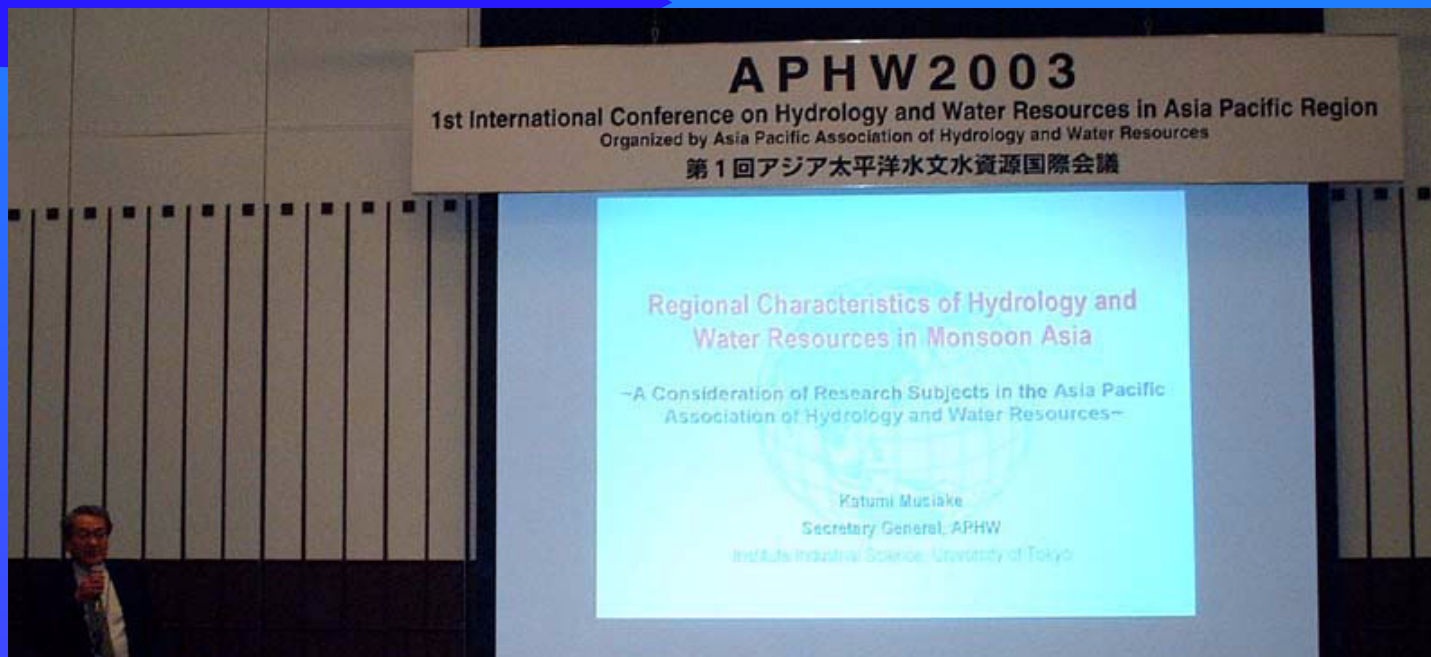


Geography and Water Budget in Asia Pacific Region

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Asia Pacific Association of Hydrology and Water Resources



*Center for Environmental Remote Sensing, Chiba University

Primary Purpose:

Create a Spatial Framework to discuss
about Hydrology & Water Resources

水文・水資源について議論するための空間
的枠組み



Identity of Asia and Pacific Region
アジア太平洋地域の特徴

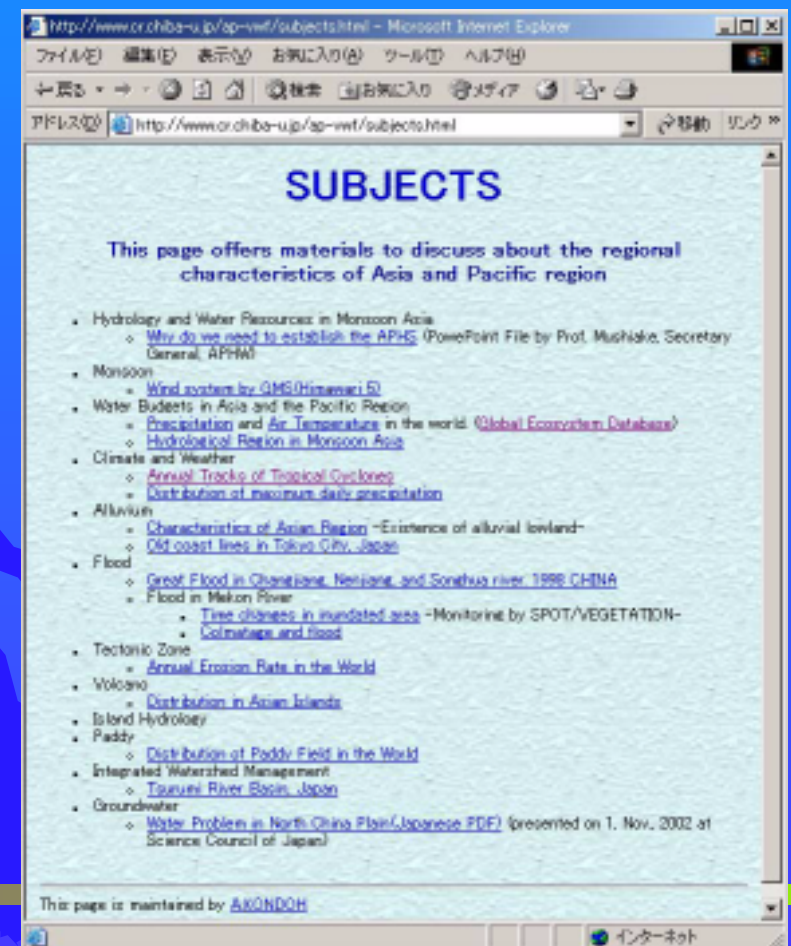
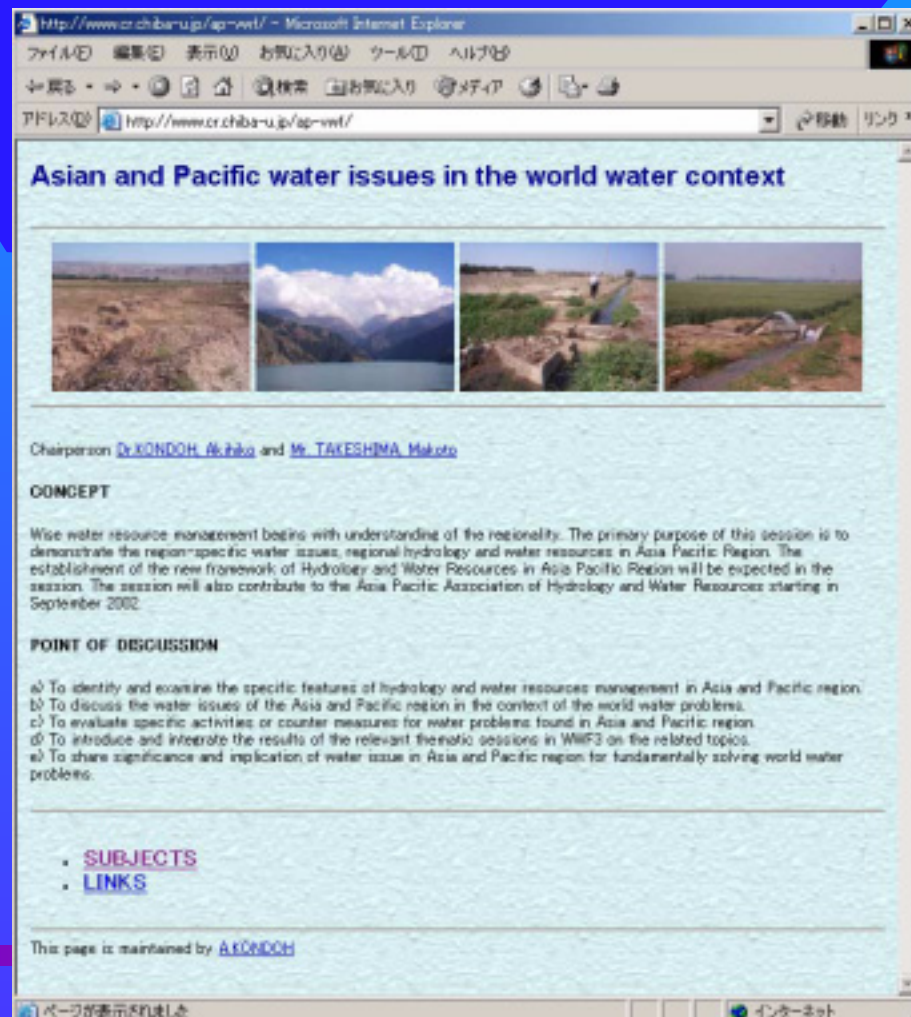
Asian and Pacific water issues in the world water context

Virtual Water Forum

Asian and Pacific water issues in the world water context

アジア太平洋地域の水問題

<http://www.cr.chiba-u.jp/ap-vwf/>





What is the characteristics of Asia and Pacific region?

- Population
- Paddy field
- Climate

Monsoon

Precipitation

Tropical Cyclone

- Geomorphology

Tectonic zone

Volcano

Erosion rate

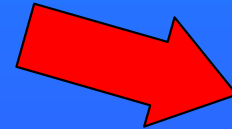
Alluvial lowland

- Disaster

Flood, Drought

- Others

Interaction
各要素の関連性、空間的配置が

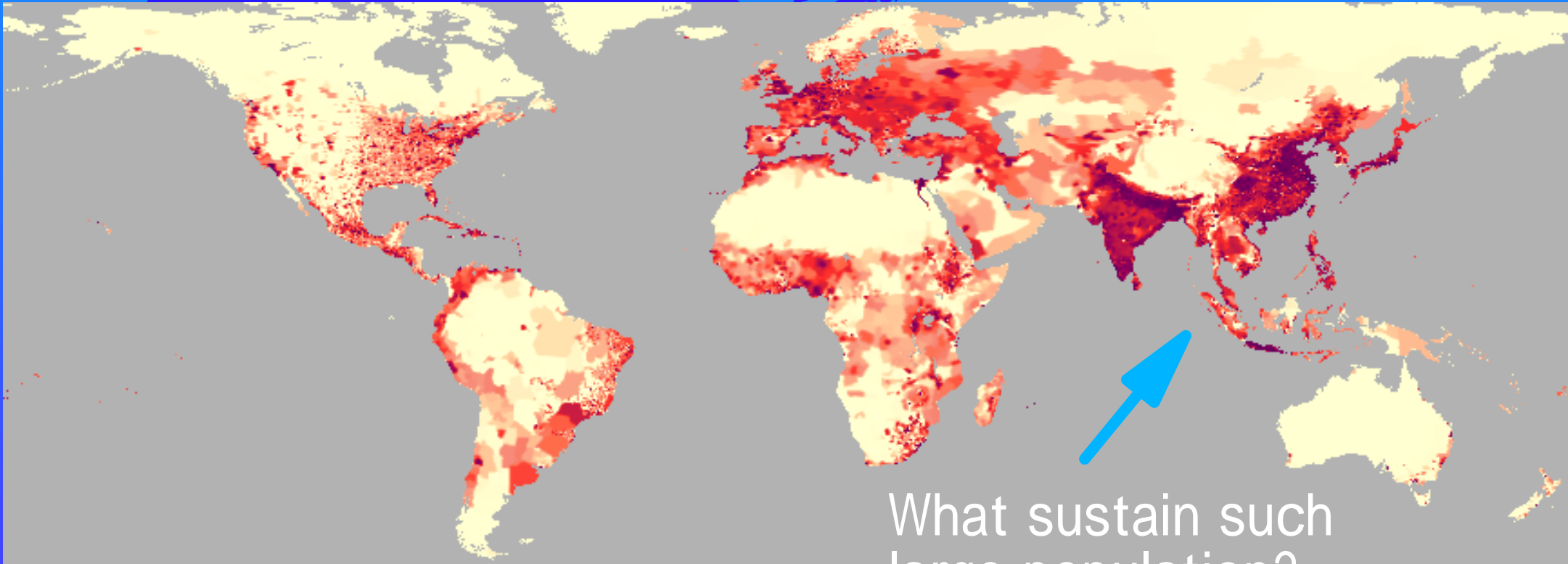


Regional Characteristics
地域性を形成している

Largest Population

世界で最も人口の多い地域

Asia and Pacific region has over 60% of world population.



What sustain such large population?

Gridded Population of the World

<http://www.ciesin.org/datasets/gpw/globldem.doc.html>

Rice Paddy Field 稲作の存在

Blessing from Alluvial Lowland

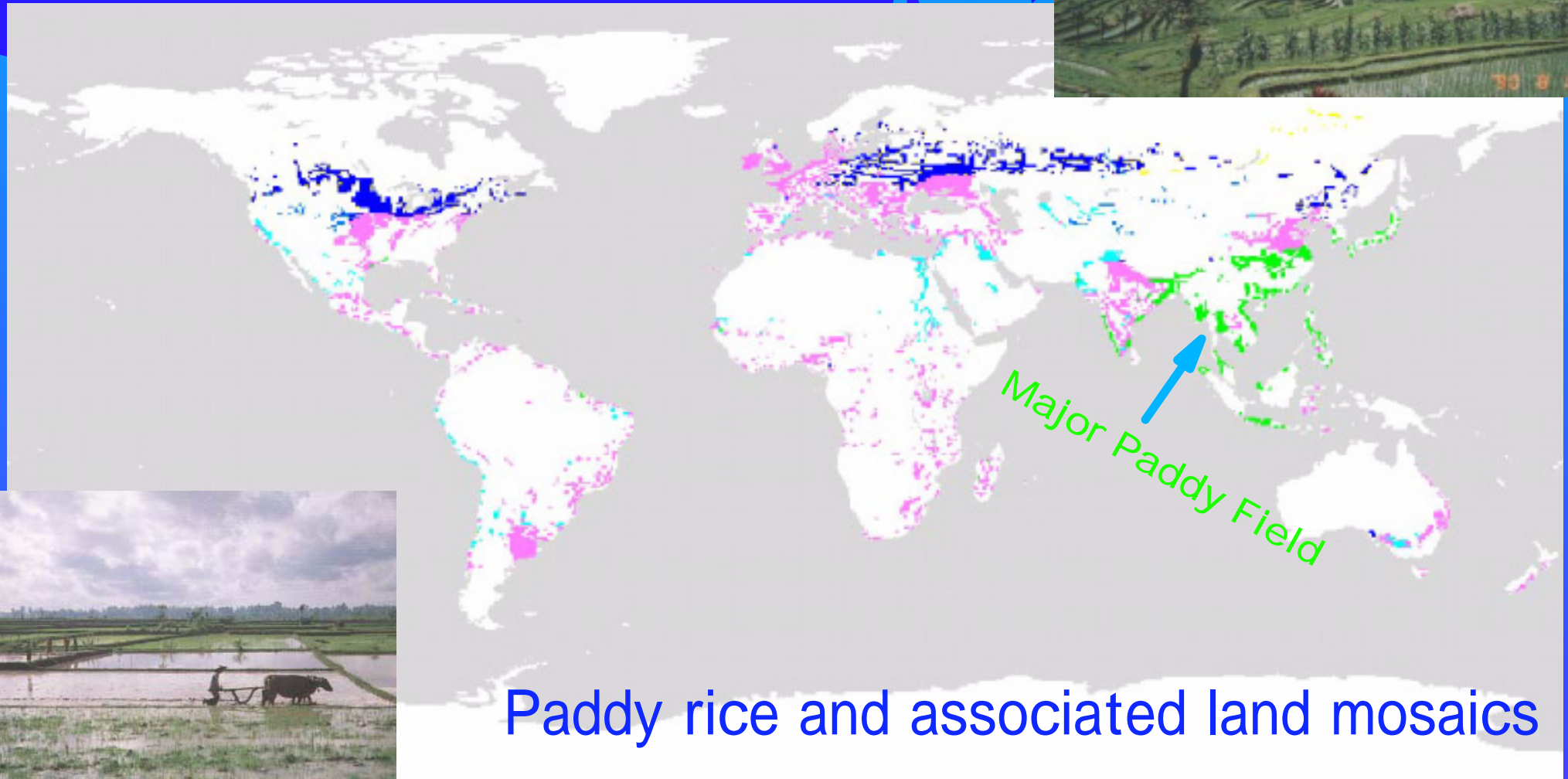


Photo by I.Kayane

The map is created from Olson World Ecosystem Classes Version 1.4D.

Why paddy fields are widely distributed in Monsoon Asia ?

Climatic Factors

- Asian Monsoon
- Tropical Cyclones



Geomorphic Factors

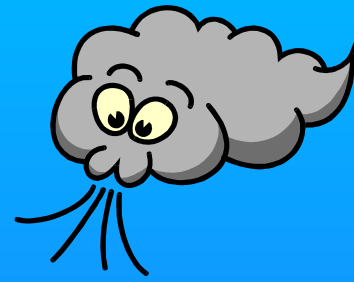
- Mobile Zone
- Volcano

なぜモンスーンアジアに水田が存在するのか？

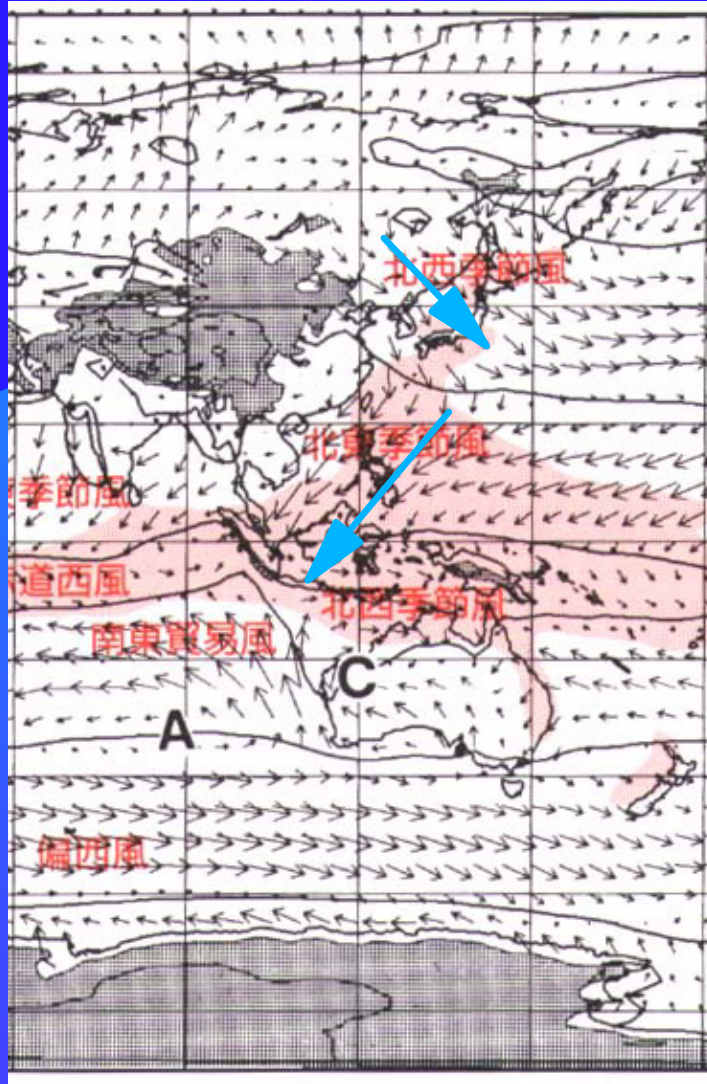


Asian Monsoon アジアモンスーン

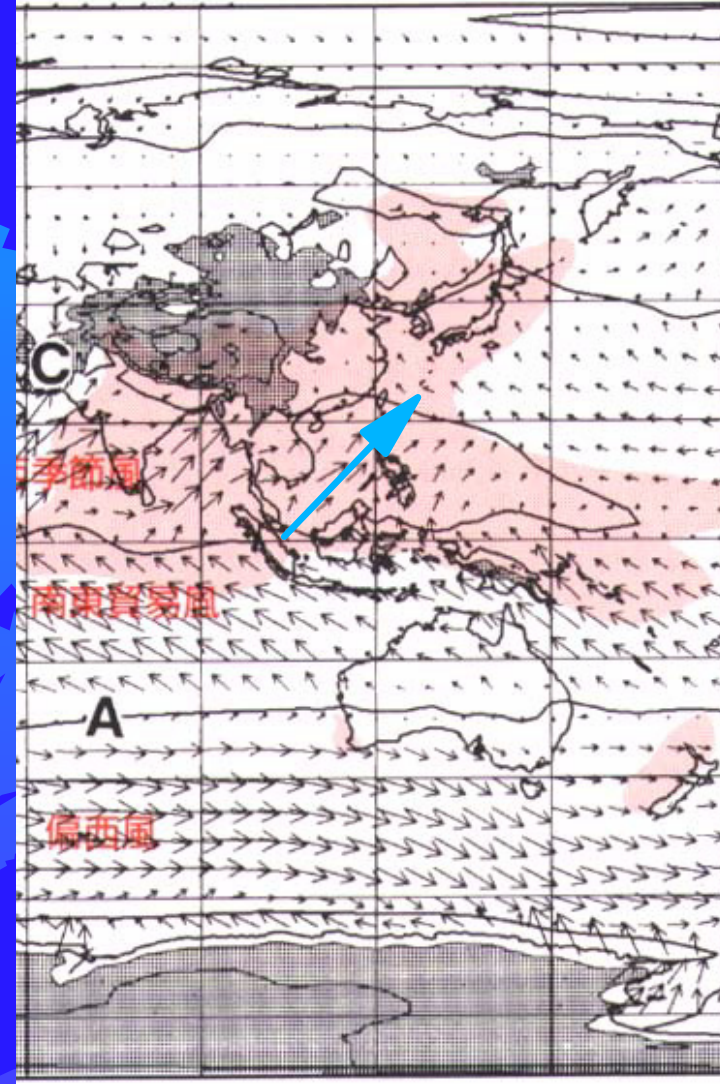
Wind system changing its direction seasonally
Wind brings much rain



季節によって風向が変わる風、
この風が恵みの雨をもたらす

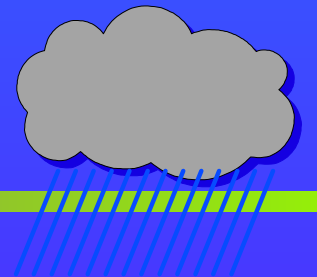


January



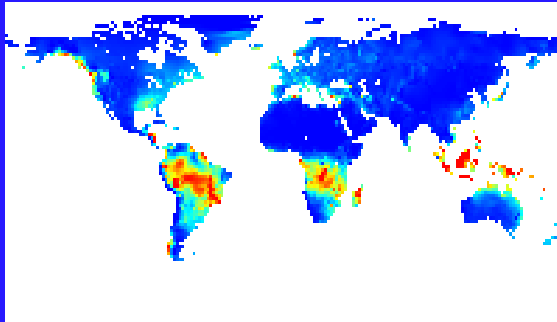
August

Pink hatch denotes the
area abundant in cloud



Climatic conditions

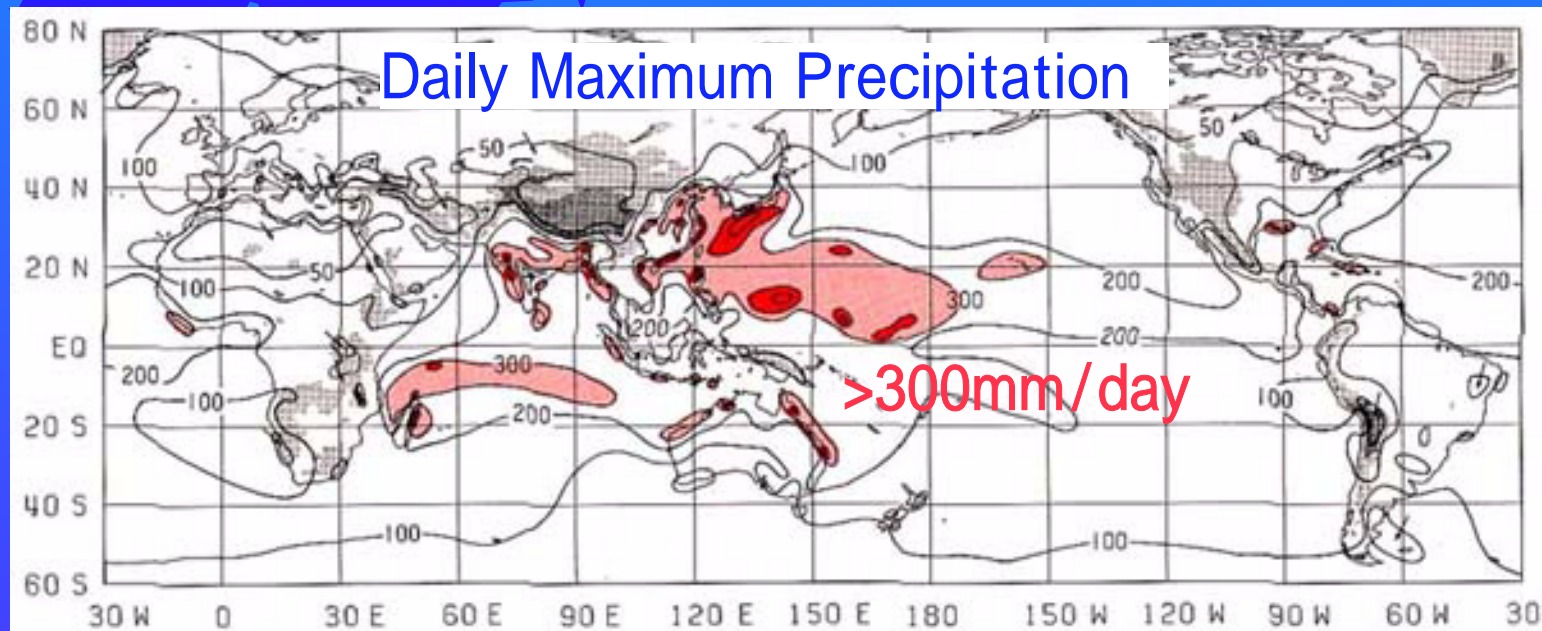
Monsoon, Precipitation, Rainfall intensity



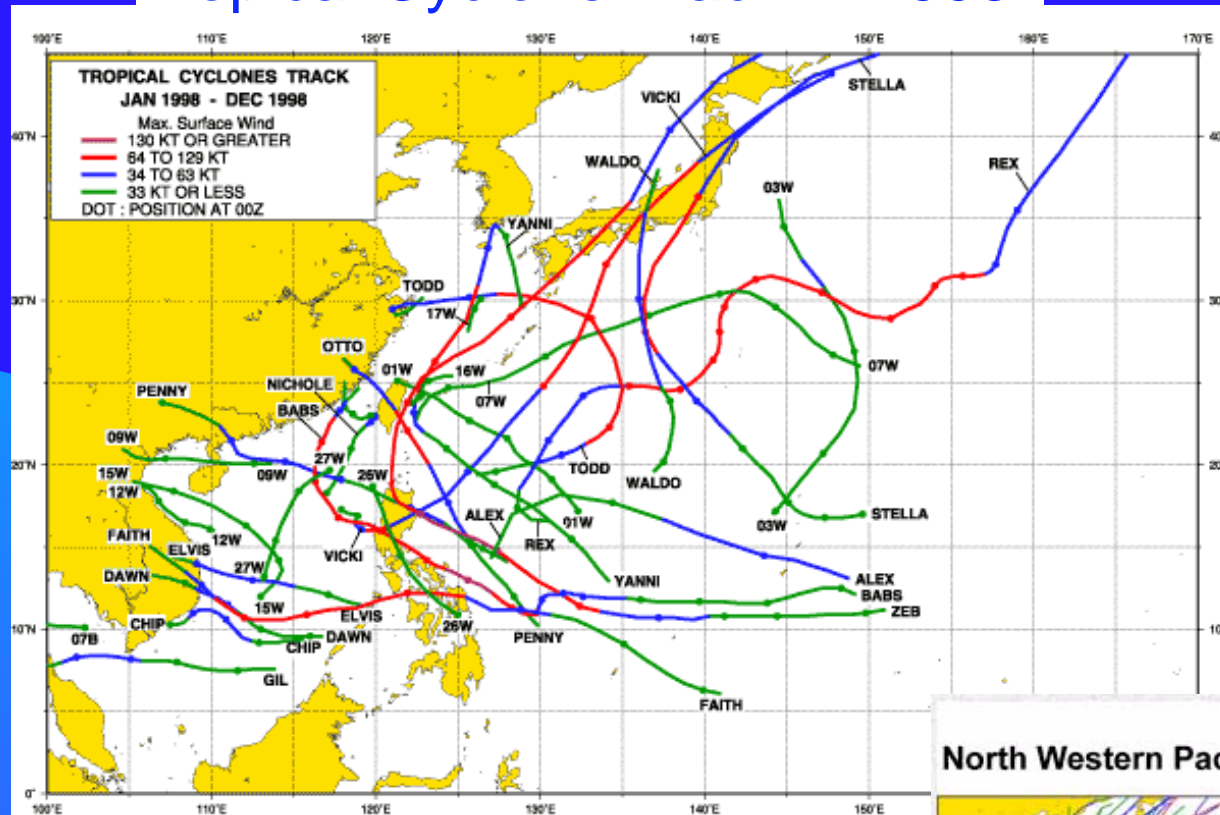
- ・世界の中で多雨地域は三カ所
- ・アジアでは降水強度が大きい



High Rainfall Intensity



Tropical Cyclone Track in 1998



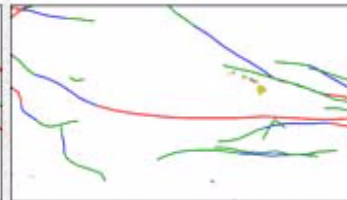
Tropical Cyclone 熱帯低気圧



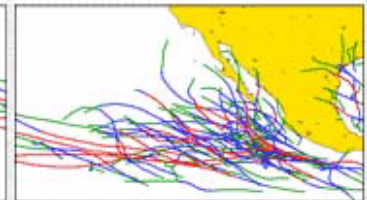
North Western Pacific



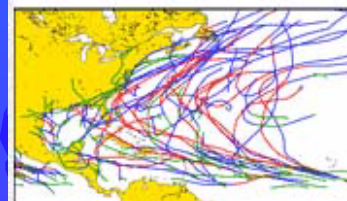
North Central Pacific



North Eastern Pacific



North Atlantic



North Indian Ocean



South Indian Ocean and
South Pacific



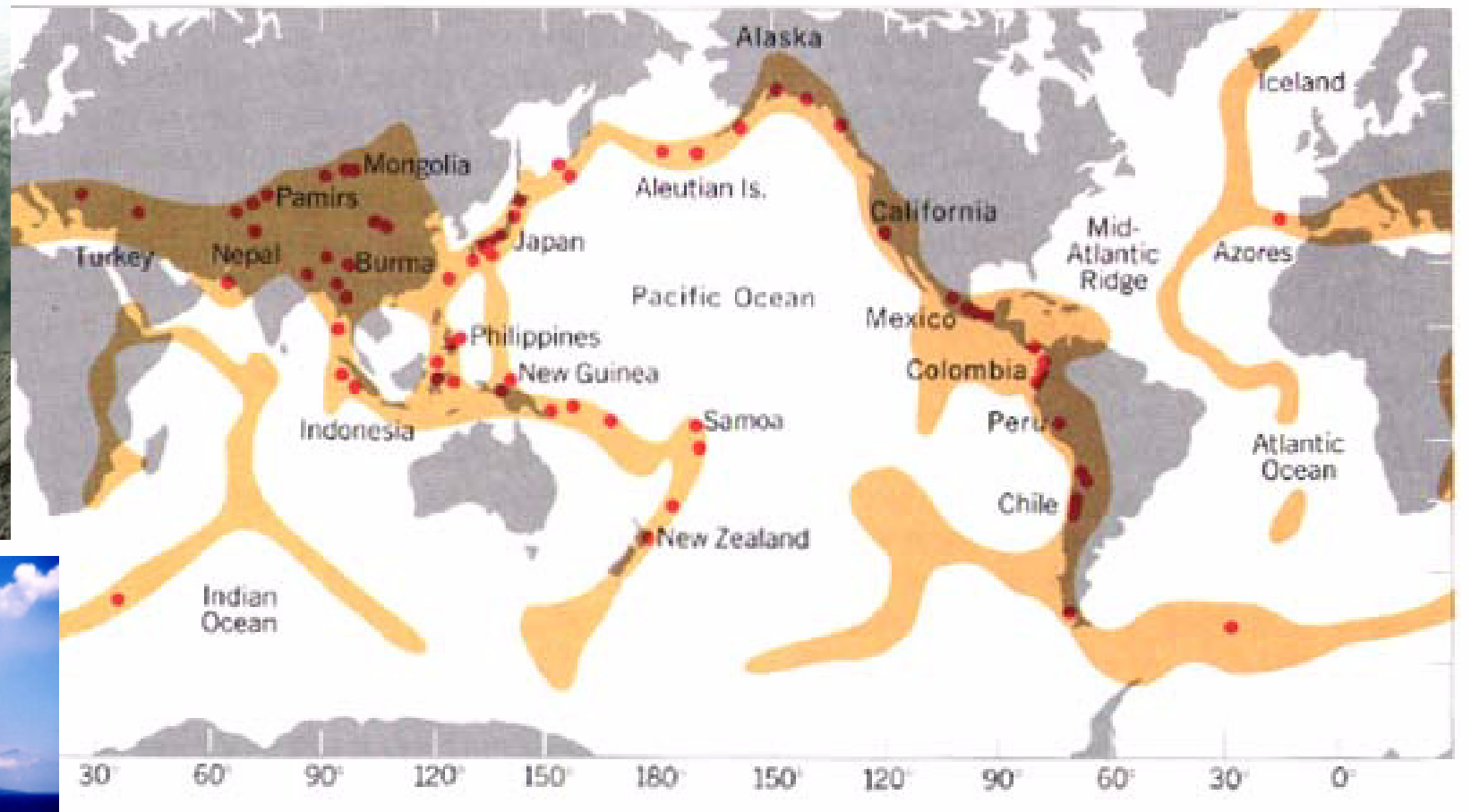
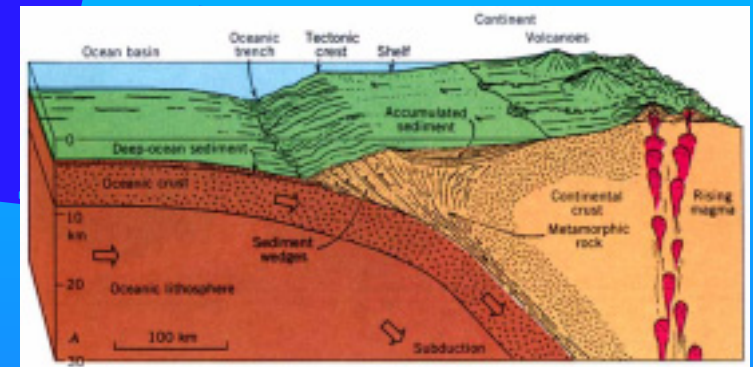
Tropical Cyclones Database CRL/NASDA

Common problem in Asia and Pacific Region - Disaster brought by Tropical Cyclone

気候条件だけでは水田の存在
は説明できない

Geomorphic conditions

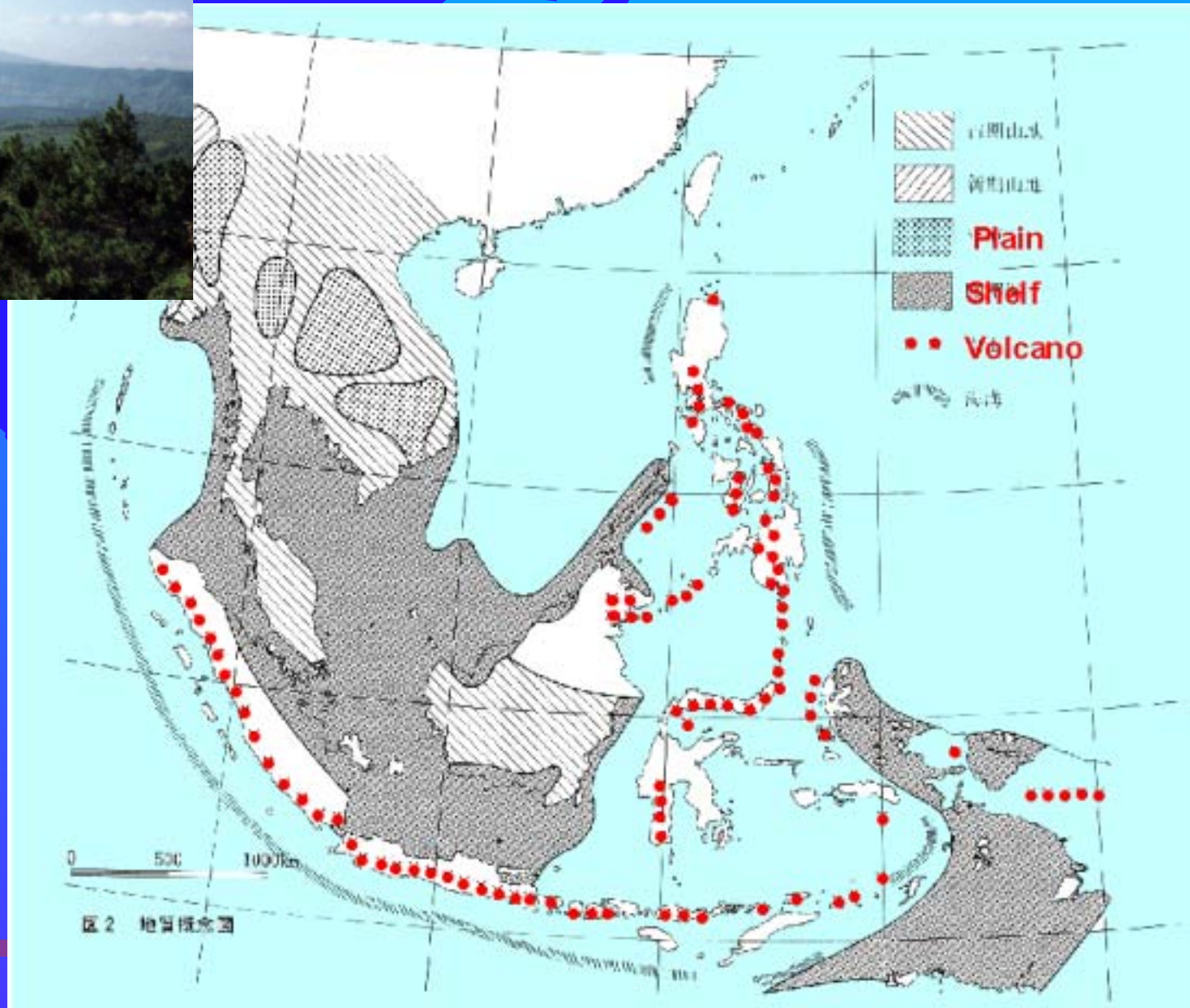
Tectonic zones / Mobile zones



Principal areas of abundant earthquakes(Strahler², 1989)

Volcano 火山の存在

災害と恵みをもたらす

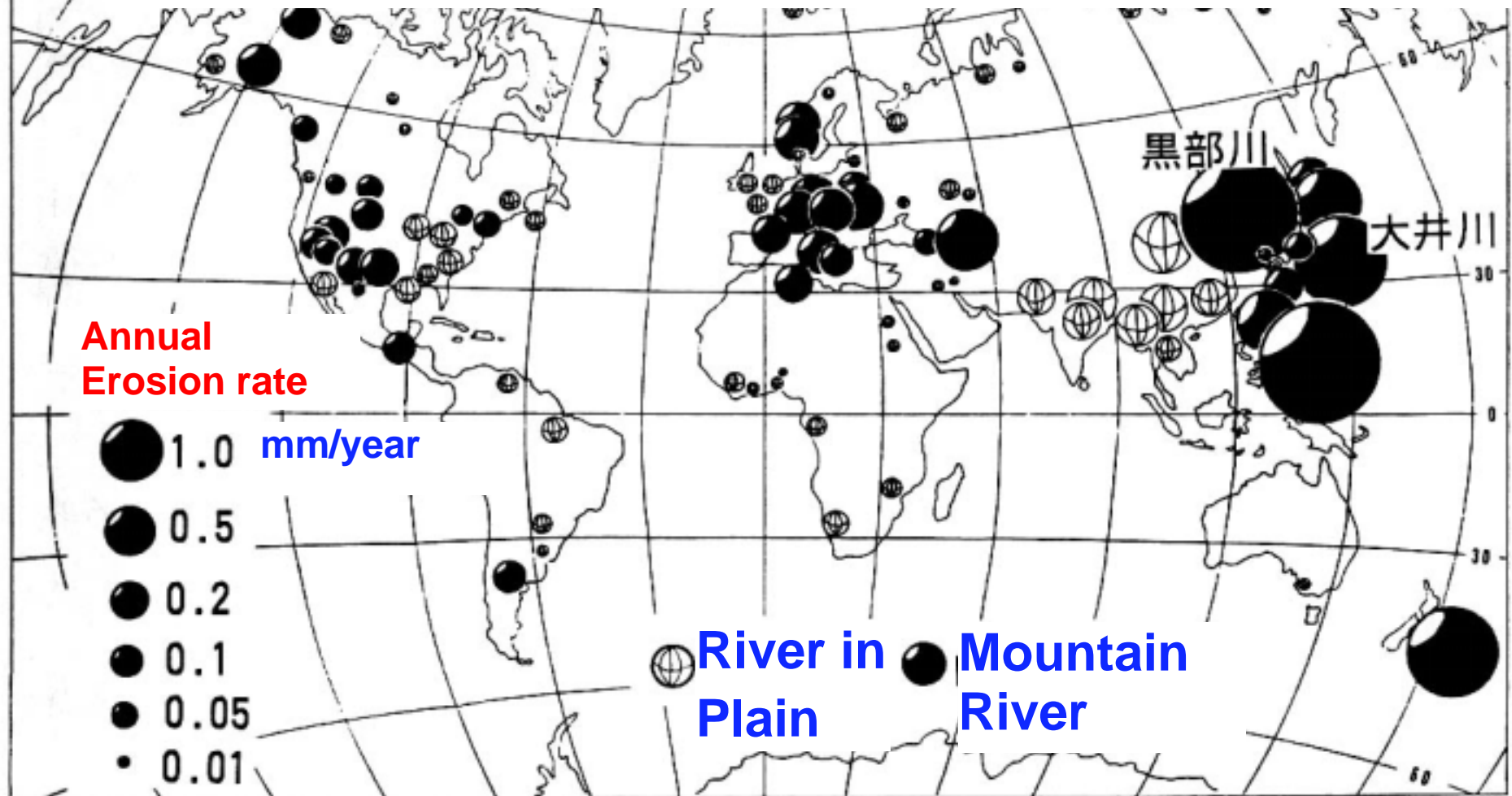


(Source: TAKAYA, Y. ed. Natural Environment in Southeast Asia, Koubunkan, 1990)

World Maximum Erosion Rate

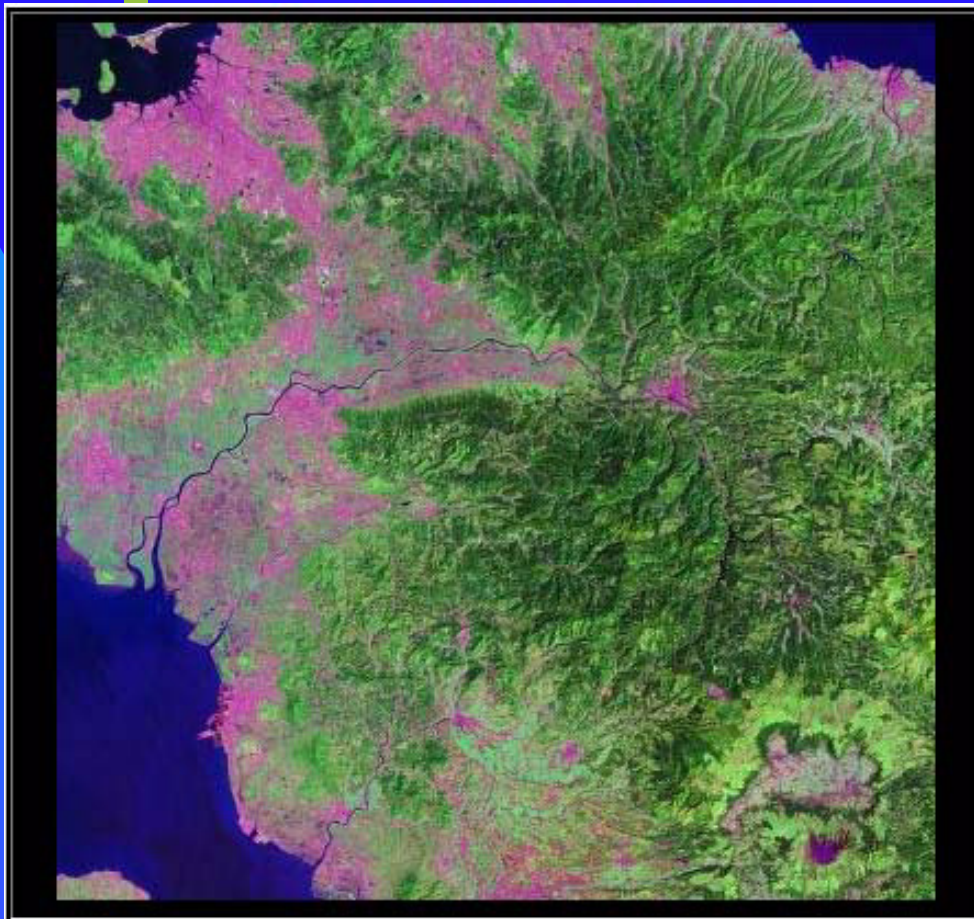
Precipitation + Tectonic Zone + Volcano

ダム堆砂量から求めた年間の山地の平均浸食量



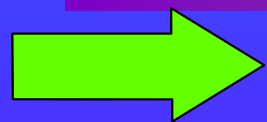
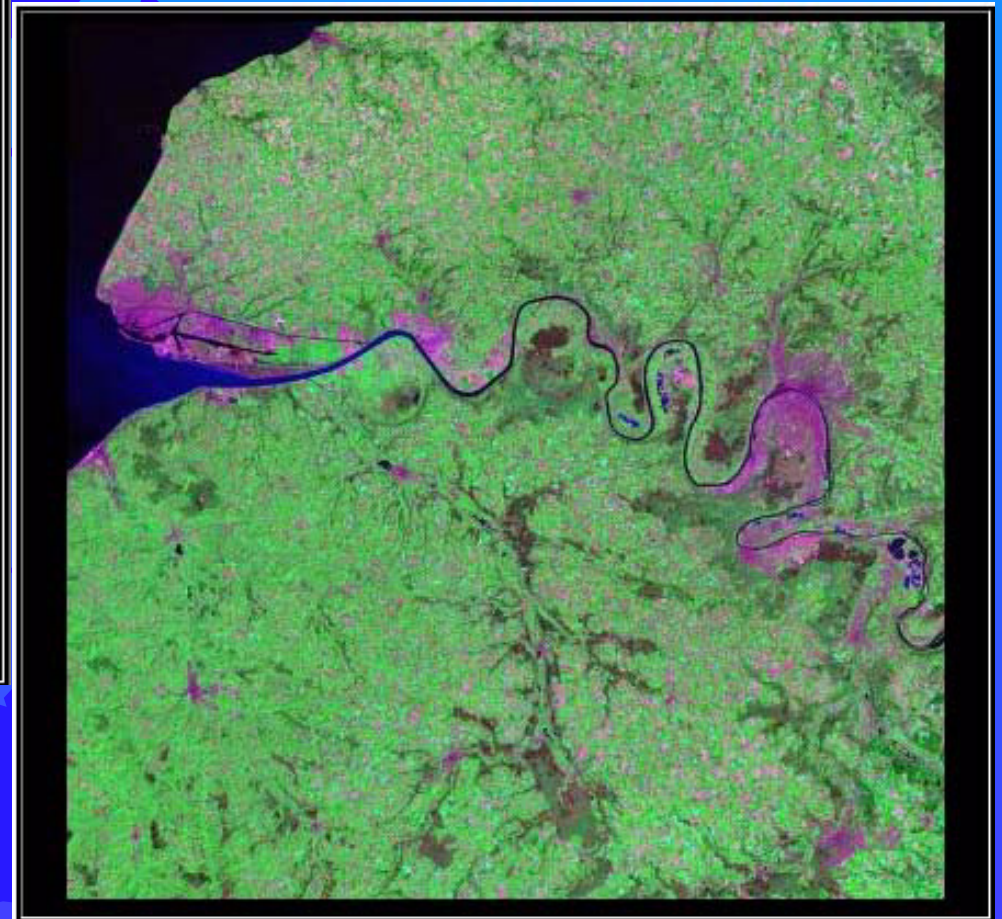
Source) Ohmori, H.(1983):Erosion rates and their relation to vegetation from the viewpoint of world-wide distribution. Bull. Dept. Geogr. Univ. Tokyo, 15, 77-91.

Alluvial Lowland 沖積低地の形成



Chikugo River: about 2/3 of the watershed is occupied by alluvial lowland

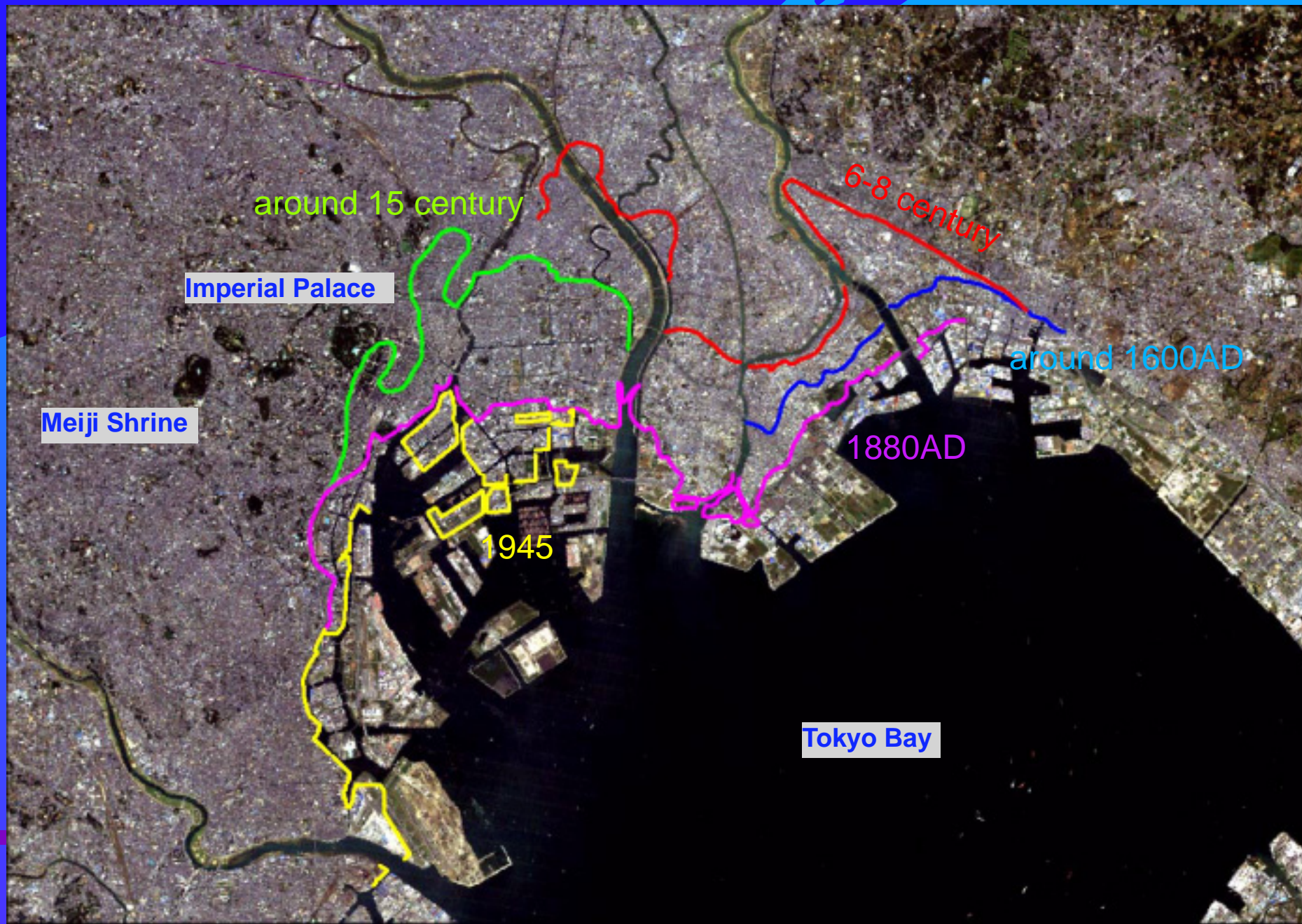
Seine River: the area of alluvial lowland at the river mouth is very narrow



Right Place for Paddy field

Many big cities in Monsoon Asia
are located in Alluvial Plain

Major part of Tokyo is located on the alluvial lowland



Land Subsidence, Urban Flood



Amount of subsidence in Nobi Plain, Japan (MLIT, Japan)



Emerge from the ground



Zero meter A.S.L.

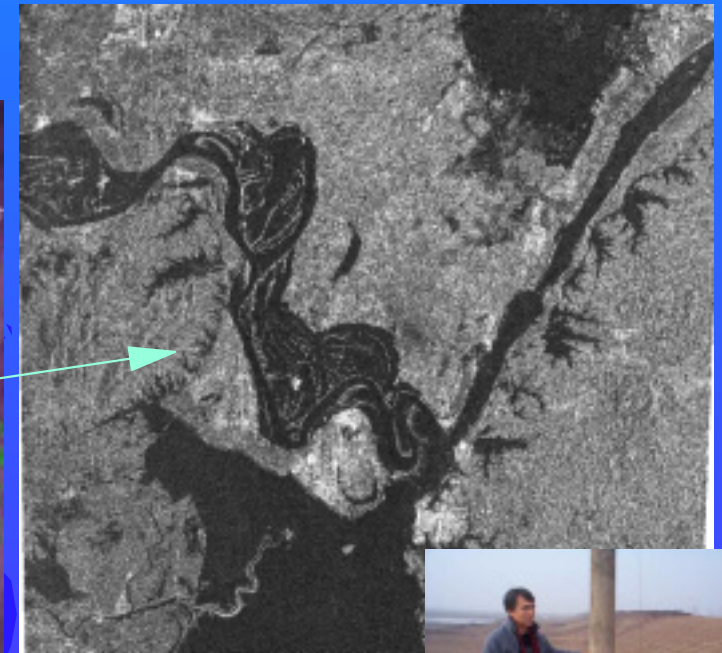
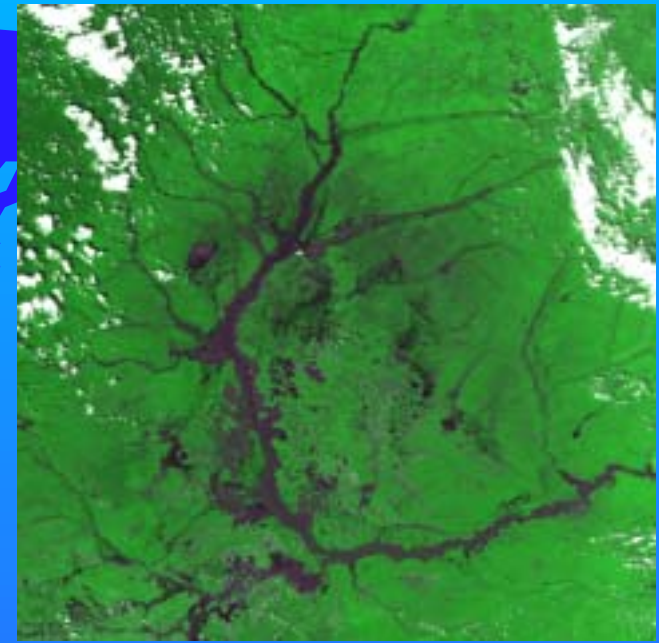


Urban flood in Jakarta

Common water problem in Alluvial Lowland

Flood 洪水

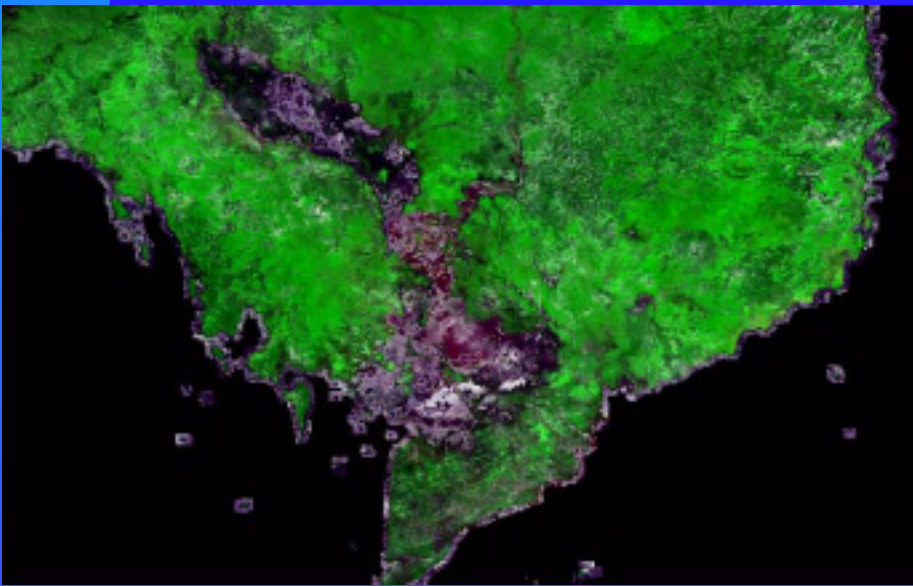
1998 Great Flood in China



Sign of maximum water level

The nature of Asia and Pacific region brings foundation of its prosperity, alluvial lowland, but also sometimes causes disasters.

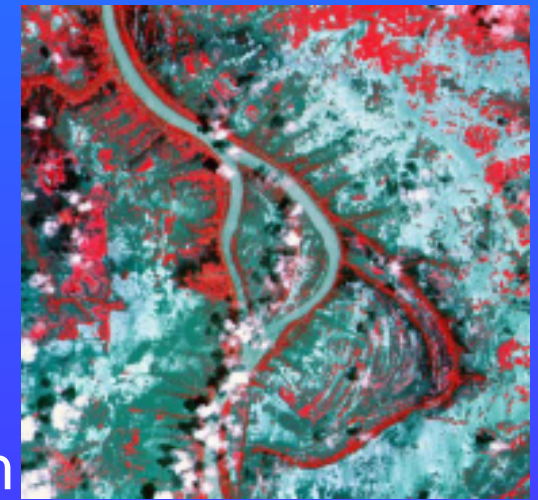
Too much water issues



Mekong flood in 2000
2000年メコン川洪水



コルマタージュ
灌漑の水路



colmatage irrigation ditch

Agricultural adaptation and its decay during modernization 農学的適応とその衰退

Spatial Framework to assign regional water problems

ここで、地域の水問題を位置付ける空間的枠組みとしての水文地域図を提案したい

A Map of Hydrological Region

An extent with similarity in water budget and its seasonal change

Map of Hydrological Region based on the Water Budget

水収支とその季節変動に基づいた 地域区分

WET

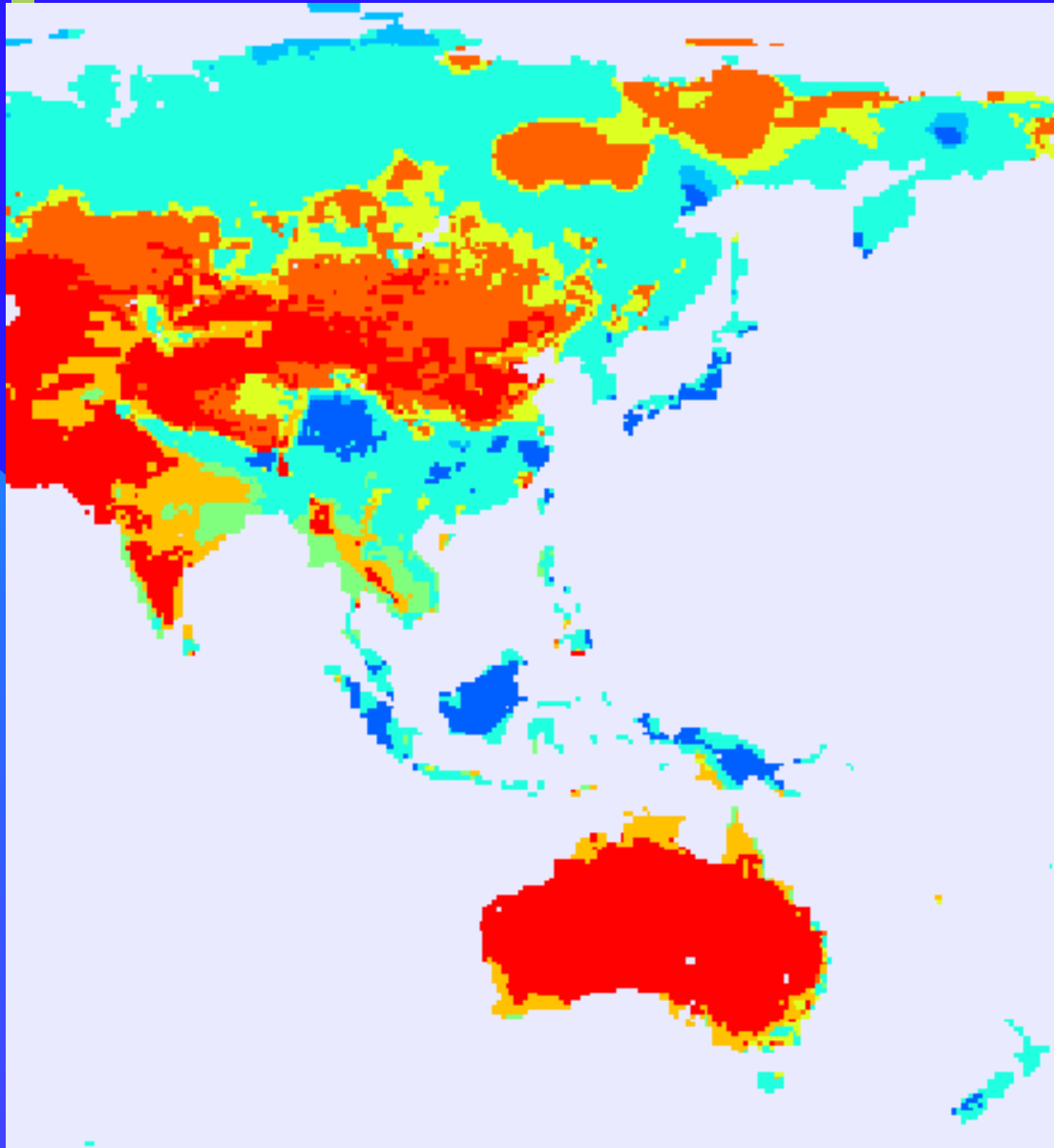


DRY

- Region A1: water surplus all year around(ATS>400mm);
- Region A2: water surplus all year around(ATS<400mm);
- Region B1: water surplus with some months deficit (ATD <200 mm);
- Region B2: water surplus with some months deficit (ATD >200 mm);
- Region C1: water deficit with some months surplus (ATD <200 mm);
- Region C2: water deficit with some months surplus (ATD >200 mm).
- Region D1: water deficit all year around (ATD <200 mm);
- Region D2: water deficit all year around (ATD >200 mm);

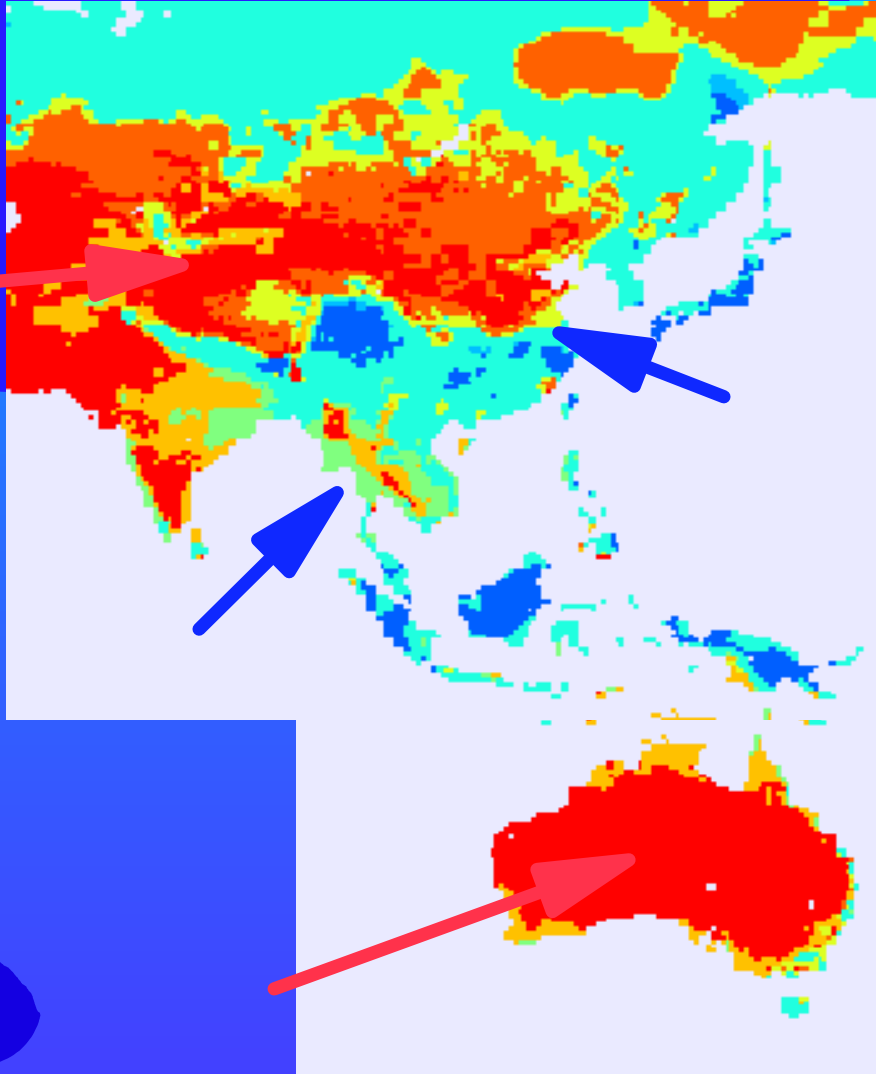
(ATD: Annual Total Deficit, ATS: Annual Total Surplus)

Hydrological Region in Monsoon Asia



- **Region A1**: water surplus all year around (ATS > 400 mm);
- **Region A2**: water surplus all year around (ATS < 400 mm);
- **Region B1**: water surplus with some months deficit (ATD < 200 mm);
- **Region B2**: water surplus with some months deficit (ATD > 200 mm);
- **Region C1**: water deficit with some months surplus (ATD < 200 mm);
- **Region C2**: water deficit with some months surplus (ATD > 200 mm);
- **Region D1**: water deficit all year around (ATD < 200 mm);
- **Region D2**: water deficit all year around (ATD > 200 mm);

What should be discussed from the map? 水文地域図から何を読み取るか？



➤ Existence of arid region
湿润地域に加えて乾燥地域も分布している

➤ Adjacency of wet and dry region
乾燥と湿润が隣り合っている

Water Problem in Arid and Semi-arid Region

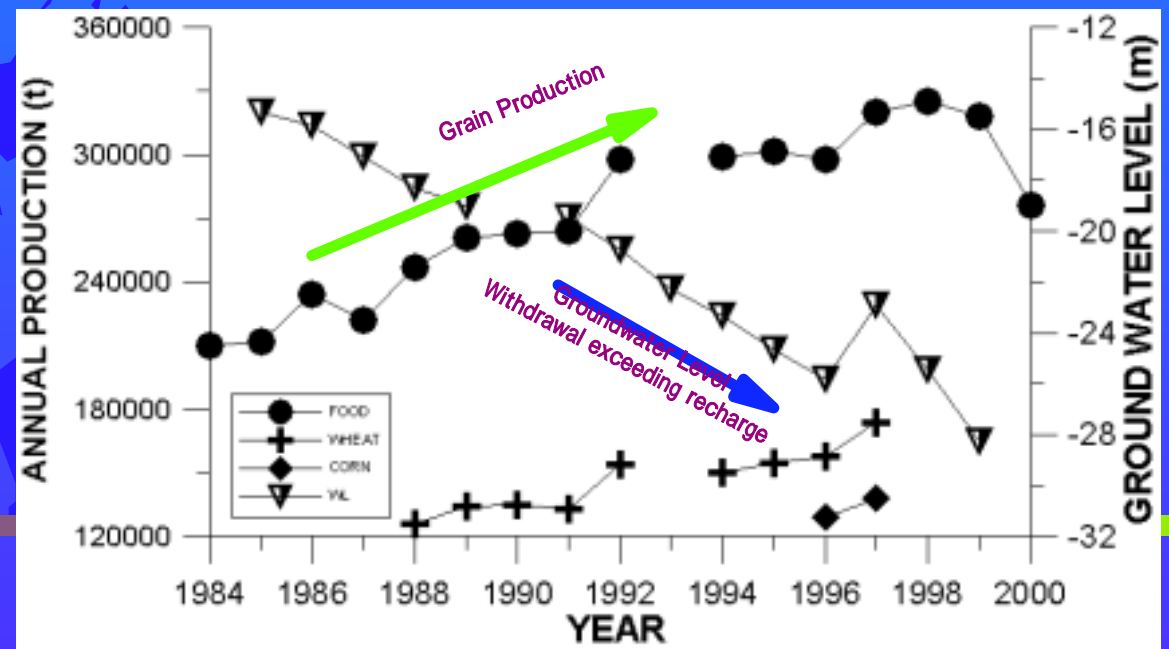
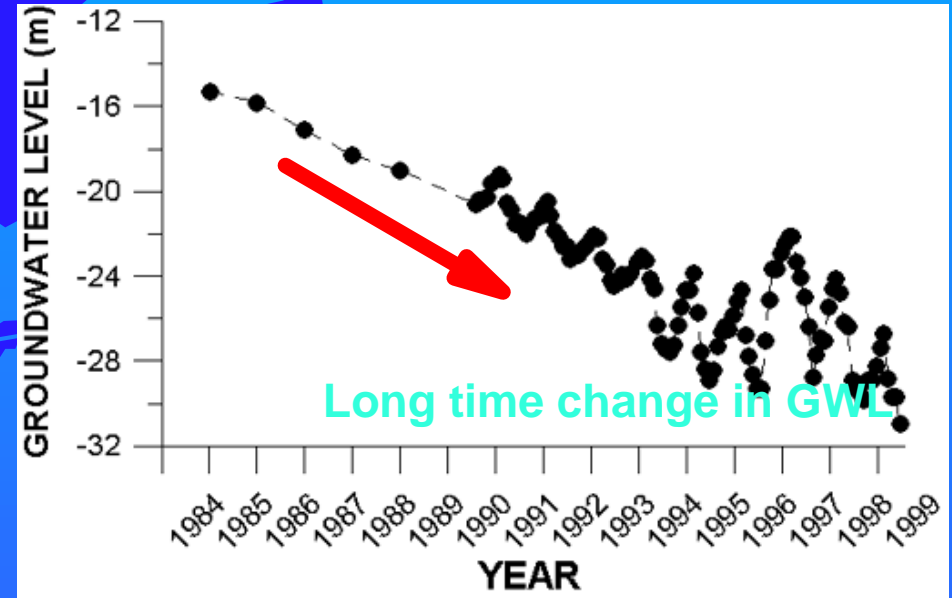
Problems in D region 乾燥地域の問題

- Disappearance of surface water 断流
- Groundwater level decline 地下水位低下
- Salinization 塩性化
- Other problems その他



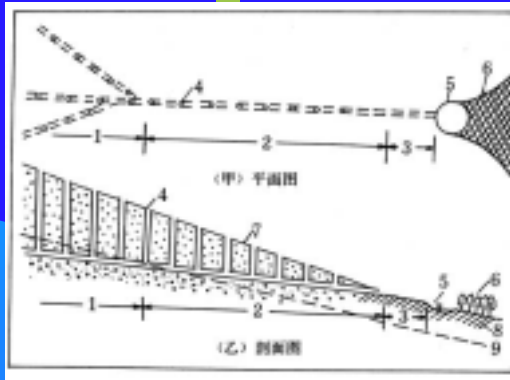
Decline of Groundwater Level in North China Plain

Water Problem in D Region

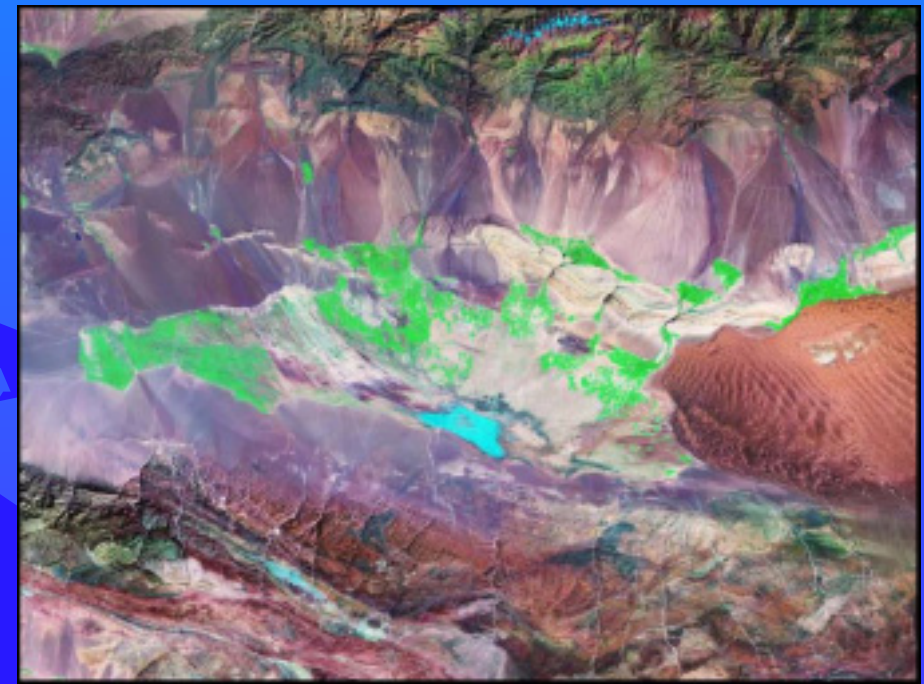


Karez in Turfan, Xinjiang, China

Groundwater problem with same background



- Water level decline
- Loss of traditional and sustainable technology
- Global warming
- Retreat of glaciers



Threat from climatic changes

as well as human dimension of water issue

Summary on Regional Characteristics

Monsoon

Mobile zone

Humid and Arid

Islands

Mountains

Population

Economic activity

- Humid and tectonically active zone
- Proximity between wet and humid
- Monsoon and tropical cyclone
- Disaster and blessing of volcano
- Paddy field and its hydrological functions
- Urbanization and related water problems
- Climatic change and its effect to hydrological cycle
-

・多様性

・関連性

・空間性

・歴史性

-Diversity

-Relationship

-Spatial Distribution

-History

We set up the spatial framework to tackle with water issues.

Asia and Pacific Region



15 March, 2003 Closing Session of APHW2003

Thank you for your attention!