AWCI/GEOSS Drought Capacity Building

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3rd AWCS/GEOSS, 2 Dec, 2007, Beppu, Japan

Drought group meetings

First: Sep. 2006, Bangkok

Second: Jan. 2007, Tokyo

Third: Sep. 2007, Bali

Forth: Dec. 2007, Beppu

Main Conclusions from Drought Group

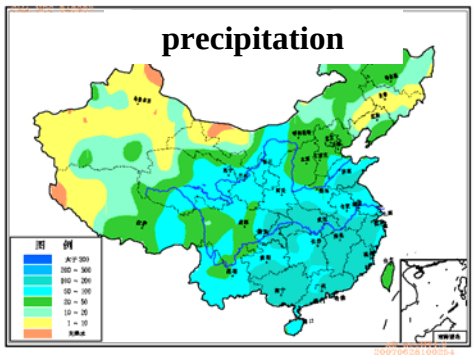
1. Today, the satellite based information on precipitation and soil moisture is mainly being used on experimental basis
2. To understand the variability of the terrain in different countries, in-situ measurements (automatic) integrated with spatial data is also necessary.

Drought Assessment and Capacity Building

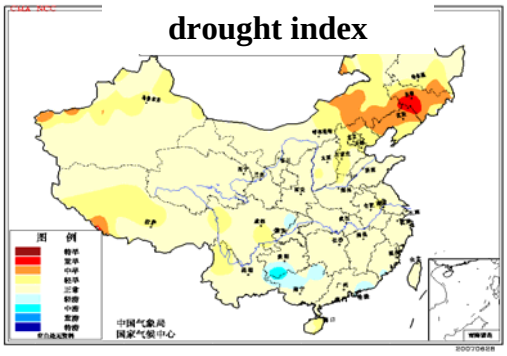
parameters	Data source	Capacity building status
NDVI	Optical RS data	Sharing of experiences with member countries
Moisture stress index(MSI)	Optical RS data (NIR, SWIR)	Sharing of experiences with member countries
Soil moisture index(SMI)	Optical RS data	Sharing of experiences with member countries
Soil moisture estimation	microwave	a topic for research and development.
Snow cover estimation	Optical RS data	Sharing of experiences with member countries
relative evapotranspiration	Optical RS and meteorological data	experts needs to be invited for training and identifying pilot projects for validations in respective regions.

Drought monitoring in China, middle June 2007

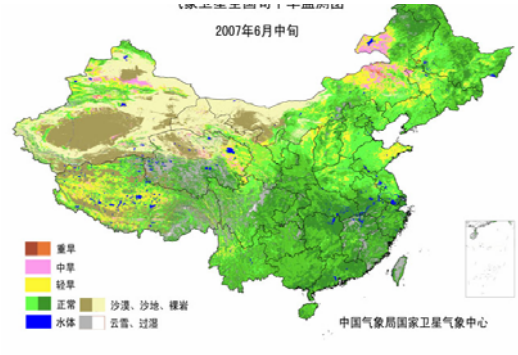
precipitation



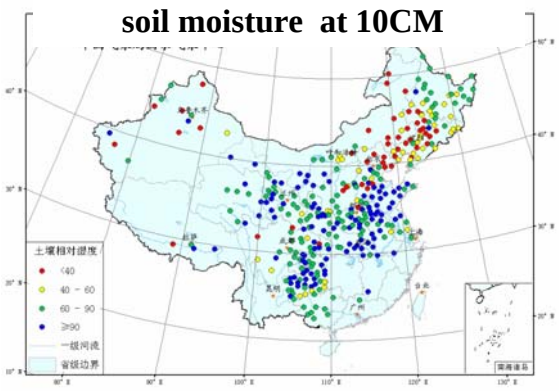
drought index



Satellite drought monitoring



soil moisture at 10CM



Toward the implementation

1, Build a drought monitoring network in Asia under AWCI

Japan, China, Mongolia, Pakistan, Nepal, Thailand, Philippines, Vietnam, India

Toward the implementation

2, Remote sensing products will be used in drought monitoring (mainly focus on the soil moisture monitoring)

Visible & Inferred RS for Soil Moisture

1). Theory

Thermal inertia represents ability of the sub-surface's ability to store heat during the day and reradiate it during the night. It is also relevant to the water stored in the subsurface layer.

2). Algorithms

Thermal inertia is a function of daily difference of the maximum and minimum soil temperature, which can be derived from satellite remote sensing measurements at midday and midnight overpass time.

3). Main Data Source

NOAA/AVHRR, EOS/MODIS

Others

4). Applications

Soil moisture product

Drought monitoring

5). Merits and shortages

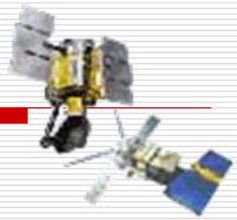
(1) The RS data are easy to be collected, and at high temporal and spatial resolution.

(2) Conception based shortage: focus on soil heat flux but sensible and latent heat fluxes.

(3) Influence of the vegetation layer.

(4) Errors in deriving the maximum and minimum soil temperature.

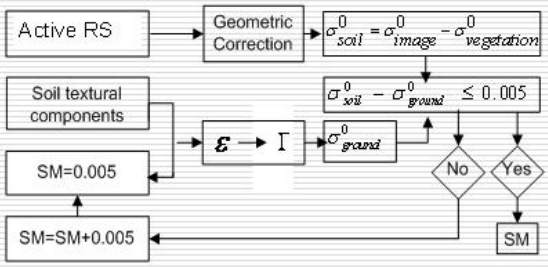
Active Microwave RS for Soil Moisture



1). Theory

The satellite sensor received signals are the contributions from soil moisture, vegetation and surface roughness in the active microwave remote sensing. Soil moisture contribution need to be separated from this mixed signals.

2). Algorithm (Flow Chart)



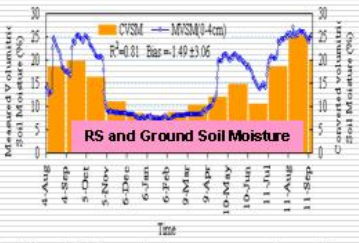
SM: soil moisture

3). Data Source

ENVISAT/ASAR, ERS/Scatterometer

ALOS/PALSAR and Others

4). Applications (Climate & Soil Moisture)



5). Merits and shortages

(1) The active RS data are at higher spatial resolution but lower temporal resolution

(2) All-weather observation.

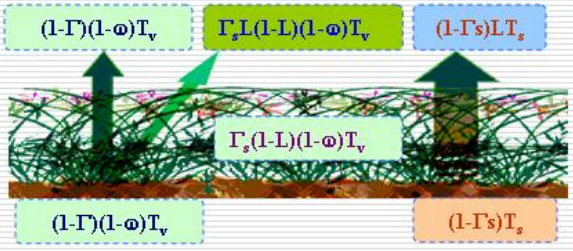
Passive Microwave RS for Soil Moisture

1). Theory

Solve the radiation transfer equation which is used to describe the microwave radiation transfer process between the land surface soil and satellite sensor.

2). Algorithm

$$T_{Bp}(\tau,\theta) = (1+L\Gamma_p)(1-L)(1-\omega)T_V + (1-\Gamma_p)LT_S$$



L: vegetation transmittance Γ_p: soil reflectivity

τ: vegetation optical thickness ω: single scattering Aledo

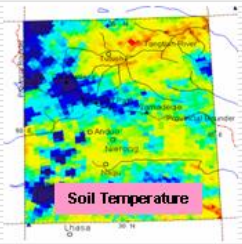
T_v: canopy temperature T_s: soil temperature

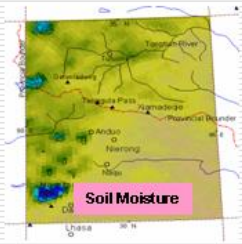
3). Data Source

SSM/I, TRMM/TMI, AMSR-E

SMOS, Others

4). Applications





5). Merits and shortages

(1) The passive RS data are at higher temporal resolution but lower spatial resolution.

(2) All-weather observation.

(3) Climate change research.

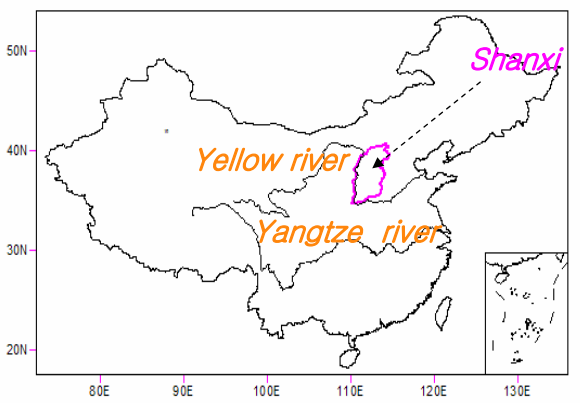
We will work together with JAXA/University of Tokyo and local scientists through the framework of AWCI/GEOSS

Towards the implementation

3, In-Situ observation of soil temperature/moisture, precipitation and air temperature are necessary

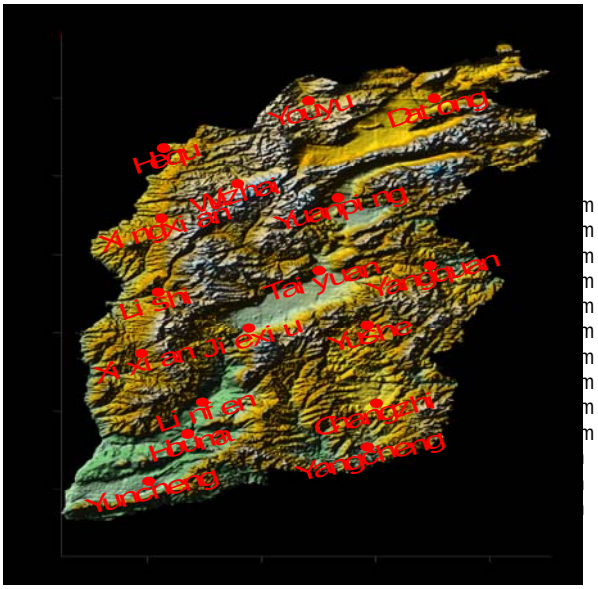
we choose 1-2 key area in each related countries

Case study in China: Shanxi province

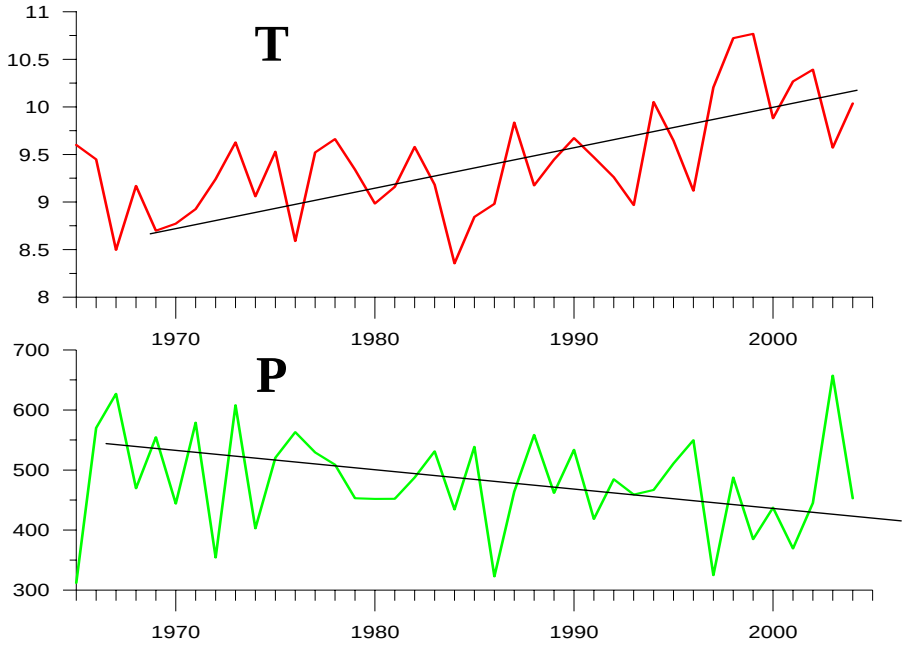


Location of Shanxi

Relief map
of Shanxi province



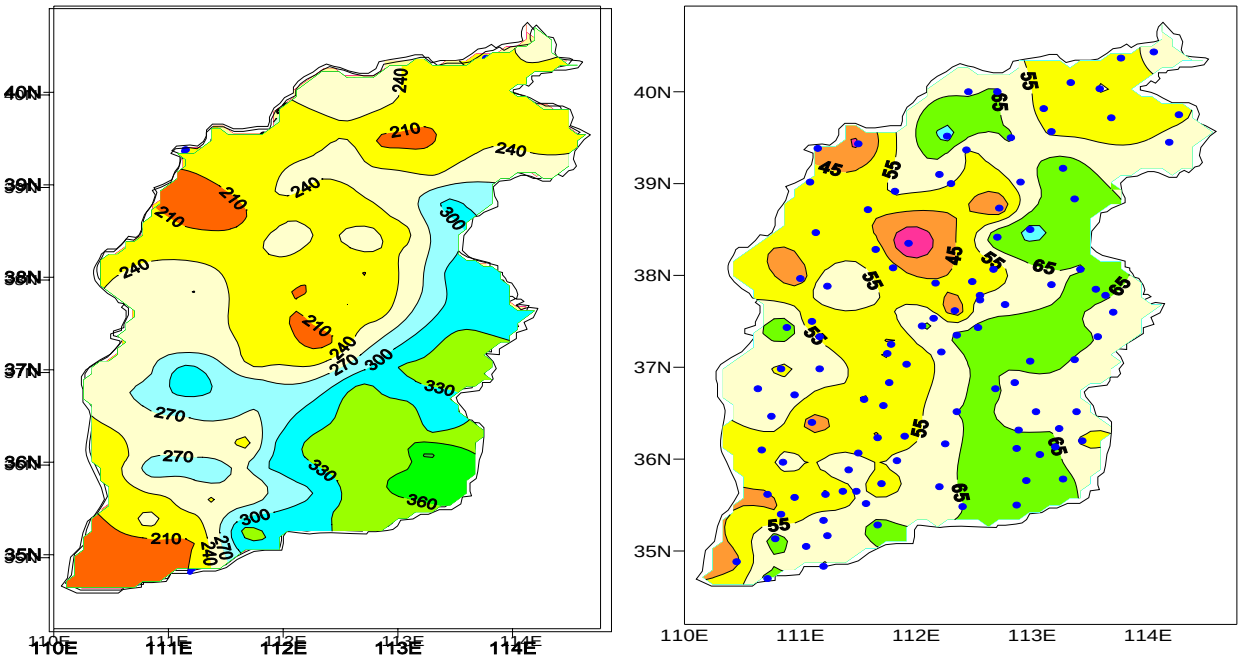
Time series of annual precipitation and mean temperature of Shanxi in recent 40 years



Soil T and M at 10cm in summer (2001-2006)

Summer precipitation

(b)Summer relative soil moisture at 10cm



The distribution of observing stations (108) summer precipitation and soi l moisture (2001-2006) in Shanxi province, China

Toward the implementation

4, Fanatical support

Besides the strong support of JAXA and Tokyo university, We already submitted the APN proposal under the framework of AWCI/GEOSS in October this year, other opportunity?