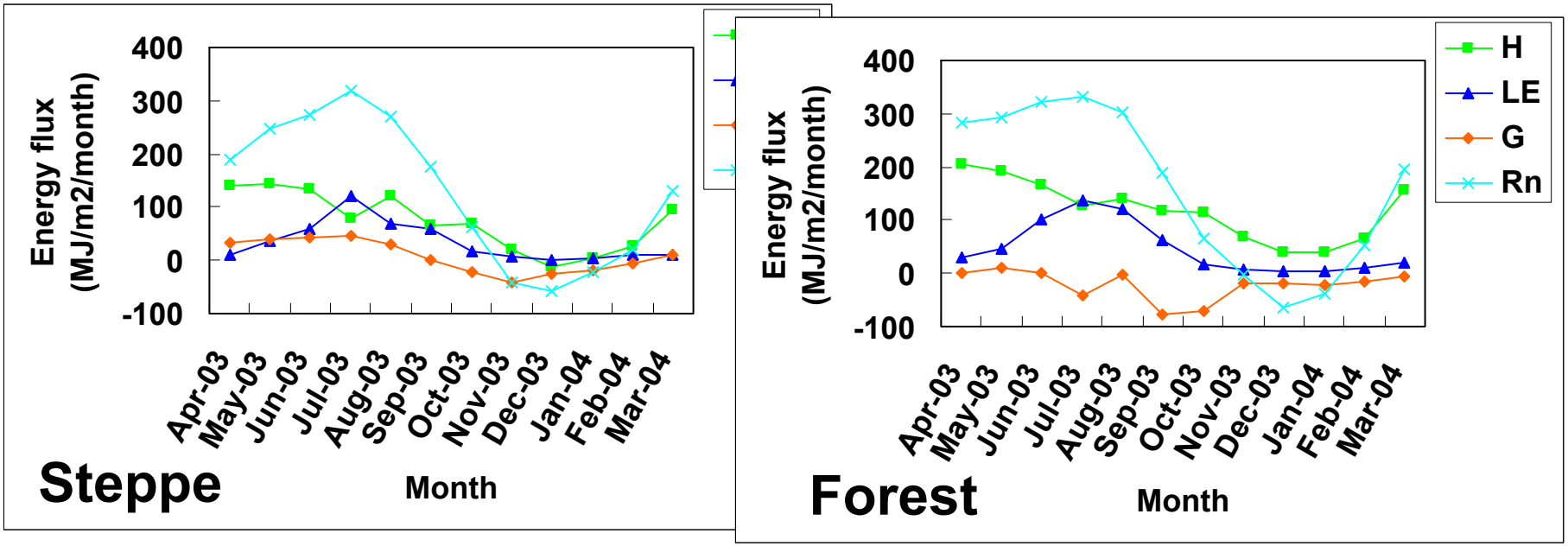
Flux type AWS of RAISE p.



A sample of monitoring data : Change in the daily mean values of basic elements from September 2000 to August 2004 at Mandalgobi of MAVEX /CEOP

(IRT: surface soil temperature, AT: air temperature, NR: net radiation flux, St: soil temperature, VWC: volumetric water content of soil moisture)

Energy and water balance (RAISE p. :Li et al., 2004)



Rn: 1563 MJ/m^2/year
H: 883 (56%)
LE: 307 (20%)
G: 84 (5%)

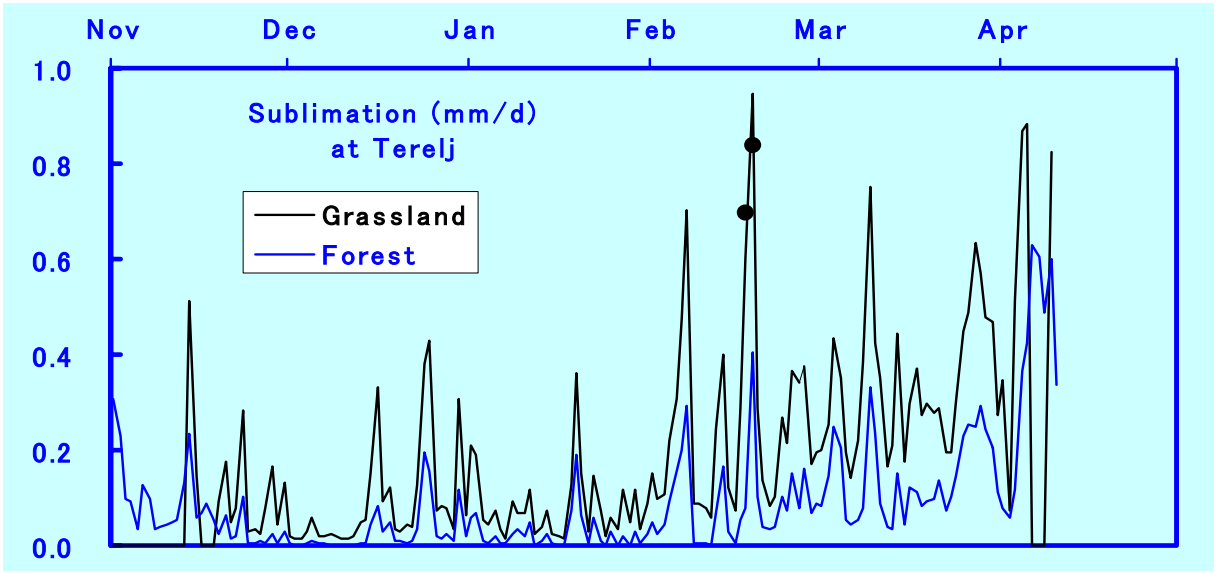
Total Precip : 196 mm/year
Annual evapotranspiration: 163 (83%)

Rn: 1929 MJ/m^2/year
H: 1434 (74%)
LE: 564 (29%)
G: -263 (-14%)

Total Precip : 302 mm/year
Annual evapotranspiration: 225 (75%)

●Land surface Processes, energy/water balance

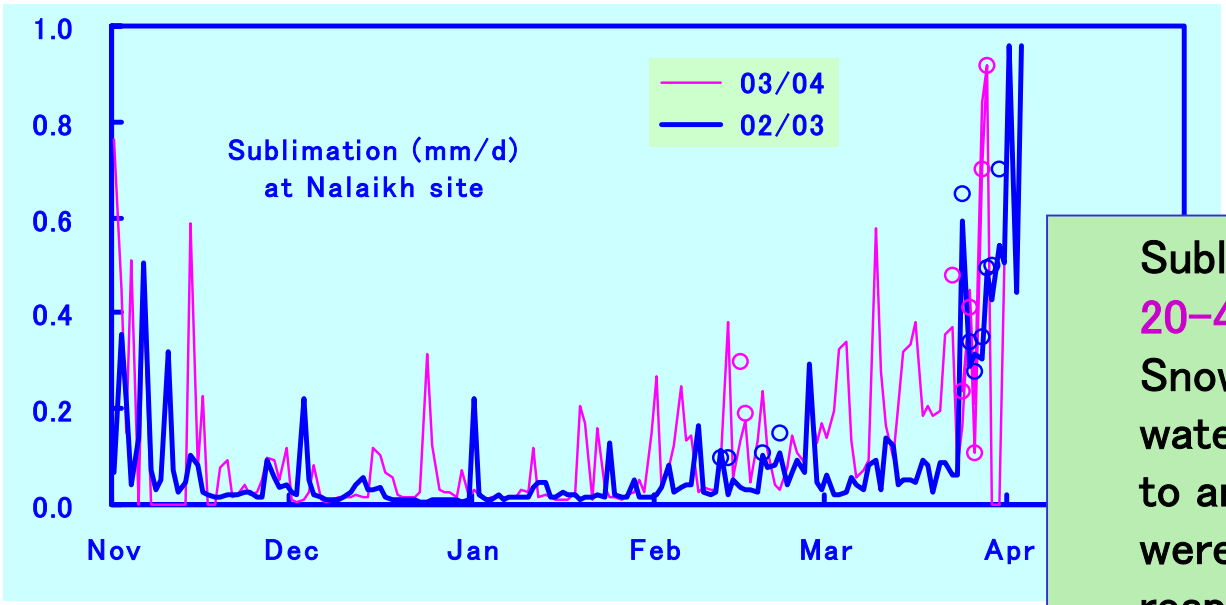
Sublimation of snow cover at Terelj and Nalaikh (IORGC p. from Zhang)



Terelj (Nov-Mar)

Forest 14.6mm

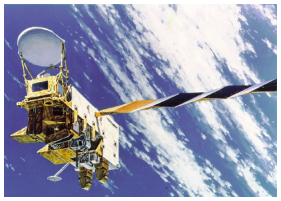
Grassland 28.8mm

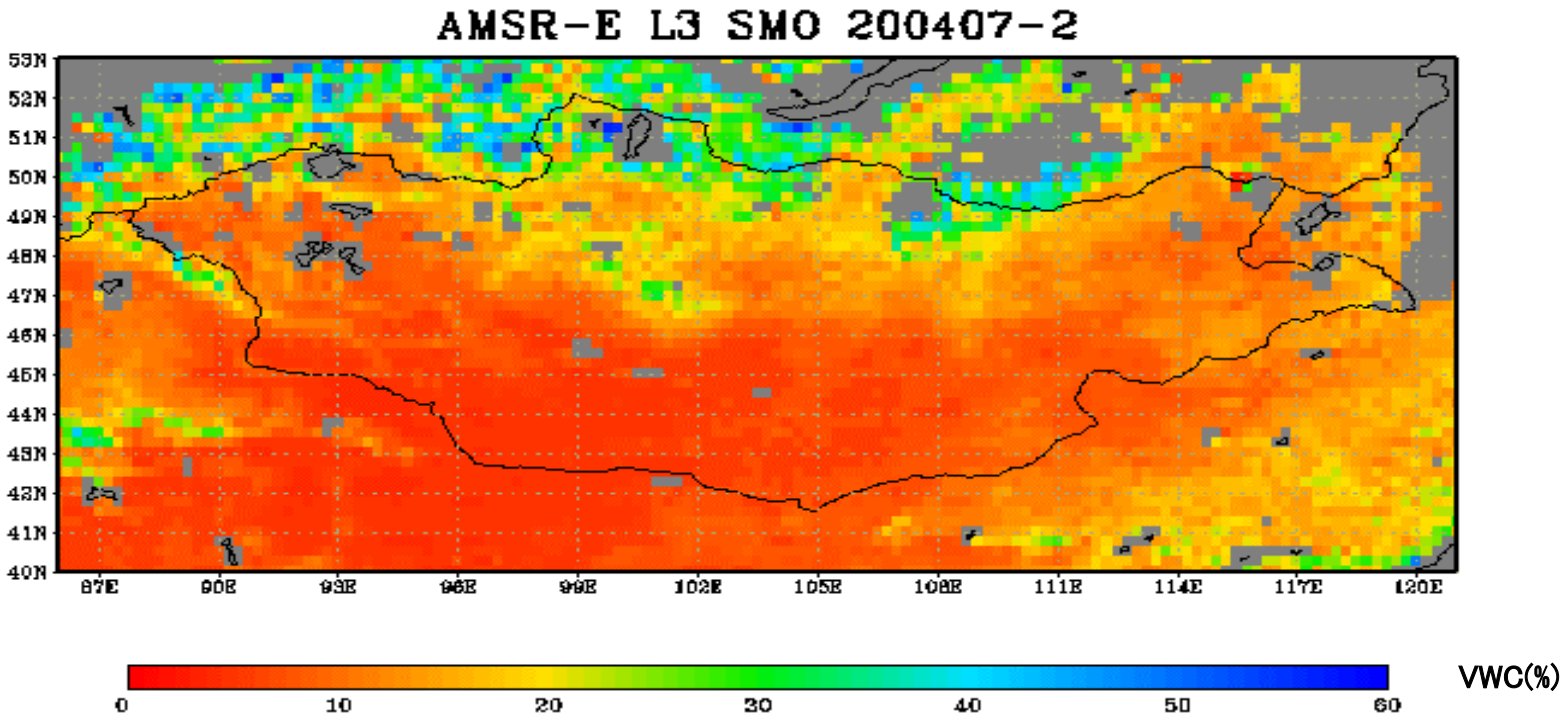


Nalaikh

Grassland18.5mm
(2003/04)

Sublimation of snow cover was 20–40% of winter precipitation. Snow sublimation and snowmelt water evaporation contribution to annual evapotranspiration were 10% to 13% and 7% to 9%, respectively.





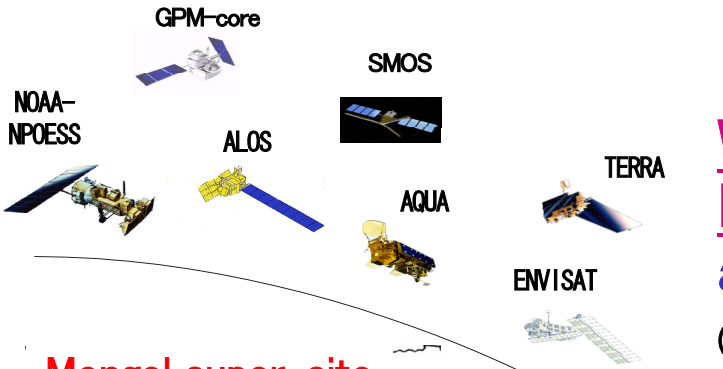
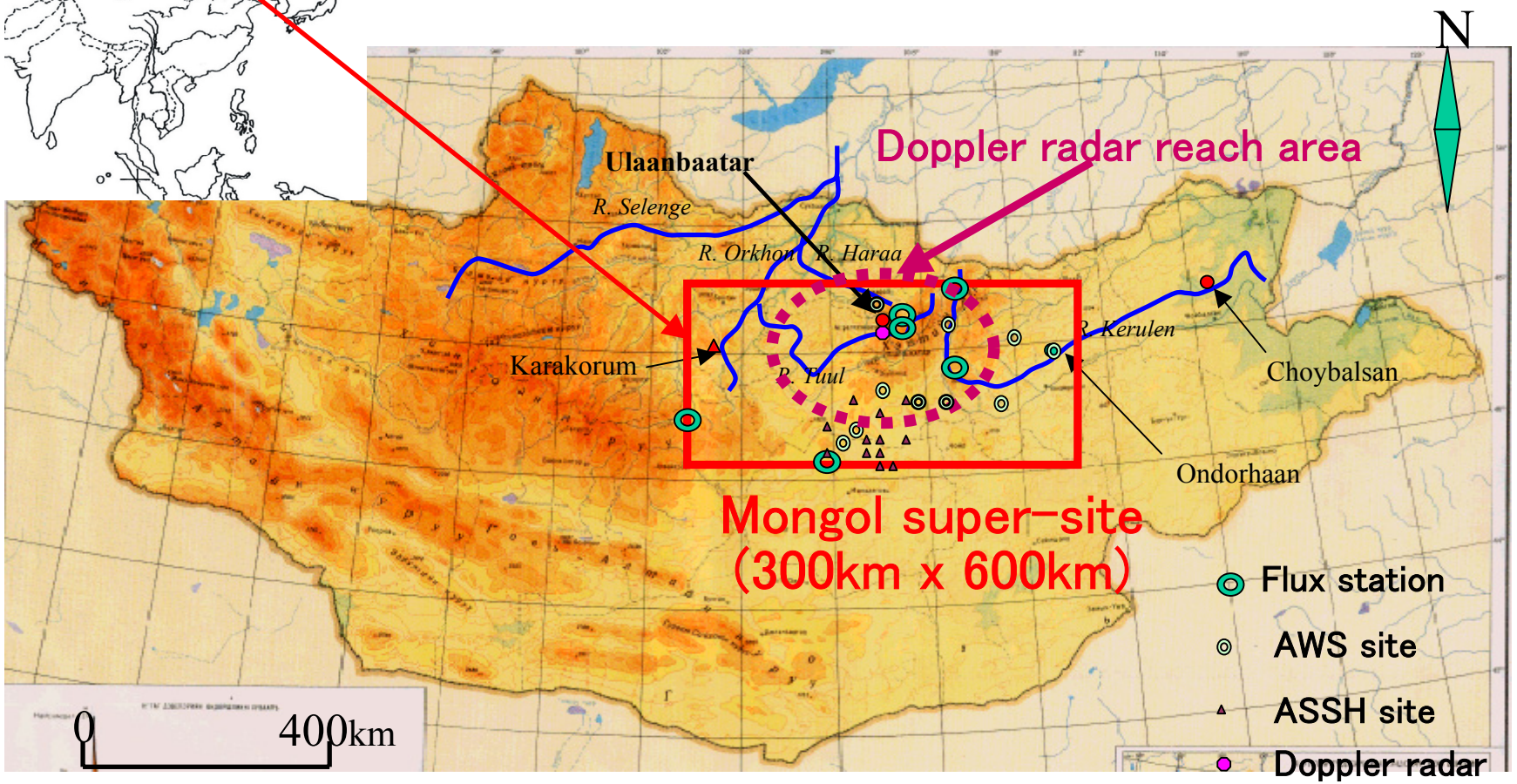
AMSR-E soil moisture estimation (Mid-July 2004) in Mongolia (MAVEX p.)

Summary of the project results

- Monitoring data
  - AWS and ASSH monitoring data from 2000 to 2005
  - Flux station monitoring data from 2003 to 2005
- Data of physical soil properties of all sites
- Some findings in water cycle study
  - Strong correlation between precipitation and phenology
  - Clear relation of precipitation and evaporation to soil moisture
  - 80–90% of precipitation was evaporation in steppe.
  - Development of regional climate model
  - Heating of Tibet by numerical experiments
  - Sublimation of snow cover was 20–40% of winter precipitation.
- Soil moisture estimation by AMSR-E observation

Future plans

- Continuing ground-based monitoring
- Satellite soil moisture observation by AMSR-E/PALSAR (ALOS)/MIRAS(SMOS) (MAVEX p.)
- Hydrological change study of Tuul river basin under global warming (IORGC p.)
- Further studies of water cycle with focusing on surface-atmosphere interaction, biology and soil (RAISE p.)
- Improvement of regional climate model and linkage of hydrological and ecosystem model to climate model (RAISE p.)
- Investigation how to open the data and of a possibility for building a water cycle observation system in Mongolia

Water Cycle Observation System in Mongolia by Earth Observing Satellites and Ground-Based Observation

(in cooperation with MAVEX p., IORGC p., RAISE p. and ？)