The 7th Southeast Water Environment Symposium
AIT, Bangkok
October 29, 2009

Vulnerability of Water Environment and Role of Scientific Monitoring

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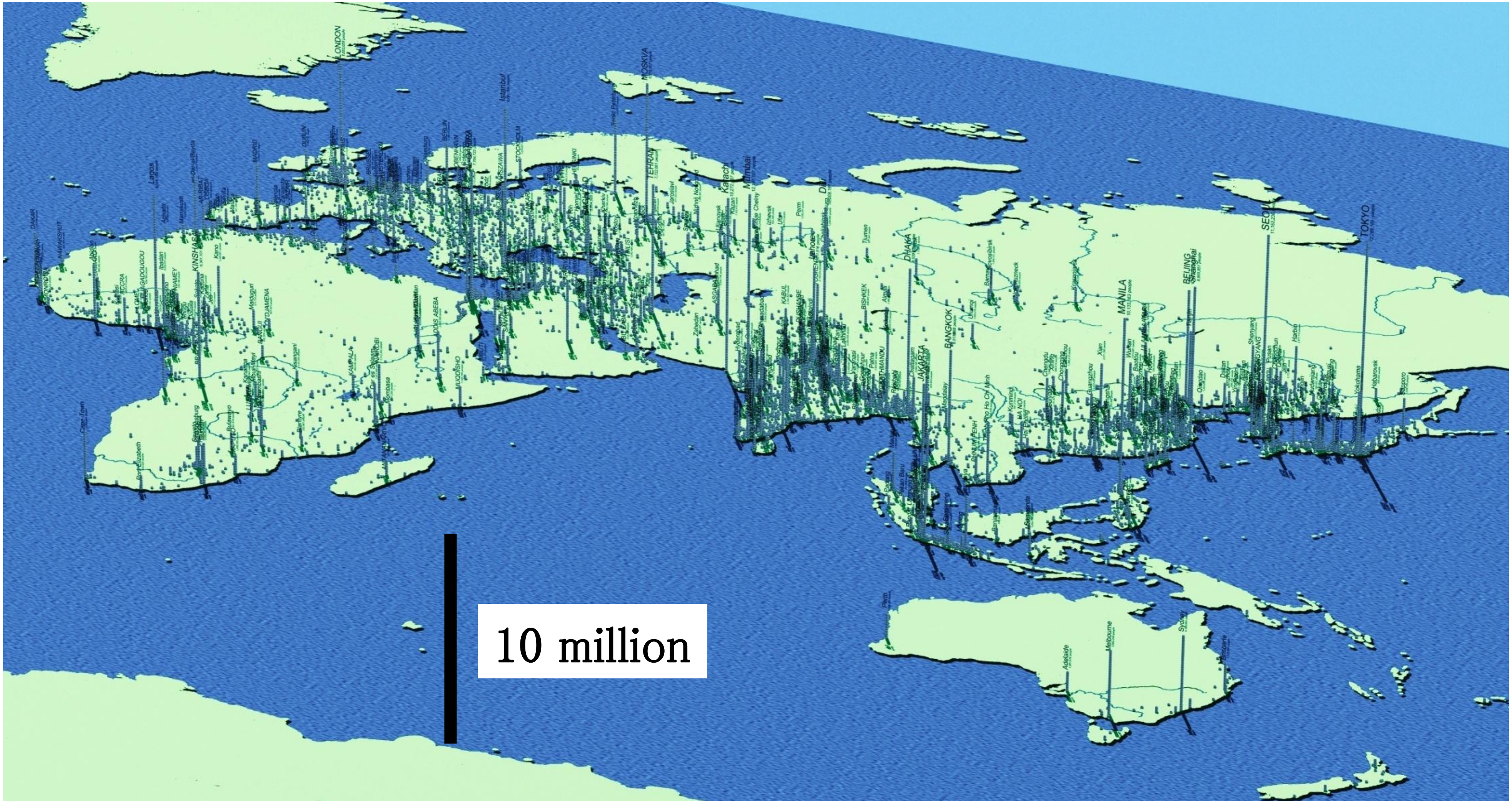
National Institute for Environmental Studies

Urban Population Distribution in Africa, Eurasia and Australia Continents



(Dr.Ohta, Center for Sustainable Urban Regeneration, The Univ. of Tokyo)

Water system in Asia experience six major surges simultaneously:

-Increasing urban population,
-Rapid economic growth and centralization,
-Unprecedented technological development,
-Social and cultural fragmentation
-Surge of economic globalization, and
-Climate change (mitigation and adaptation)

Vulnerability of Water System

Natural vulnerability

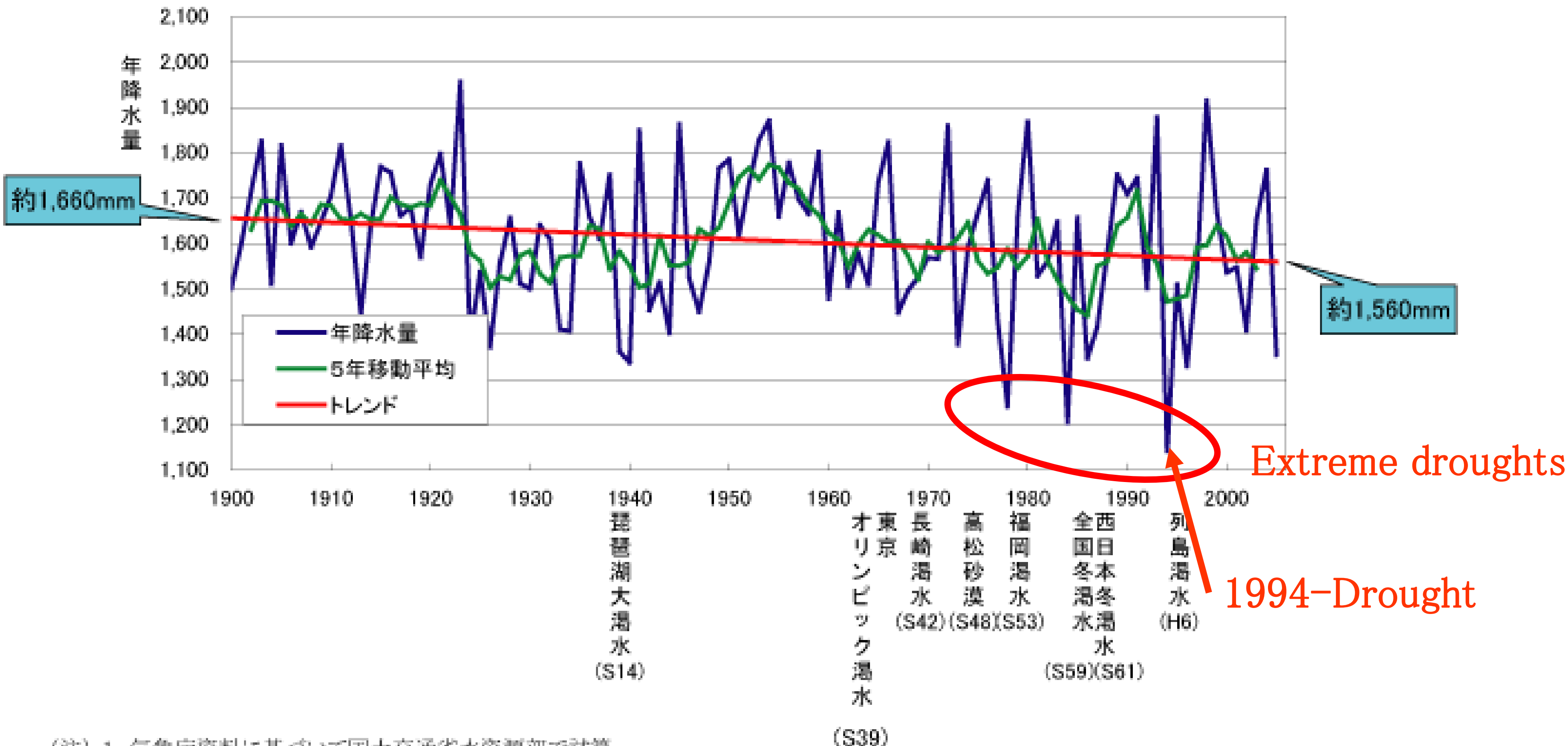
-Uncertainty of rainfall snowfall

- Uneven distribution of fresh water

- Eco-system is sensitive to water quantity and quantity.

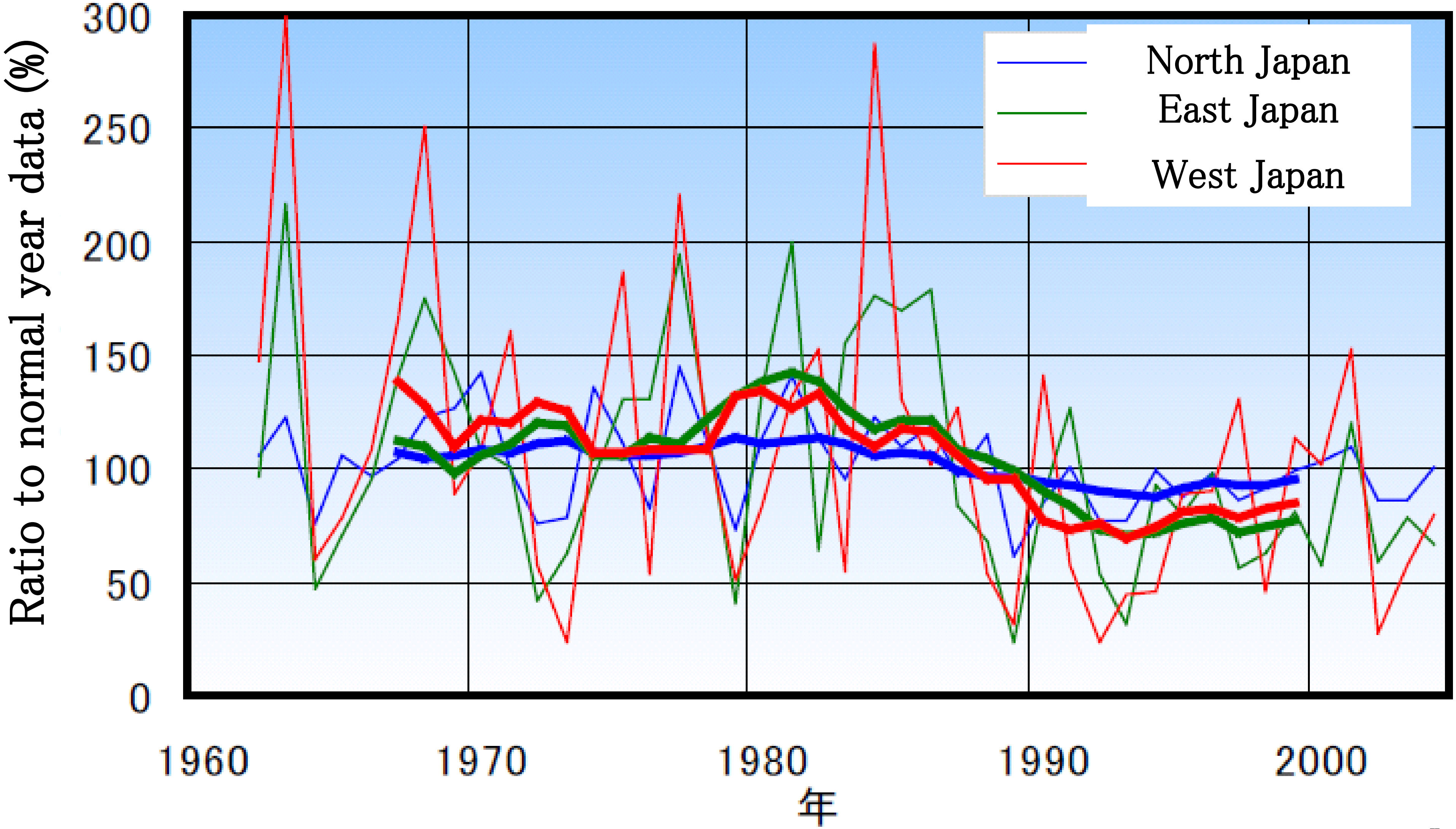
- All impacts connects to all water components.

Increasing extreme cases of annual precipitation



（注）1. 気象庁資料に基づいて国土交通省水資源部で試算。
2. 全国51地点の算術平均値。
3. トレンドは回帰直線による。
4. 各年の観測地点数は、欠測等により必ずしも51地点ではない。

Trend of Deepest-Snowfall at the west sides of Japanese mountines



太線：11年移動平均値
出典：異常気象リポート2005，気象庁

Social Vulnerability

-Water is necessities for social sanitation, but water environment conveys pathogens and hazadus materials.

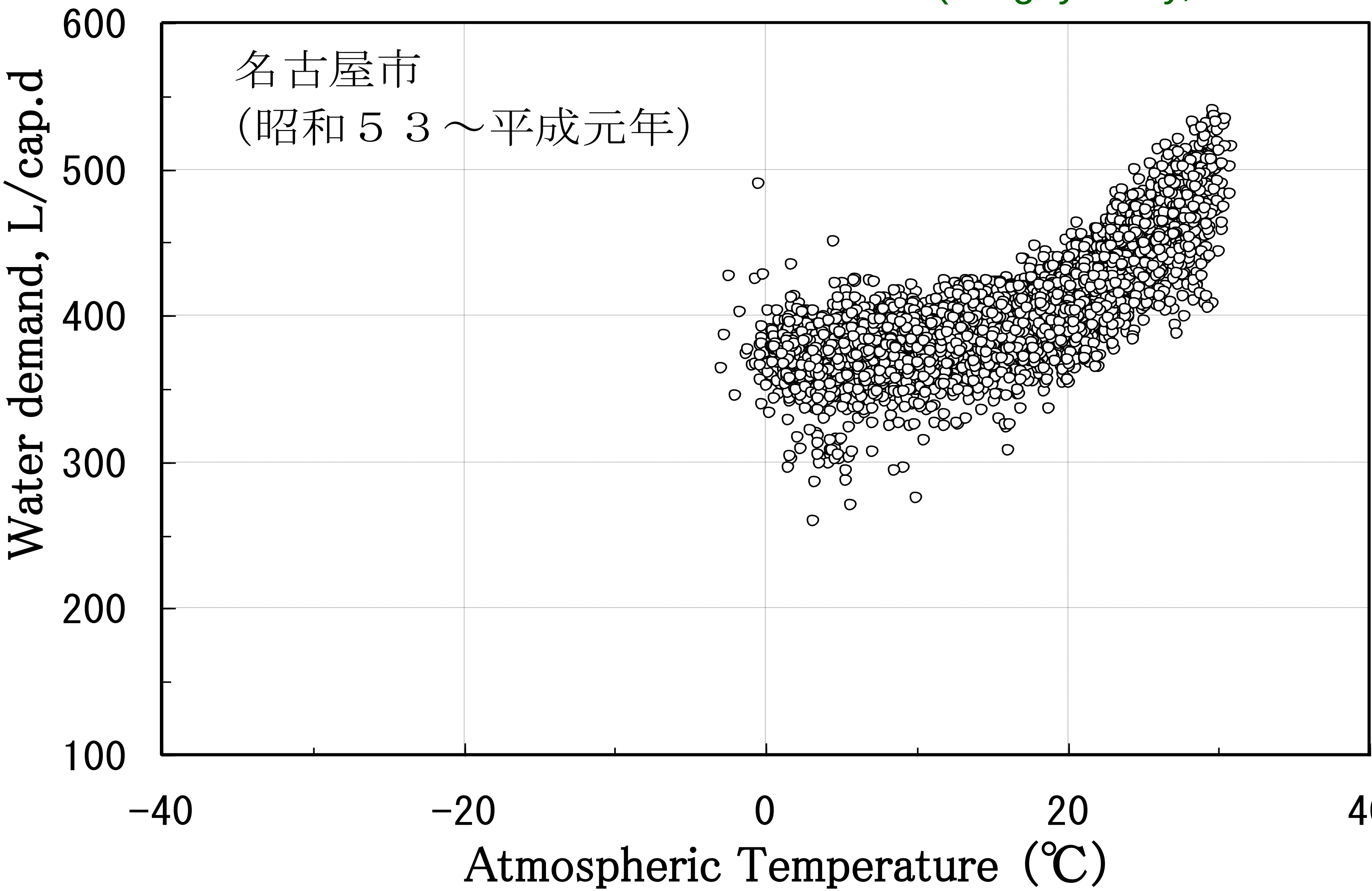
-Water supply capacity has been designed for demands, but it dose not have enough margin.

-Water system is sensitive to natural disasters.

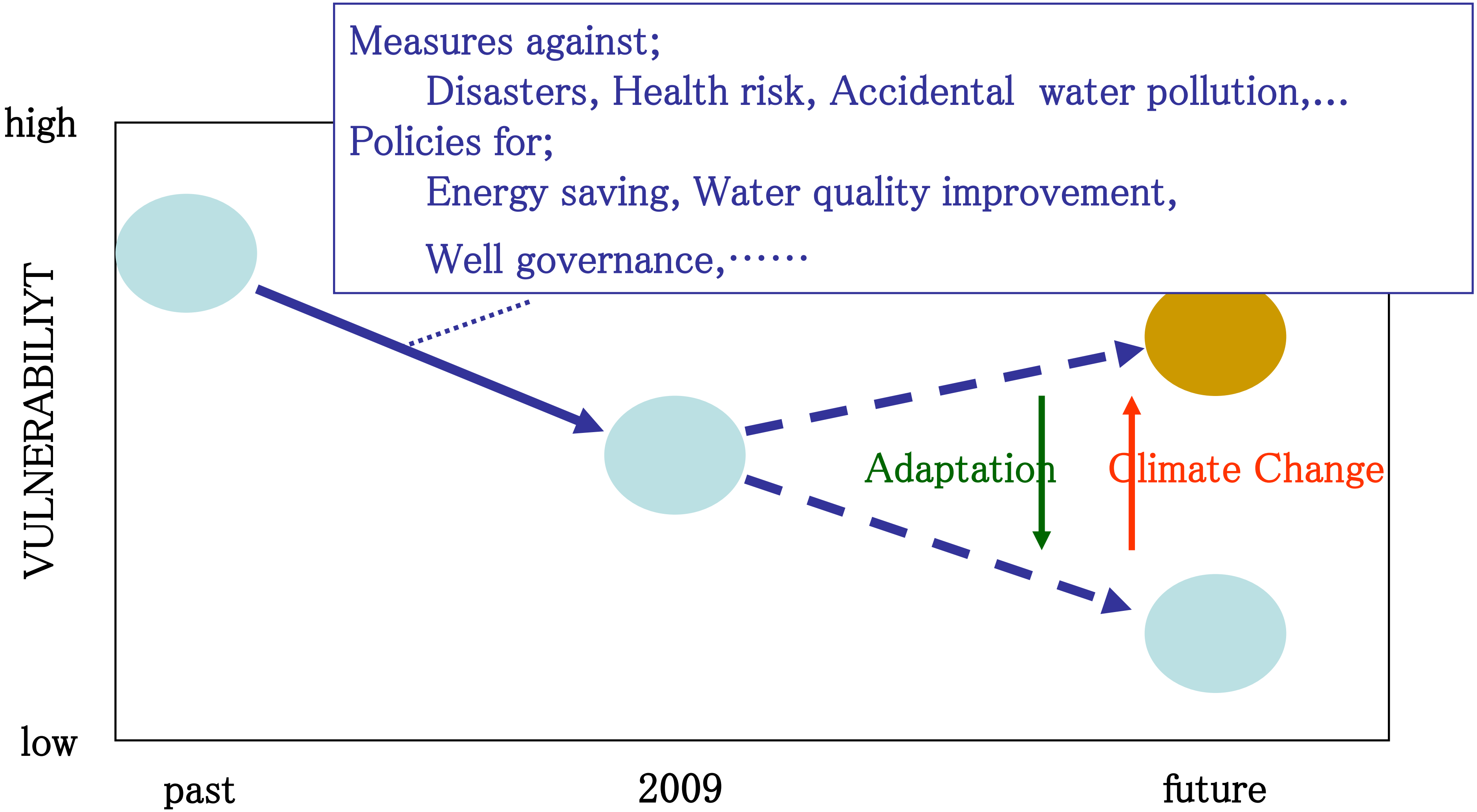
-Water resources causes local and international conflicts.

Water Demand vs. Atmospheric Temperature

(Nagoya City, 1978-1989)



Change of Vulnerability and Adaptation



Needs for environmental monitoring

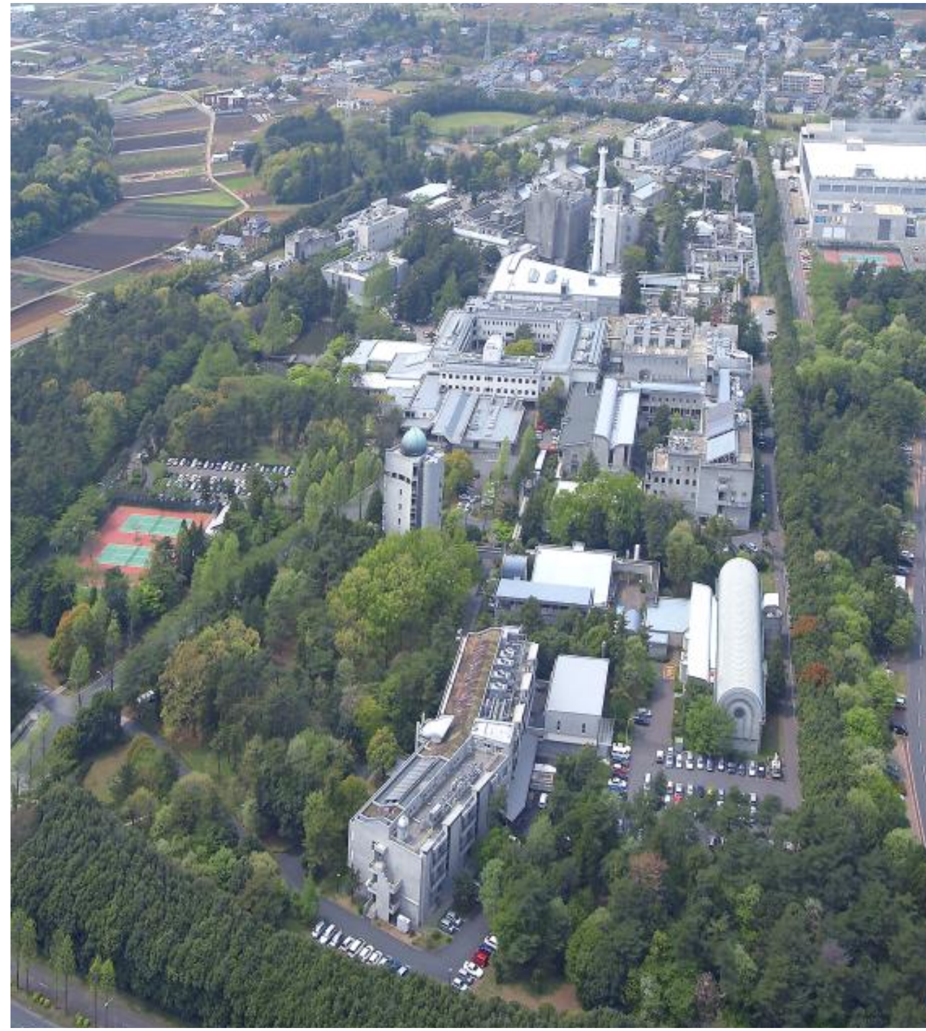
- We have to learn from the past, and design the future.

- The policy for future should be based on scientific data or evidence.

- The accumulation of observed data on environment is essential for future sustainable society.

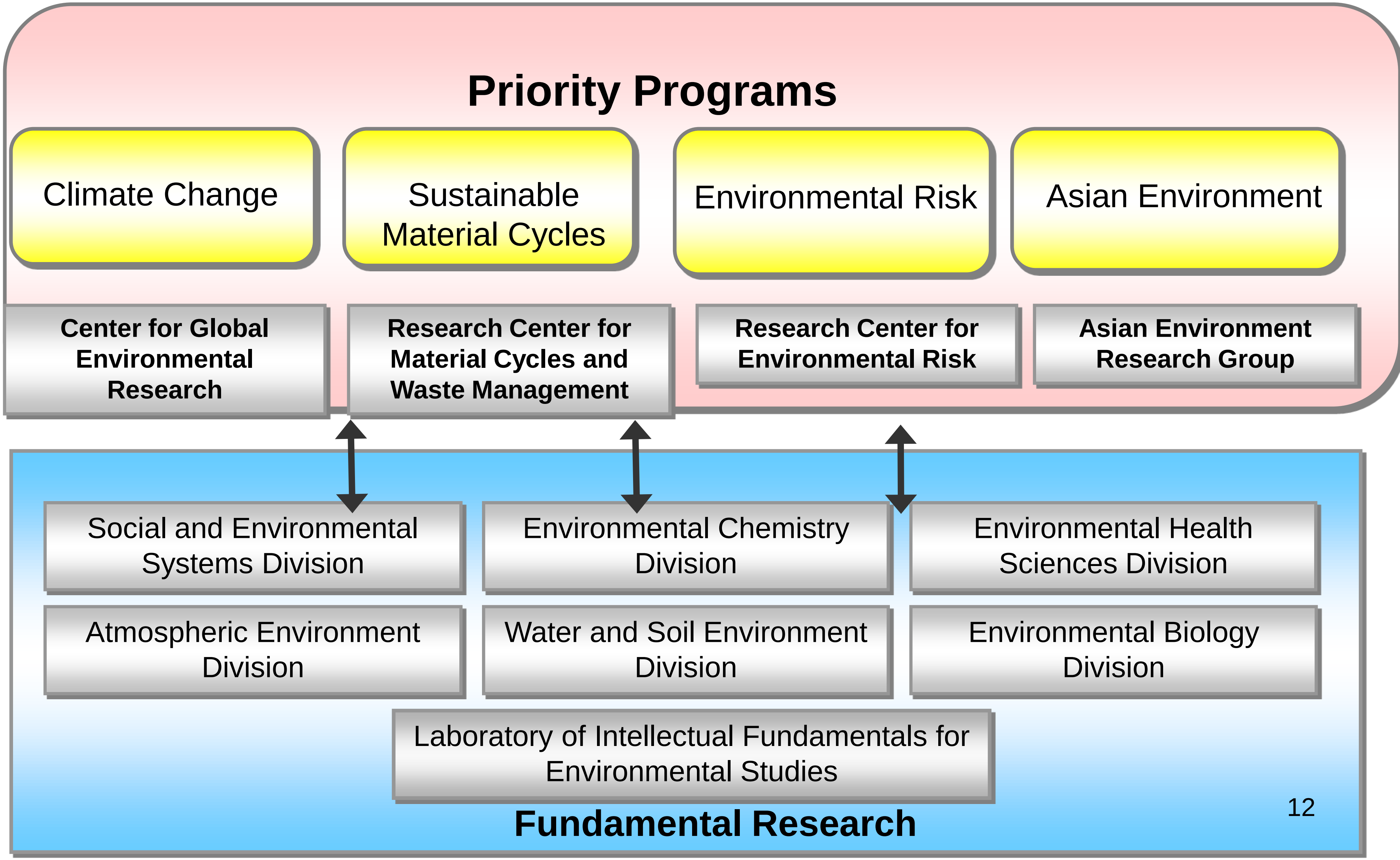
National Institute for Environmental Studies (NIES)

National Institute for Environmental Studies



Bird's Eye View of NIES Main Campus in Tsukuba (23 ha)

Research Framework for Second Five-Year Plan (2006-10)



NIES Research Monitoring Facilities in Japan

Cape Hedo
(Transboundary air)

NIES

Teshio (CO_2 Flux)

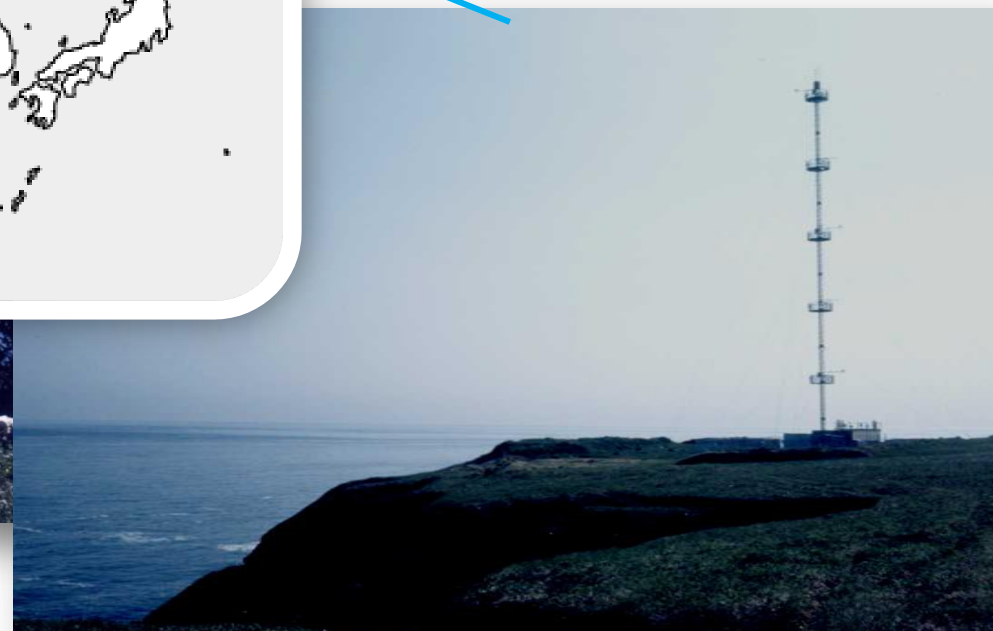
Cape Ochi-Ishi
(GHGs)

Hateruma
(GHGs)

Mt. Fuji
(CO_2 Flux)

Lake Kasumigaura
(lake environment)

Global Environment Monitoring station in CGER/NIES



Hateruma monitoring station

Tower height 39m

Air intake height 46.5m

Ochi-ishi monitoring station

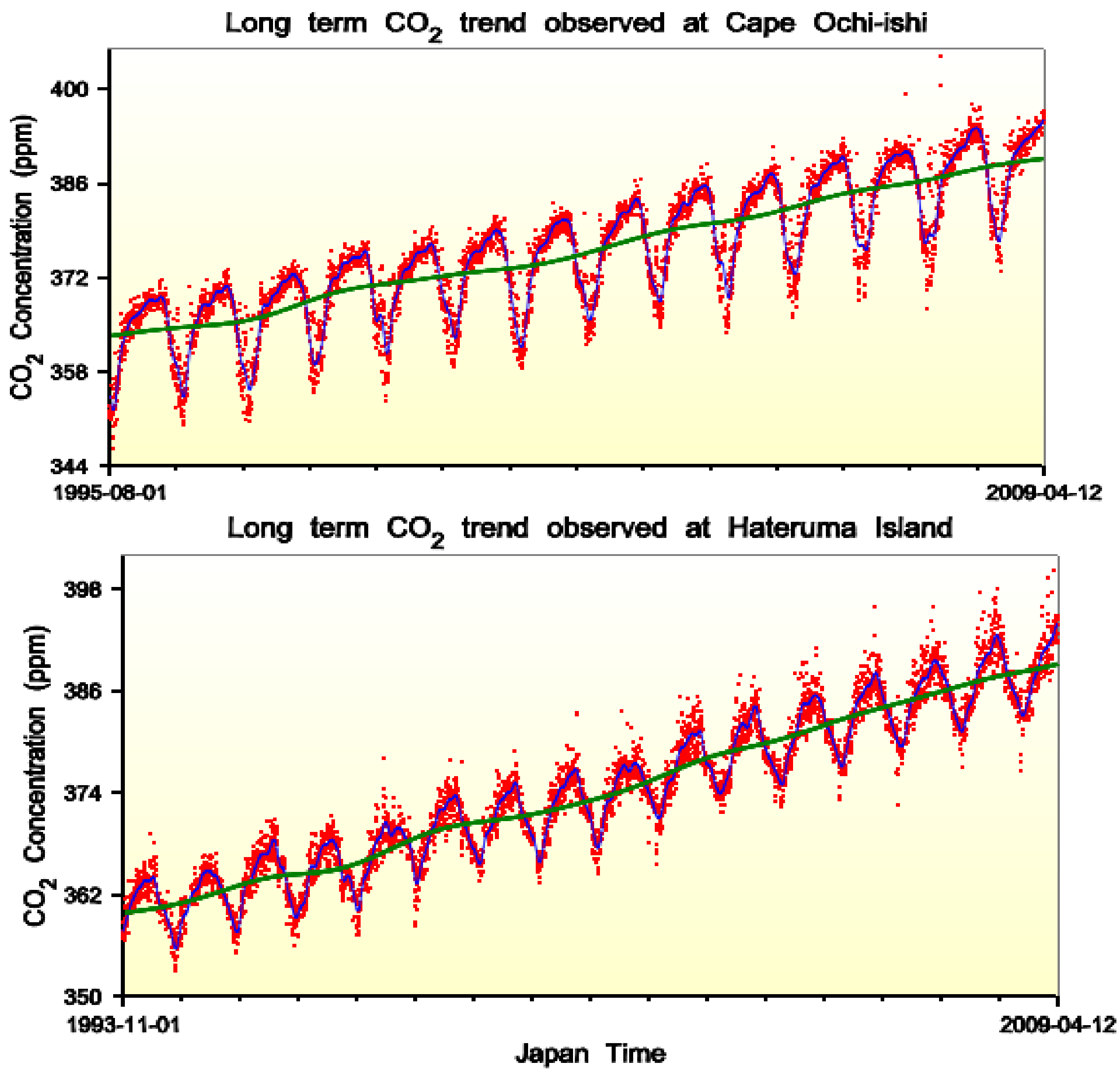
43º9’34”N, 145º30’5”E

Tower height 55m

Air intake height 96m

Cape Ochi-ishi station

Long-term CO_2 trend



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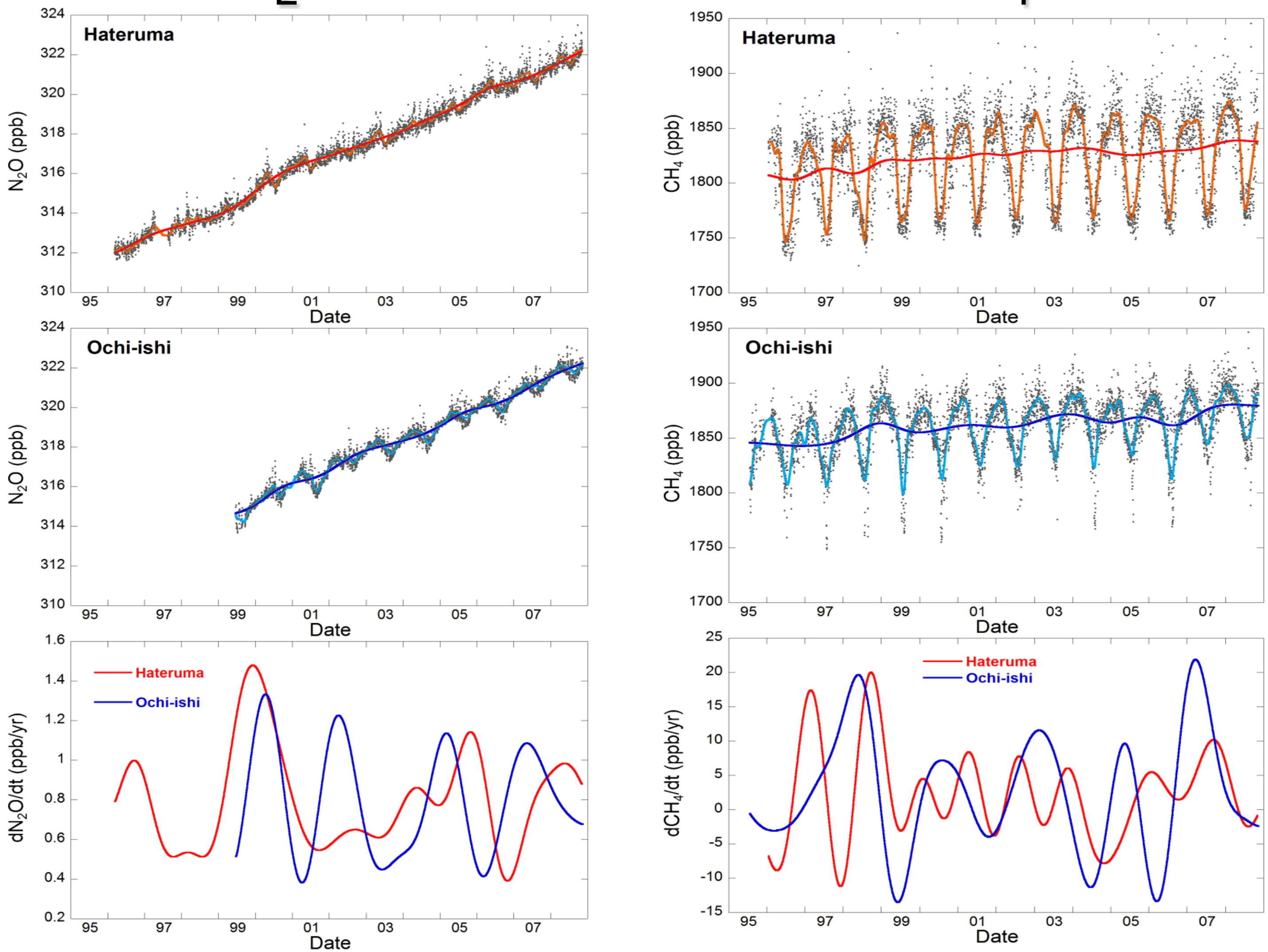
Long term $CH_4 \cdot N_2O$ trend

N_2O CH_4



© Yasunori TOHJIMA, NIES,

CH4: Tohjima et al. (2002),J. Geophys. Res. 2009

N2O: Tohjima et al.(2000), Chemosphere-Global Change Science

Monitoring Data

Link from the World Data Centre for Greenhouse Gases(WDCGG)

quasi-real time CO_2 data from NIES' monitoring station


WMO Global Atmosphere Watch
World Data Centre for Greenhouse Gases
WDCGG

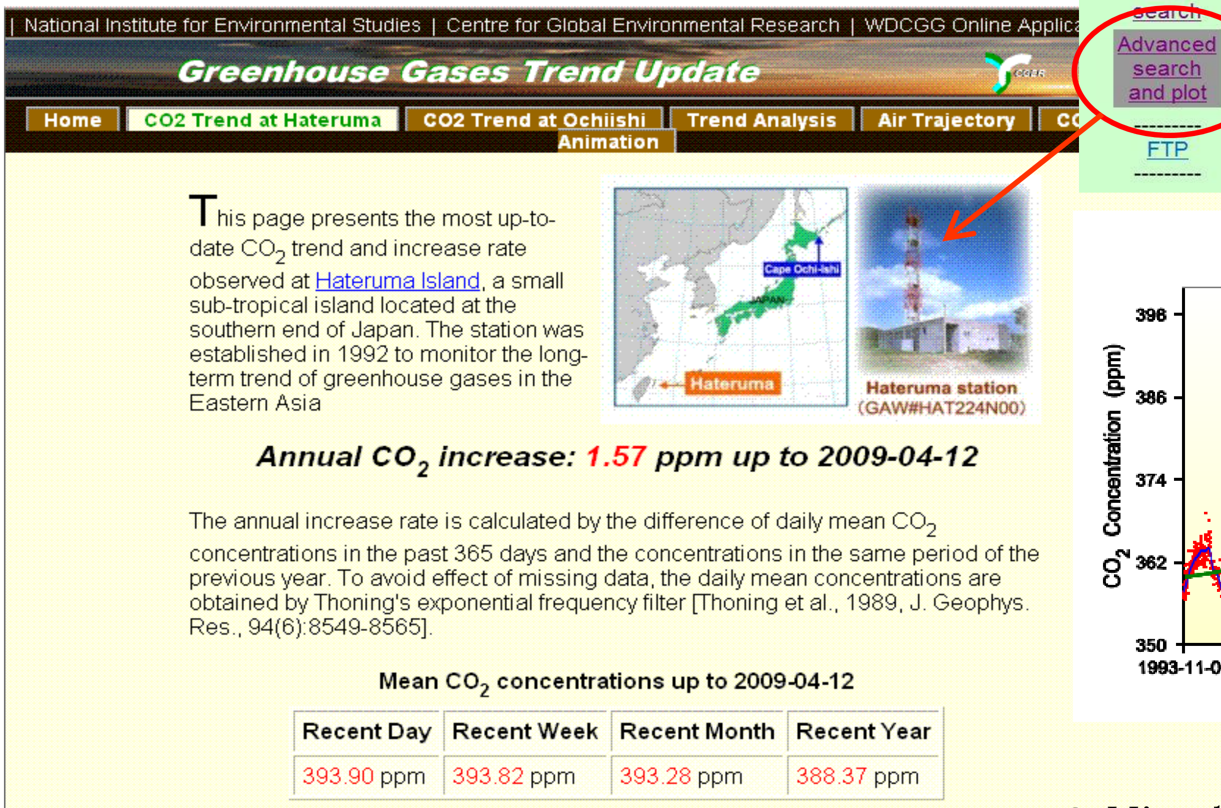
Introduction | Contributors | Data/ Quick Plot | Catalogue search | Form search | Map search | Advanced search and plot | --------- | FTP | ---------

About | Quick view | Data query | Stations & cruises

Online Application

Welcome to this online application developed by the Centre for Global Environmental Research (CGER) of the National Institute for Environmental Studies (NIES) in cooperation with the Japan Meteorological Agency (JMA), by which the World Data Centre for Greenhouse Gases (WDCGG) under the World Meteorological Organization (WMO) provides advanced functions. The main purpose of this site is to provide a place for conditional data search and visualization of global greenhouse gas concentrations from the WDCGG's database. The WDCGG maintains data for various kinds of greenhouse gases (i.e. CO2, CH4, N2O, O3, halocarbon, etc) observed at stations in the world and onboard ships and aircraft.

What can you do here?


| National Institute for Environmental Studies | Centre for Global Environmental Research | WDCGG Online Applica

Greenhouse Gases Trend Update

Home | CO2 Trend at Hateruma | CO2 Trend at Ochiishi | Trend Analysis | Air Trajectory | CO | Animation

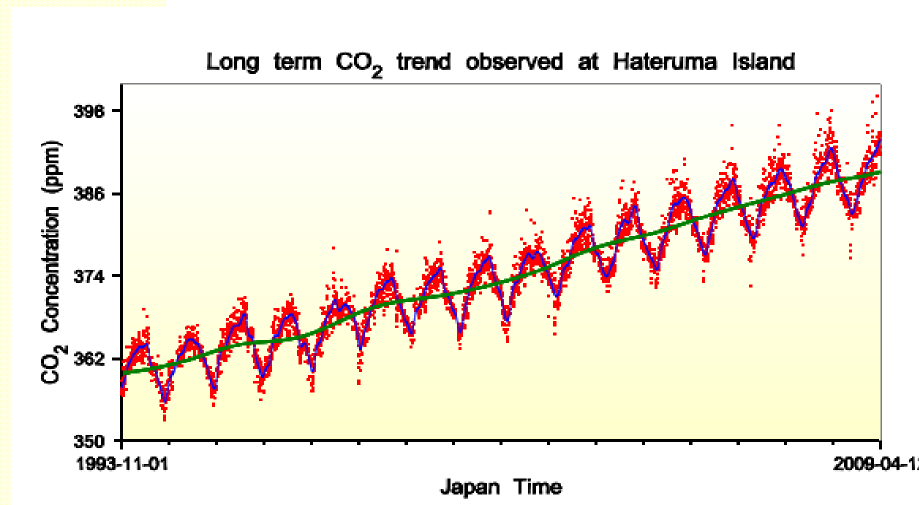
This page presents the most up-to-date CO_2 trend and increase rate observed at Hateruma Island, a small sub-tropical island located at the southern end of Japan. The station was established in 1992 to monitor the long-term trend of greenhouse gases in the Eastern Asia

Annual CO_2 increase: 1.57 ppm up to 2009-04-12

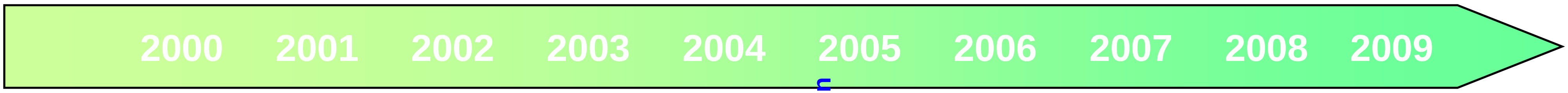
The annual increase rate is calculated by the difference of daily mean CO_2 concentrations in the past 365 days and the concentrations in the same period of the previous year. To avoid effect of missing data, the daily mean concentrations are obtained by Thoning's exponential frequency filter [Thoning et al., 1989, J. Geophys. Res., 94(6):8549-8565].

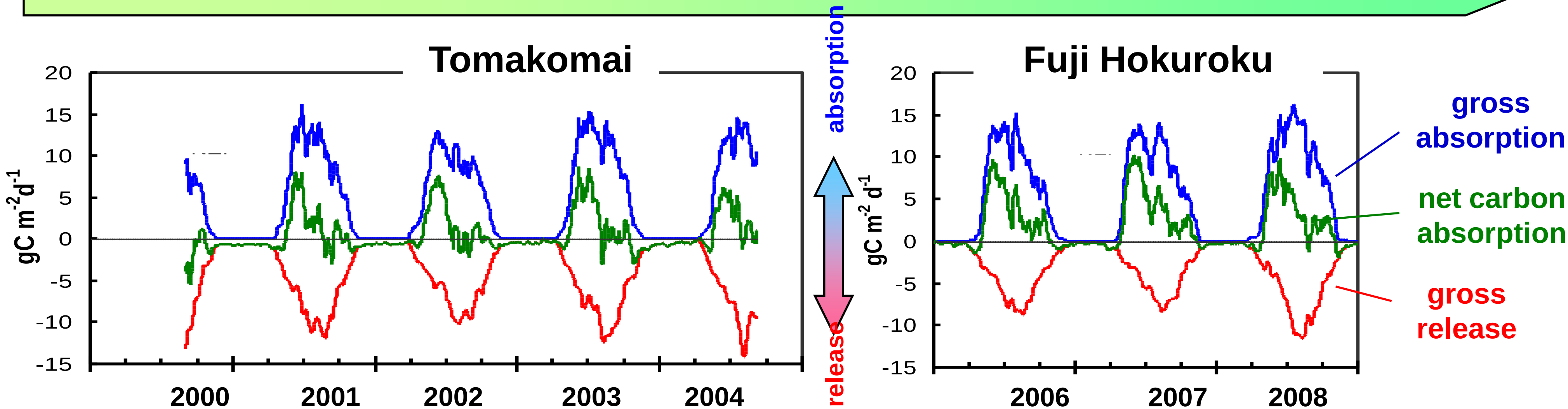
Mean CO_2 concentrations up to 2009-04-12

Recent Day	Recent Week	Recent Month	Recent Year
393.90 ppm	393.82 ppm	393.28 ppm	388.37 ppm



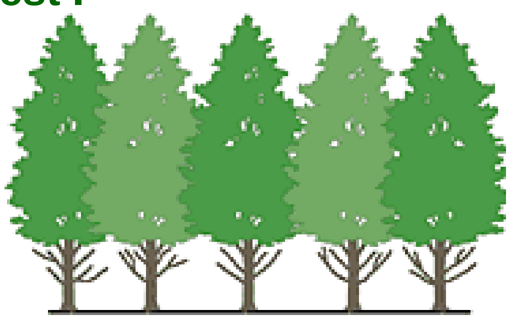
Inter-annual Variations in Forest CO_2 Exchange



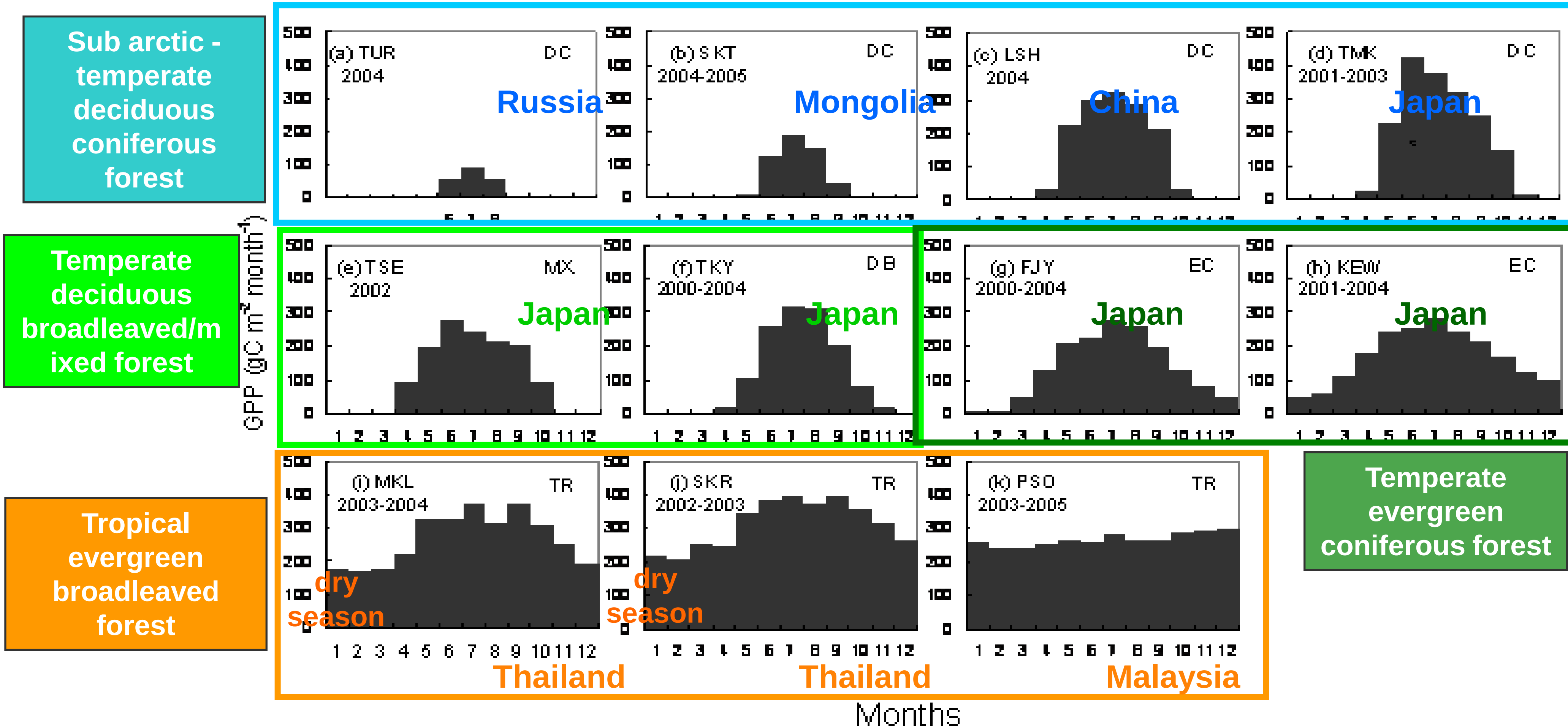


Adapted from Hirata *et al*.
Agric. For. Meteorol. (2007)

matured (40-50 yrs old) larch (deciduous needle leaved) forest .

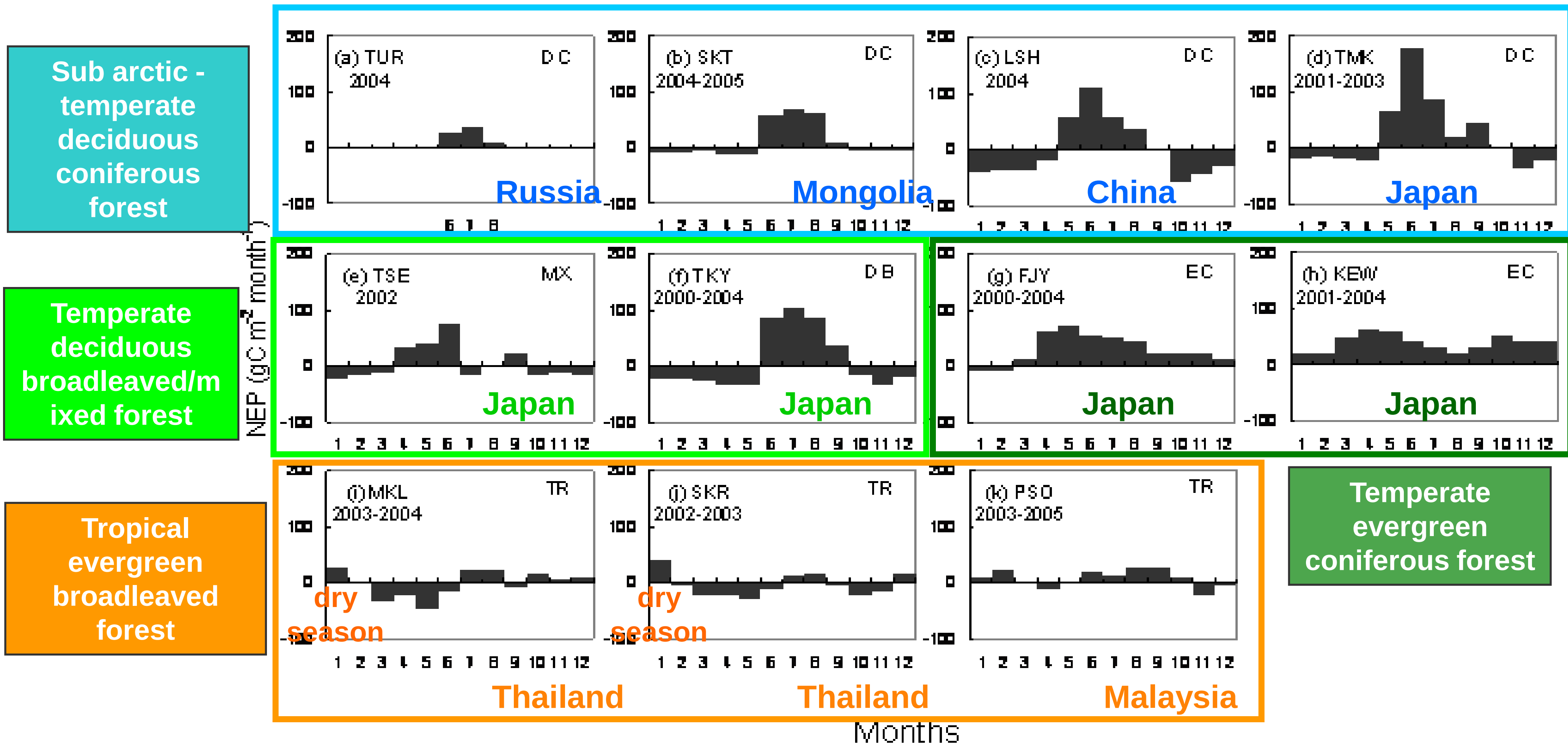


Gross Primary Production in Asian Forests



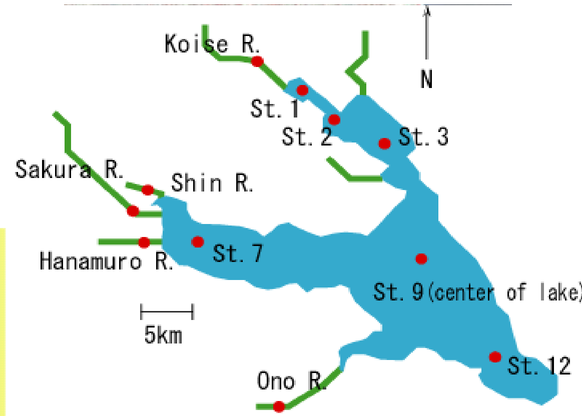
GPP shows different patterns of seasonal variation depending on the length of growing season; if it's evergreen or deciduous, if it's dry or rainy season, etc.

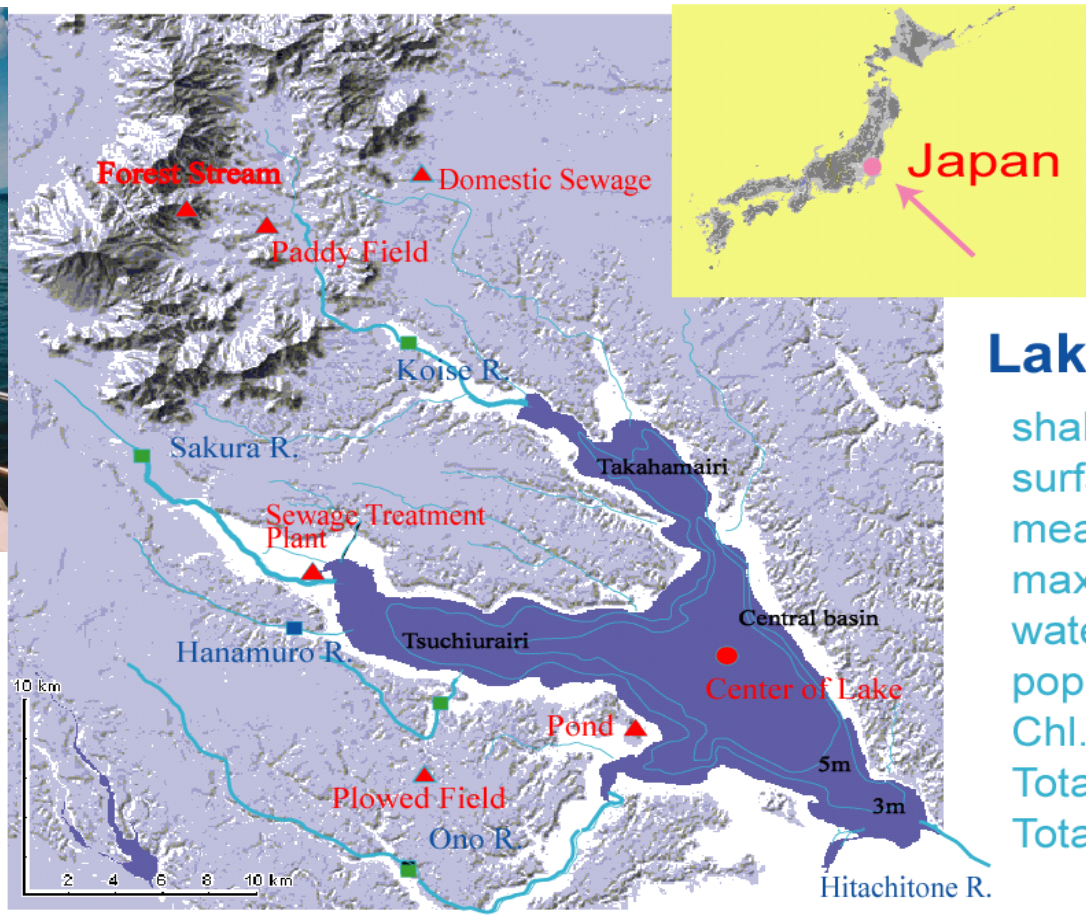
Net Ecosystem Production in Asian Forests



Deciduous forests absorb CO_2 in summer and release it in winter
Evergreen forests show less seasonal variation.

Lake Kasumigaura trend monitoring: sampling sites (10 sites, monthly)

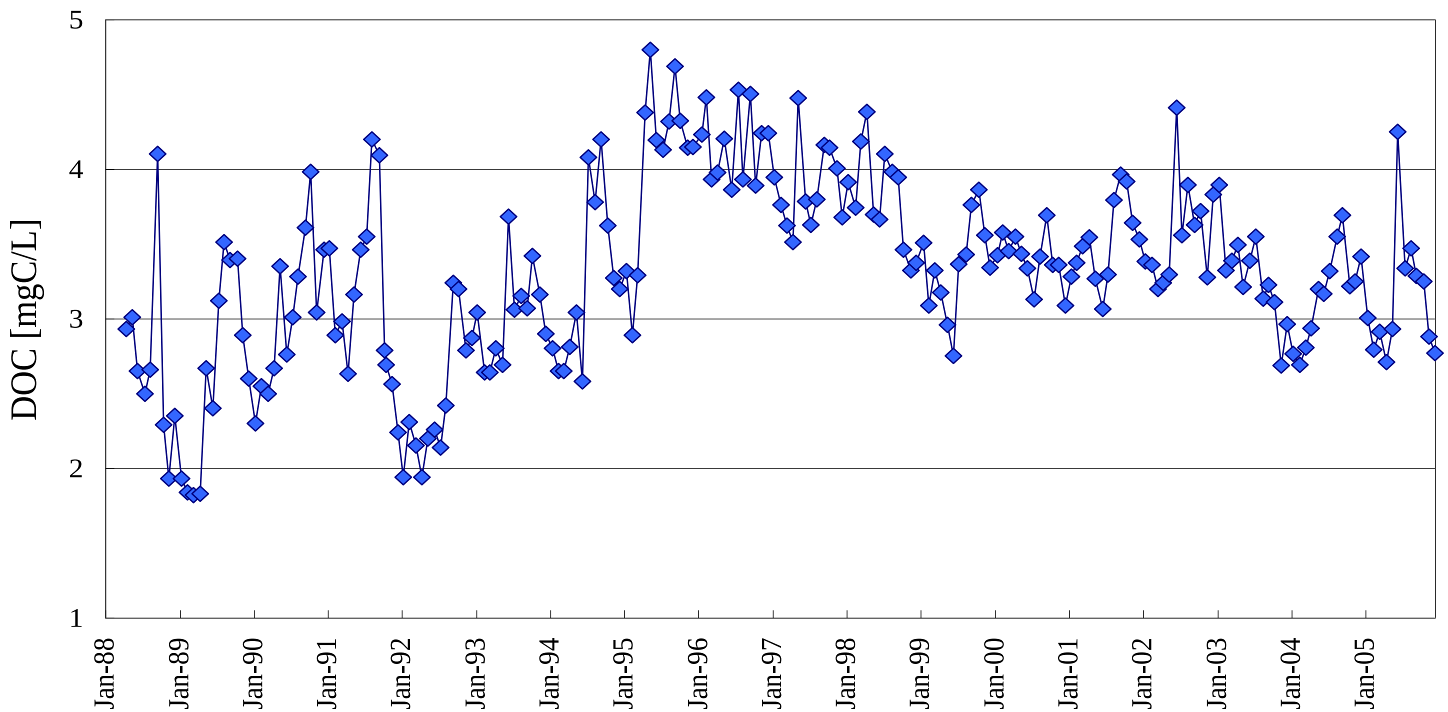




Lake Kasumigaura

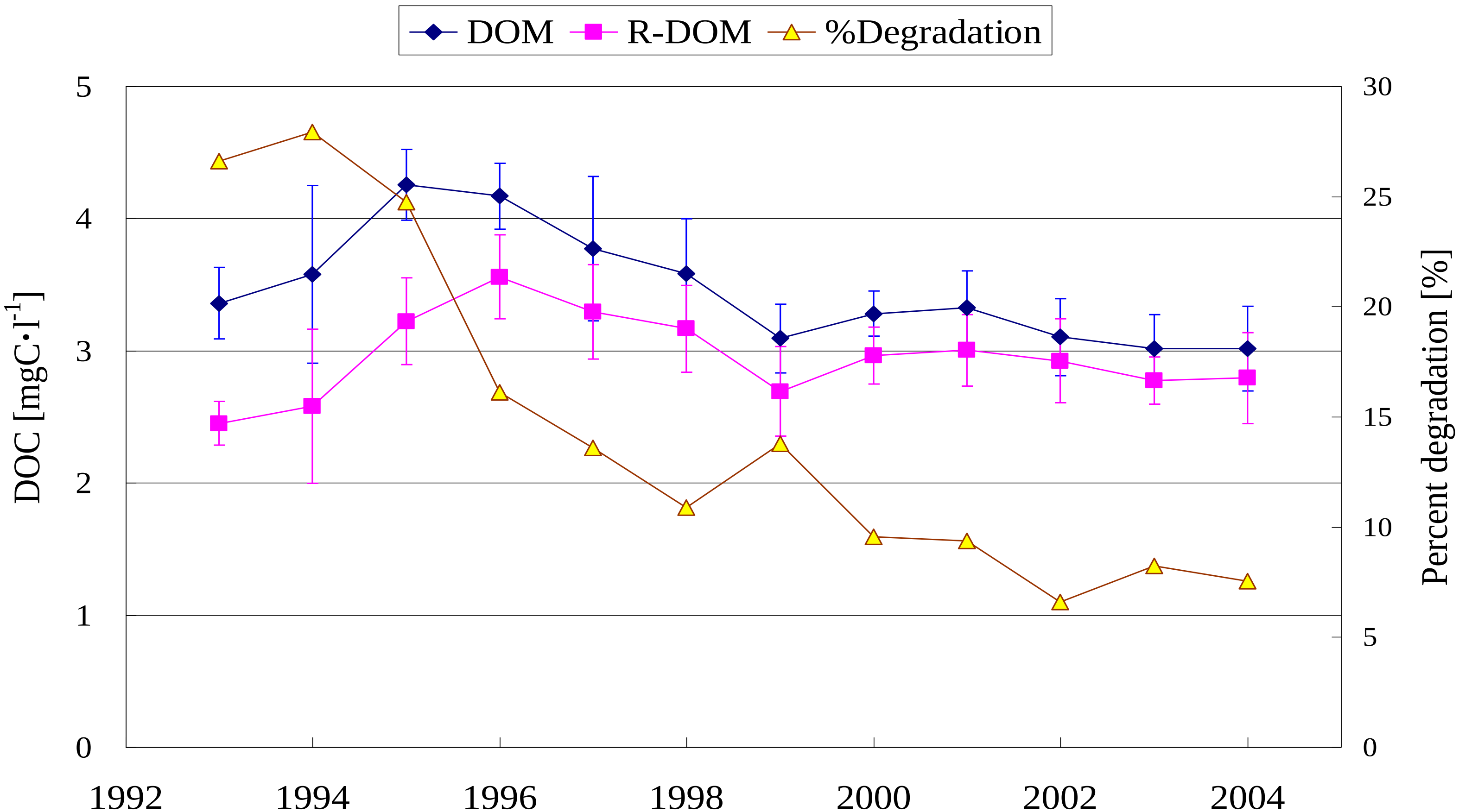
- shallow eutrophic lake
- surface area: 171 km^2
- mean depth: 4.0 m
- maximum depth: 7.3 m
- watershed area: 1,577 m^2
- population in the area: 900,000
- Chl. - *a*: 65 μg L^{-1}
- Total P: 95 μg L^{-1}
- Total N: 1.15 mg L^{-1}

Long-term trends in DOM (as DOC) at the center of Lake Kasumigaura



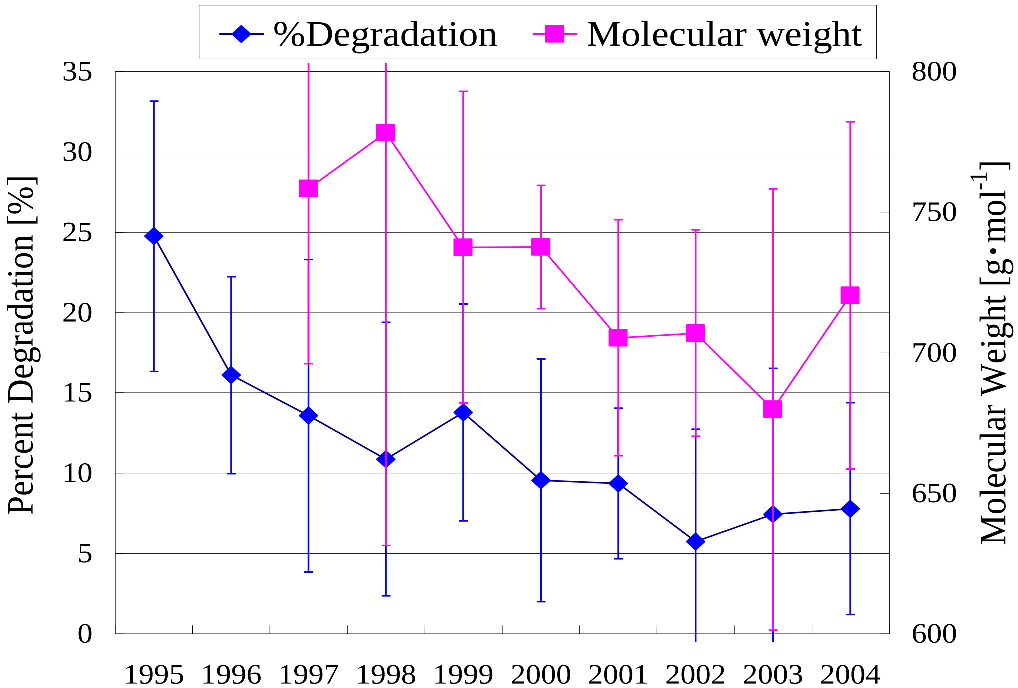
- DOM in Lake Kasumigaura was increased from 1988 to 1995, then showed a tendency to decrease up to 2005.

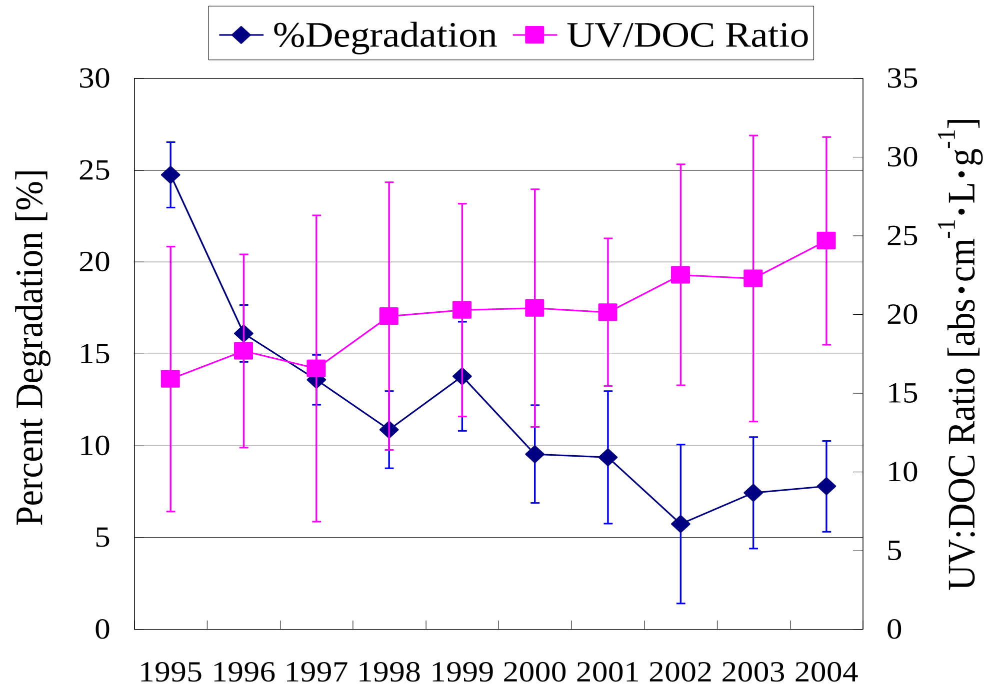
Trends in DOM and recalcitrant DOM (RDOM) in Lake Kasumigaura



- DOM was in decline since 1995, while the degradation ratio was substantially decreased during the same period.
- DOM has become more recalcitrant since 1995.

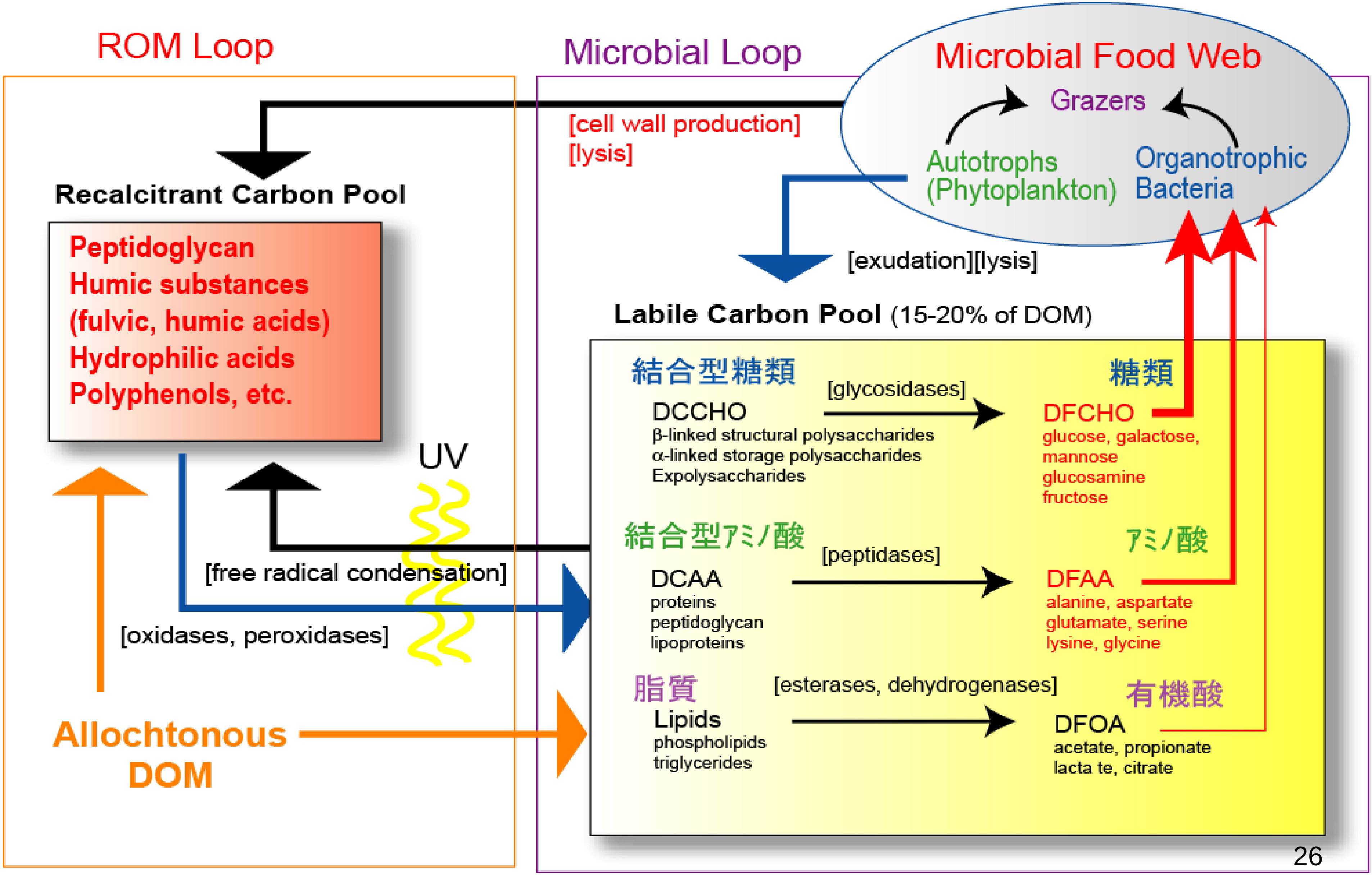
Long-term trend of DOM characteristics at the center of Lake Kasumigaura (1995~2004)





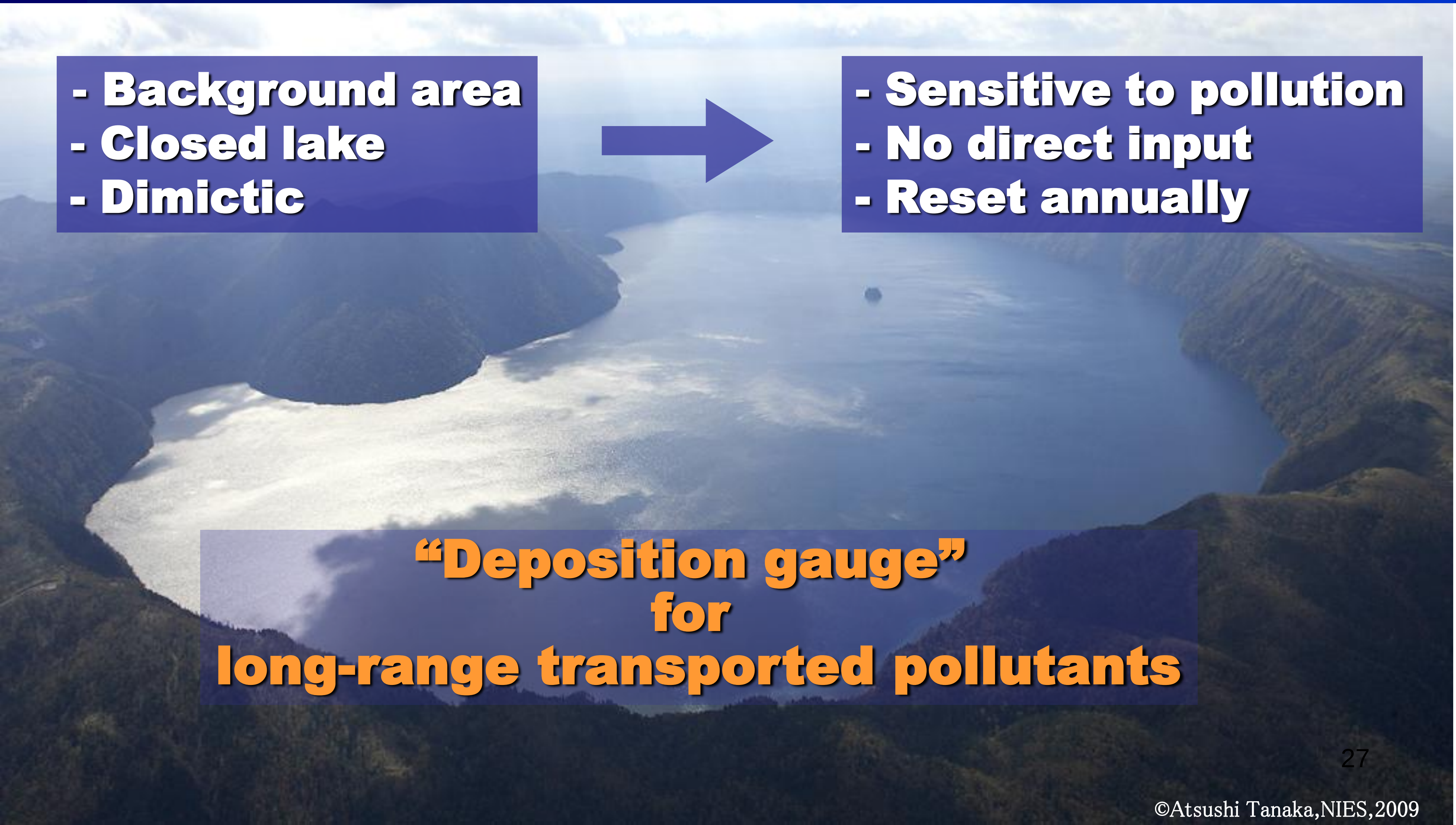
- DOM has become more recalcitrant as time goes by.
- The molecular size of DOM has become lower.
- The UV/DOC of DOM has become greater.

DOM Processing Cycle



Lake Mashu

Baseline Monitoring Station of UNEP GEMS/Water



- Background area
- Closed lake
- Dimictic

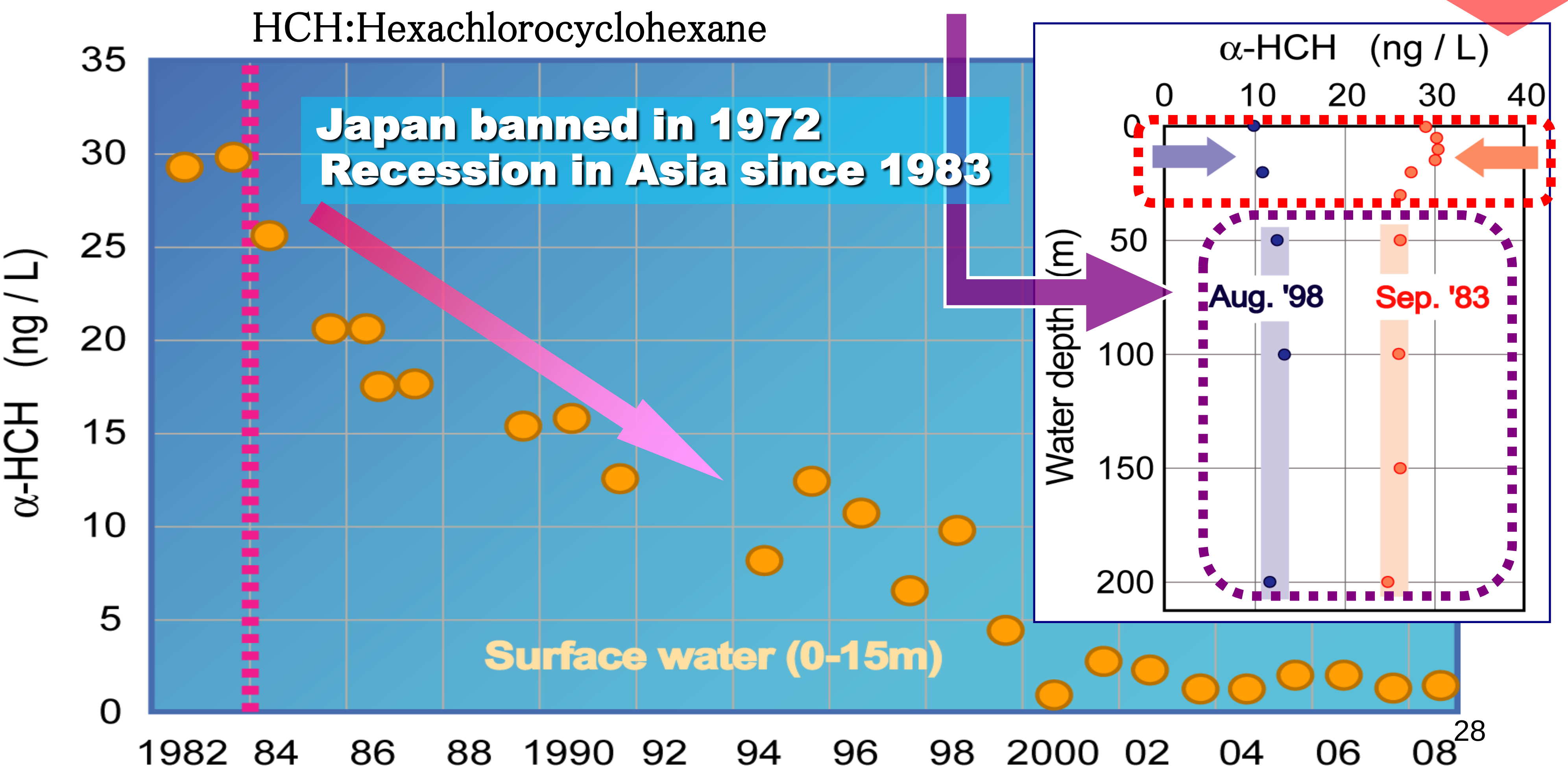
→

- Sensitive to pollution
- No direct input
- Reset annually

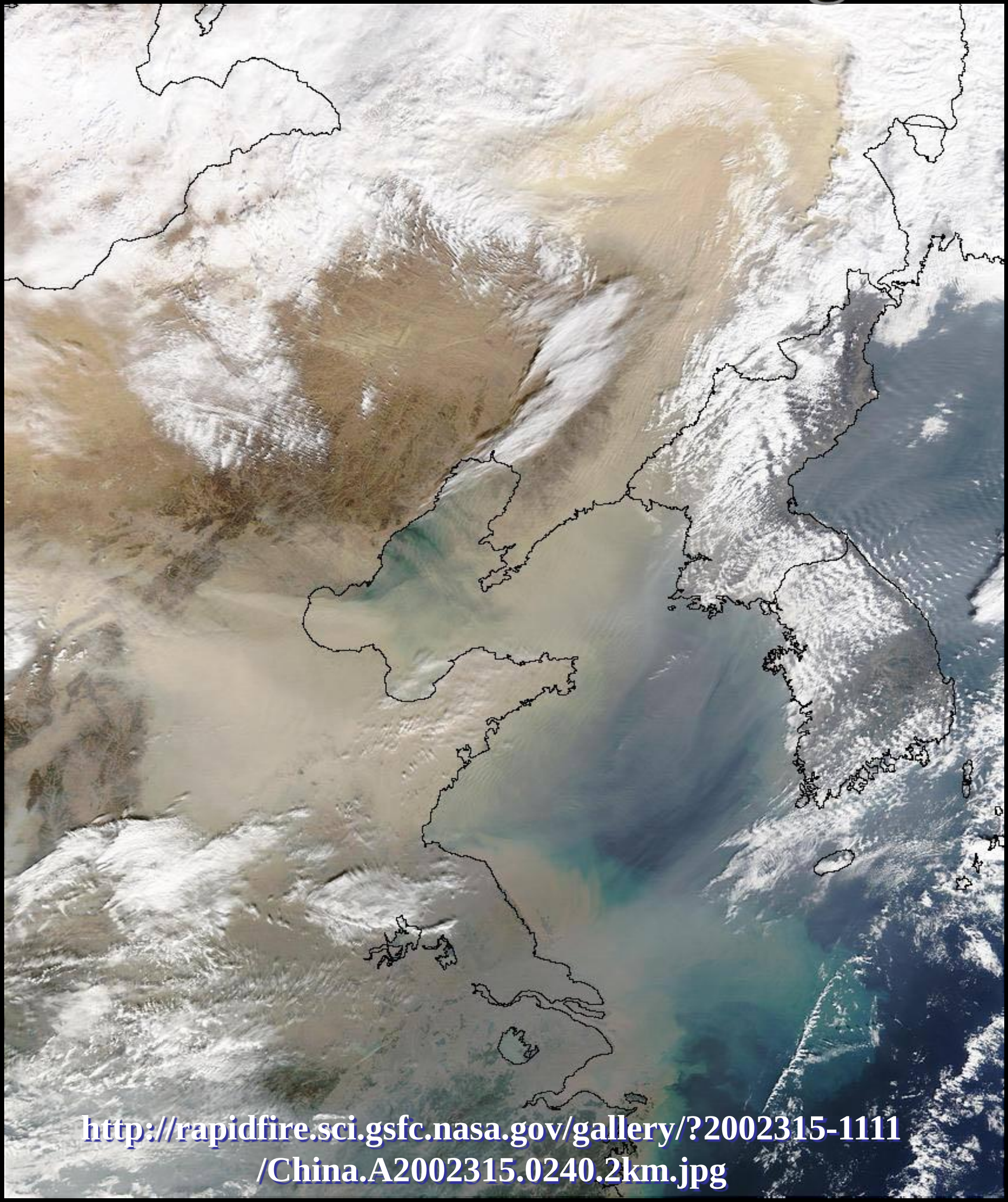
"Deposition gauge"
for
long-range transported pollutants

Trend of α-HCH in L. Mashu Water

- Observation in summer stratified season
- Airborne impact appears in the surface water
- Mixing resets vertical profiles of HCHs annually



Scientific Background of DSS Problem



Dust and sandstorm (DSS) problems have been recognized as the environmental common issues in Northeast Asia. Long-range transport of DSS links the biogeochemical cycles of land, atmosphere and ocean. Possibly, it gives some influence to the global carbon cycle, a significant effects on regional radiative balances and human health.

To solve the serious long-range transboundary environmental problem of DSS including kosa, a regional cooperation mechanism must be established among Japan, China, Korea and other countries in this region, for example, multi-monitoring to improve a forecast model of DSS.

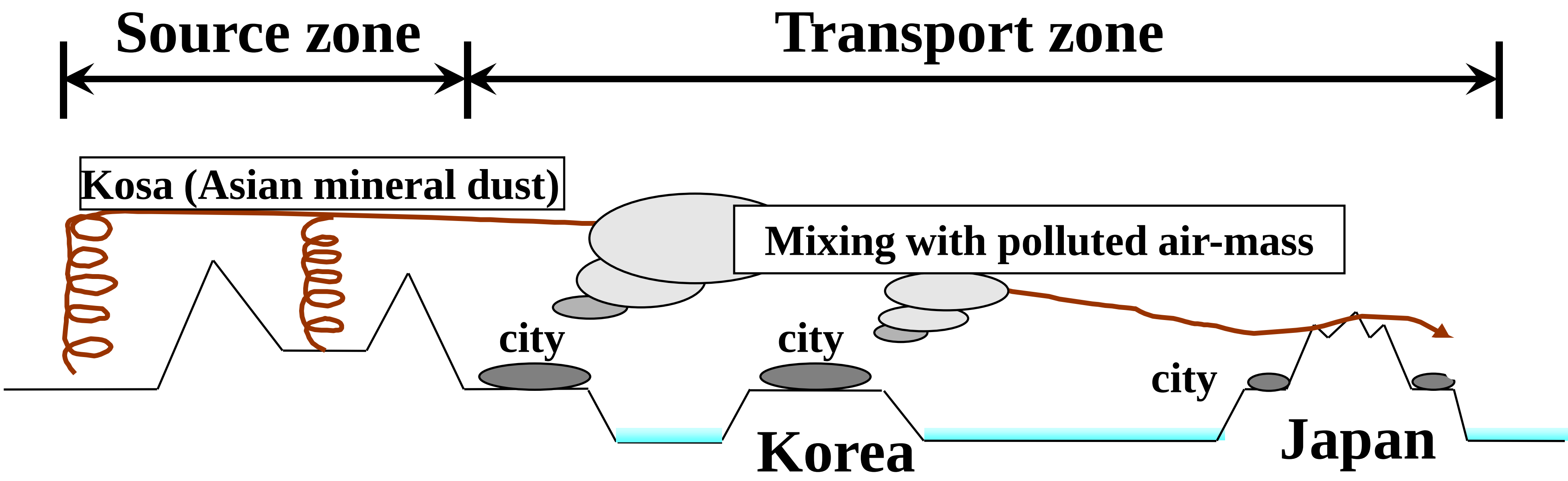
17 Apr. '06 Beijing (by Nishikawa)

(by Asahi.com)

18 Apr. '06 Tokyo (by Asahi Press)

24 Apr. '06 Seoul (by JoongAnglibo.com)

Heavy DSS attacked three capitals in the springtime, 2006



Outbreak causes & problem issues

Intensified cultivation,
Pasturage and grazing,
Desertification, Deforestation,
Desolation of glass land,
Climate change

Effects on Global environment

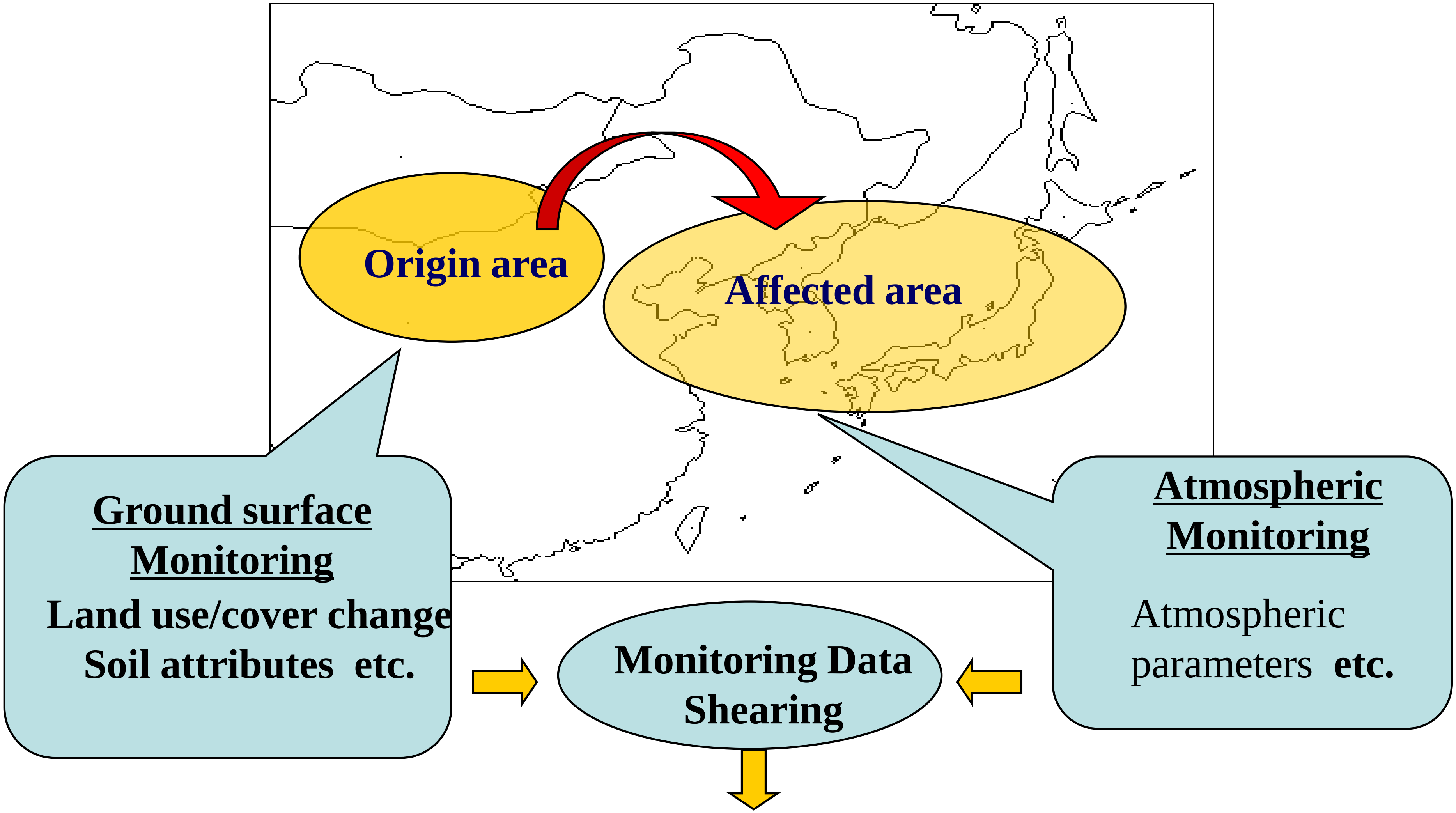
Umbrella to global warming,
Neutralization to acid rain,

Economics

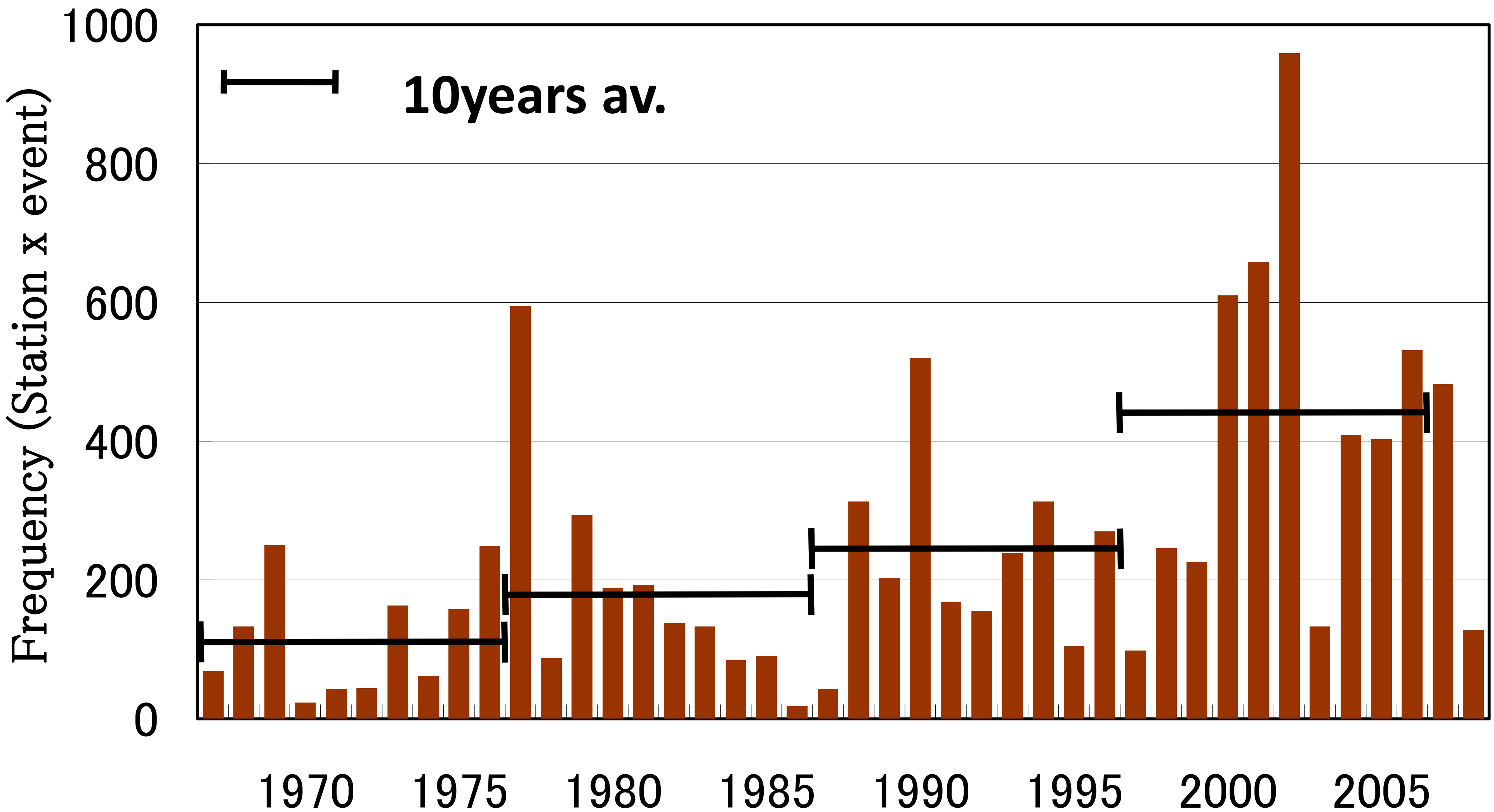
Obstacle visibility (transportation),
Inferior rate in the precision industry,
Health damage(respiratory disease)

Study on the dynamic transport mechanisms and environmental effects of DSS (kosa) originated from Northeast China and Mongolia

Scientific Collaboration Scheme to overcome DSS Problems



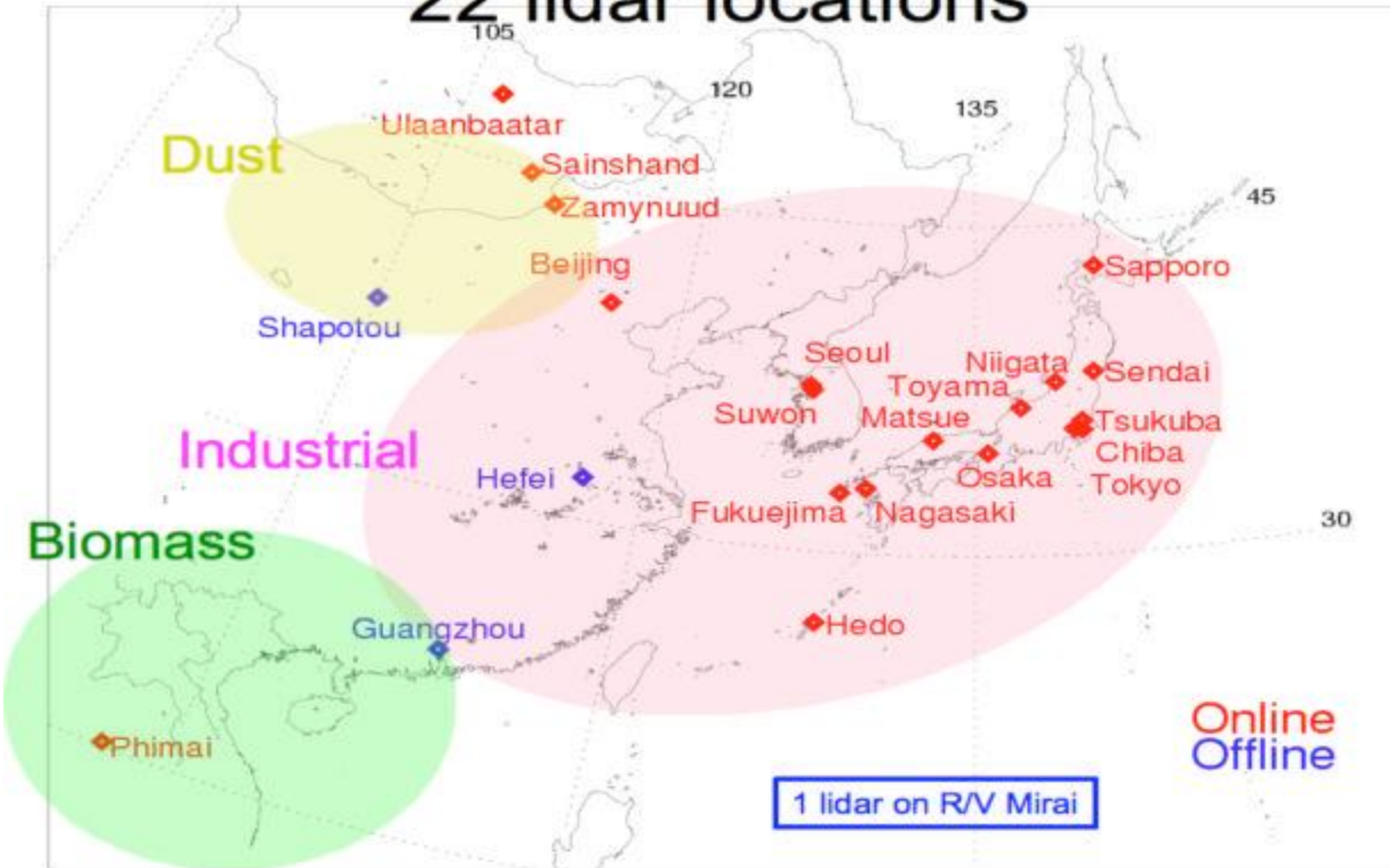
Impact Assessment, Early warning, Forecasting

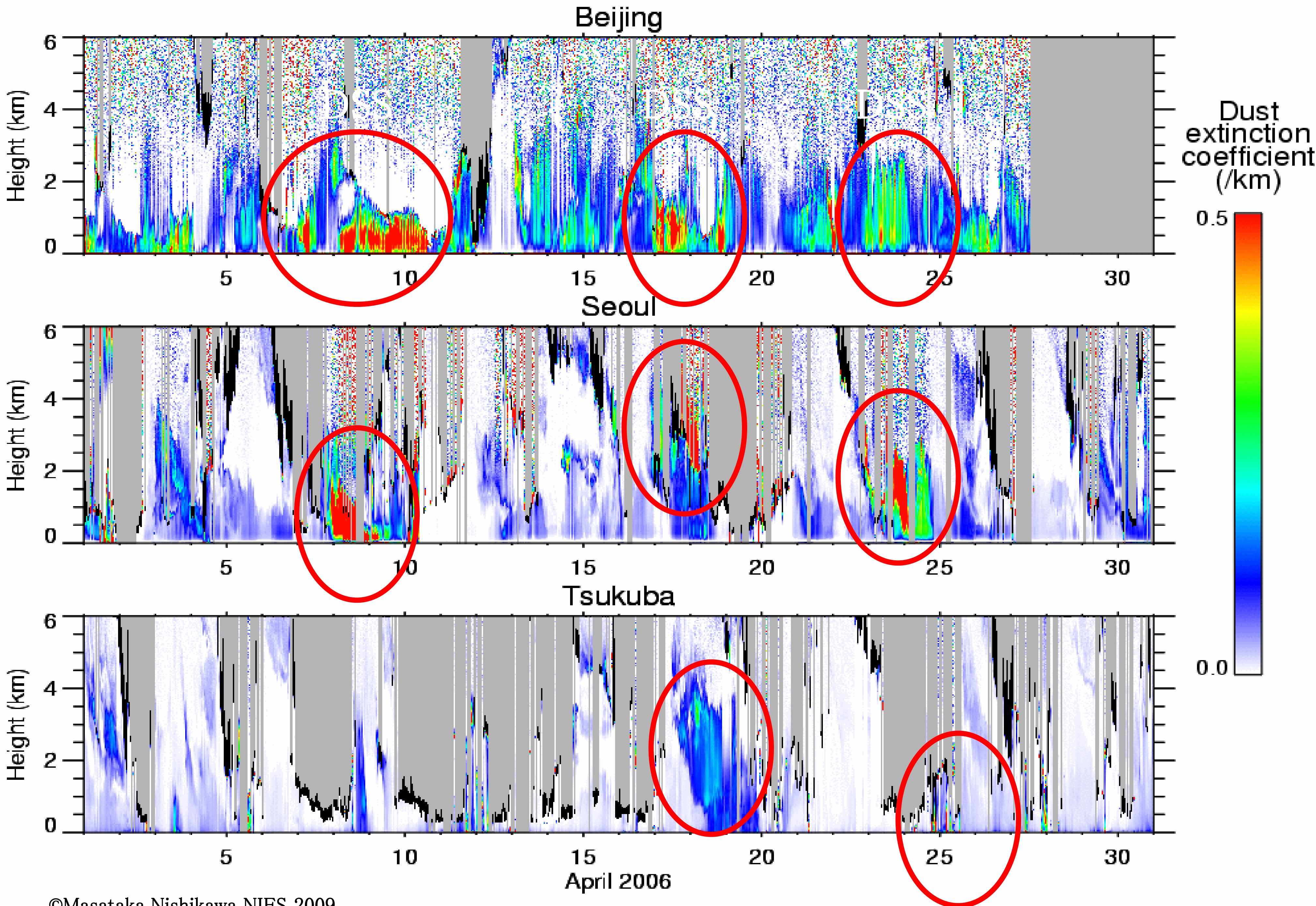


Number of observed kosa events by meteorological stations (85 sites) in the recent 30 years, Japan

Lidars in the Network for DSS observation

22 lidar locations




Beijing
Seoul
Tsukuba
Height (km)
April 2006
Dust extinction coefficient (/km)
0.5
0.0
DSS

Monitoring example

- Long-term CO_2, CH_4, N_2O in atmosphere
- Forest CO_2 exchange and biomass production
- DOM in a lake
- HCH in a lake
- Dust and sand storm

Conclusion

- Rational policies for water resources management in future require scientific and quantitative data or evidence.

-Monitoring is steadily and inconspicuous work.

- Long term monitoring and international regional monitoring have important role for establishing new policies and public consensus.

- We have to strive to strengthen our international collaboration and exchange on the monitoring data.

Thank you for your attention

National Institute for Environmental Studies

http:www.nies.go.jp