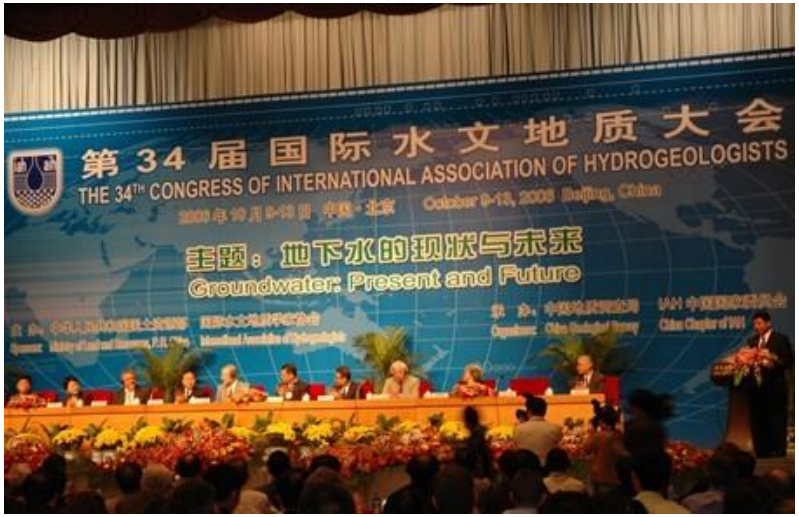
Welcome to IHEG, China

The Institute of Hydrogeology and Environmental Geology, CAGS

25-29th September 2016
Montpellier, France
CORUM CONFERENCE CENTER
43rd IAH congress

21st IAH Congress, Guilin, 10 Oct 1988 – 15 Oct 1988



34th IAH Congress, Beijing, 9 Oct 2006 – 13 Oct 2006

25-29th September 2016
Montpellier, France
CORUM CONFERENCE CENTER
43rd IAH congress

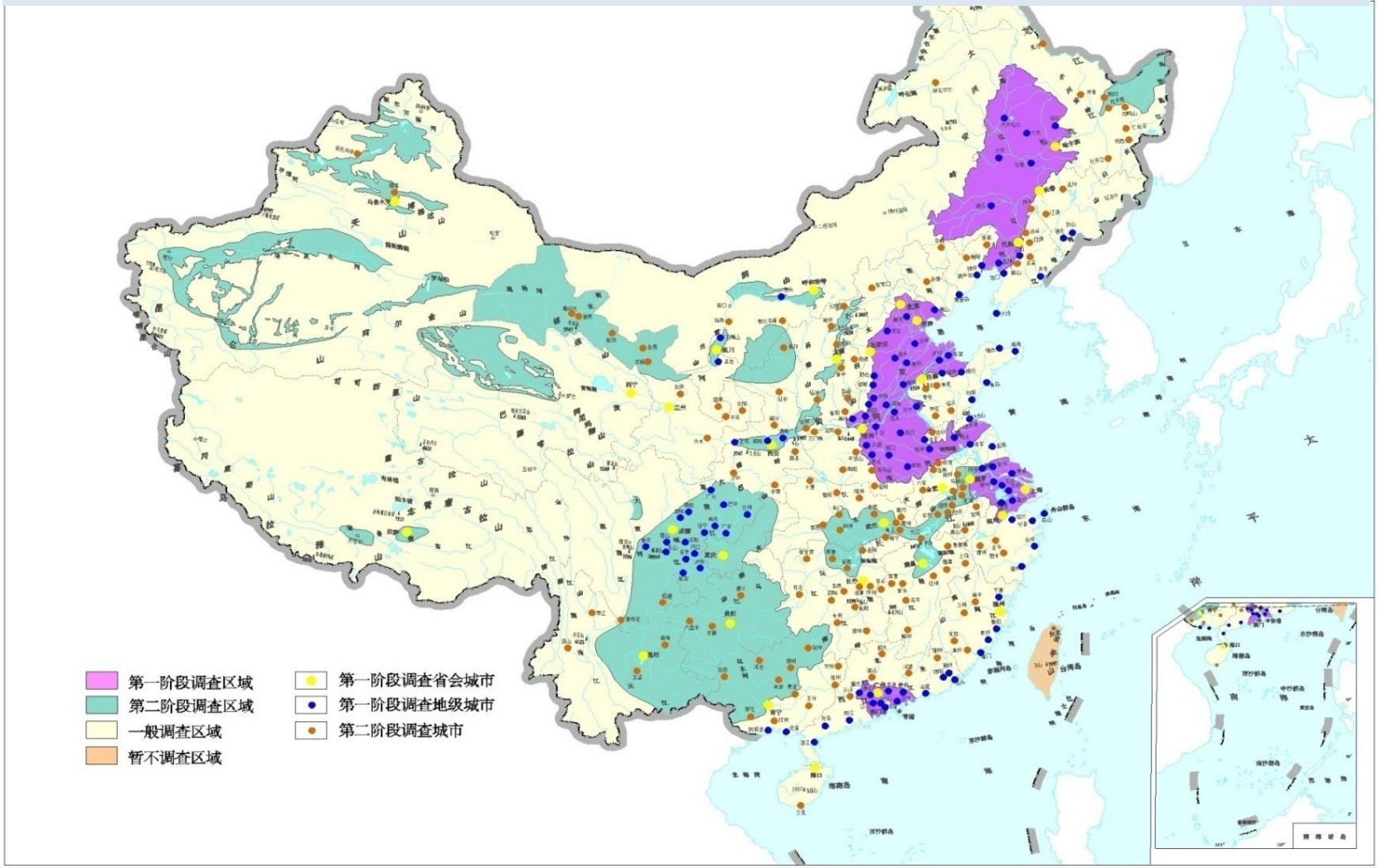
INVESTIGATION AND EVALUATION OF GROUNDWATER POLLUTION IN NORTH CHINA PLAIN AND RESEARCH ON KEY TECHNOLOGY

Dr. Li yasong
liyasong712@126.com

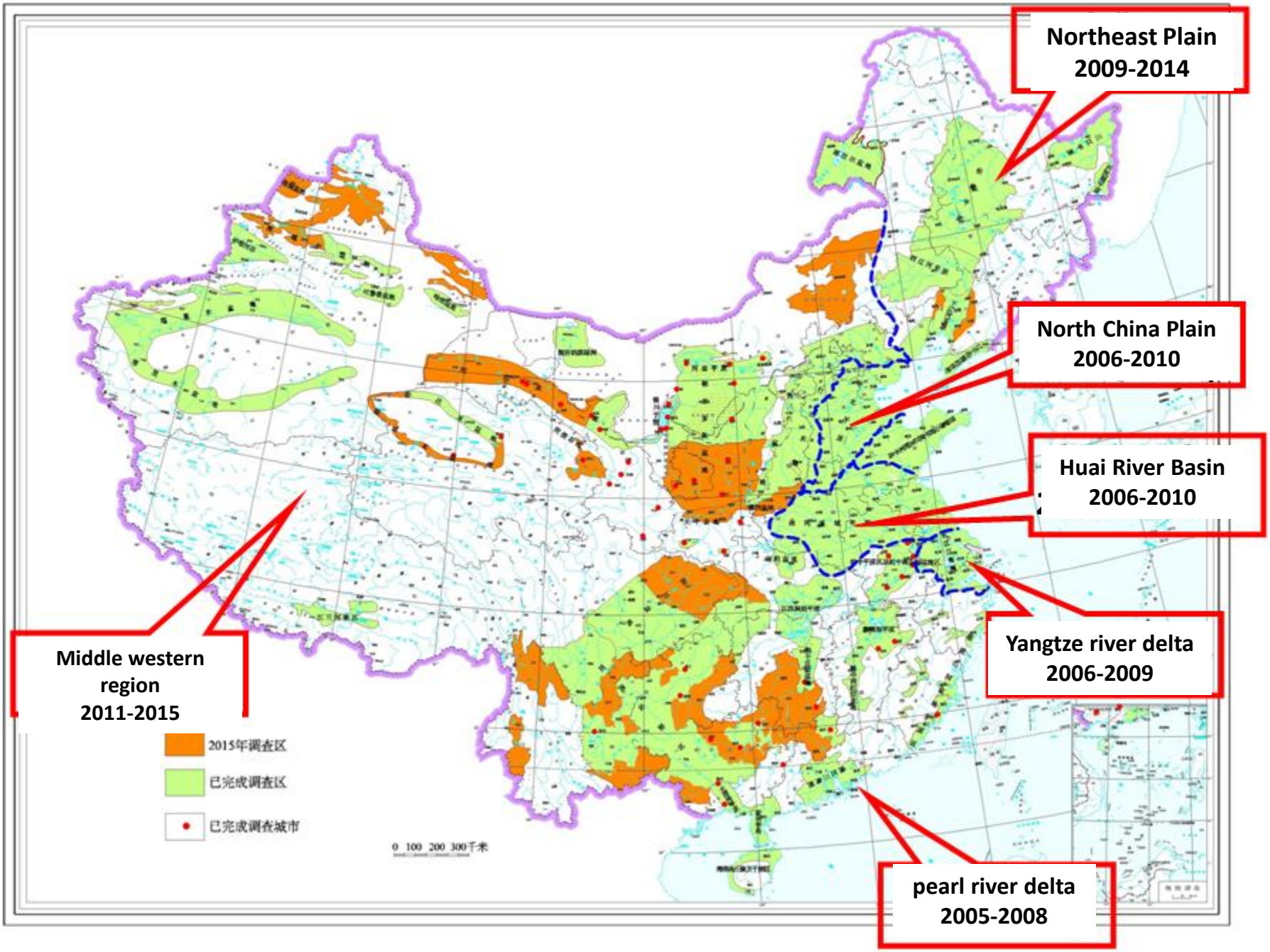
Outlines

1. Regional Groundwater Quality Assessment in China
2. New Technologies used in field work
3. Groundwater Quality and Pollution Characteristics in North China Plain
4. New contaminants in agriculture
5. Seek cooperation opportunities

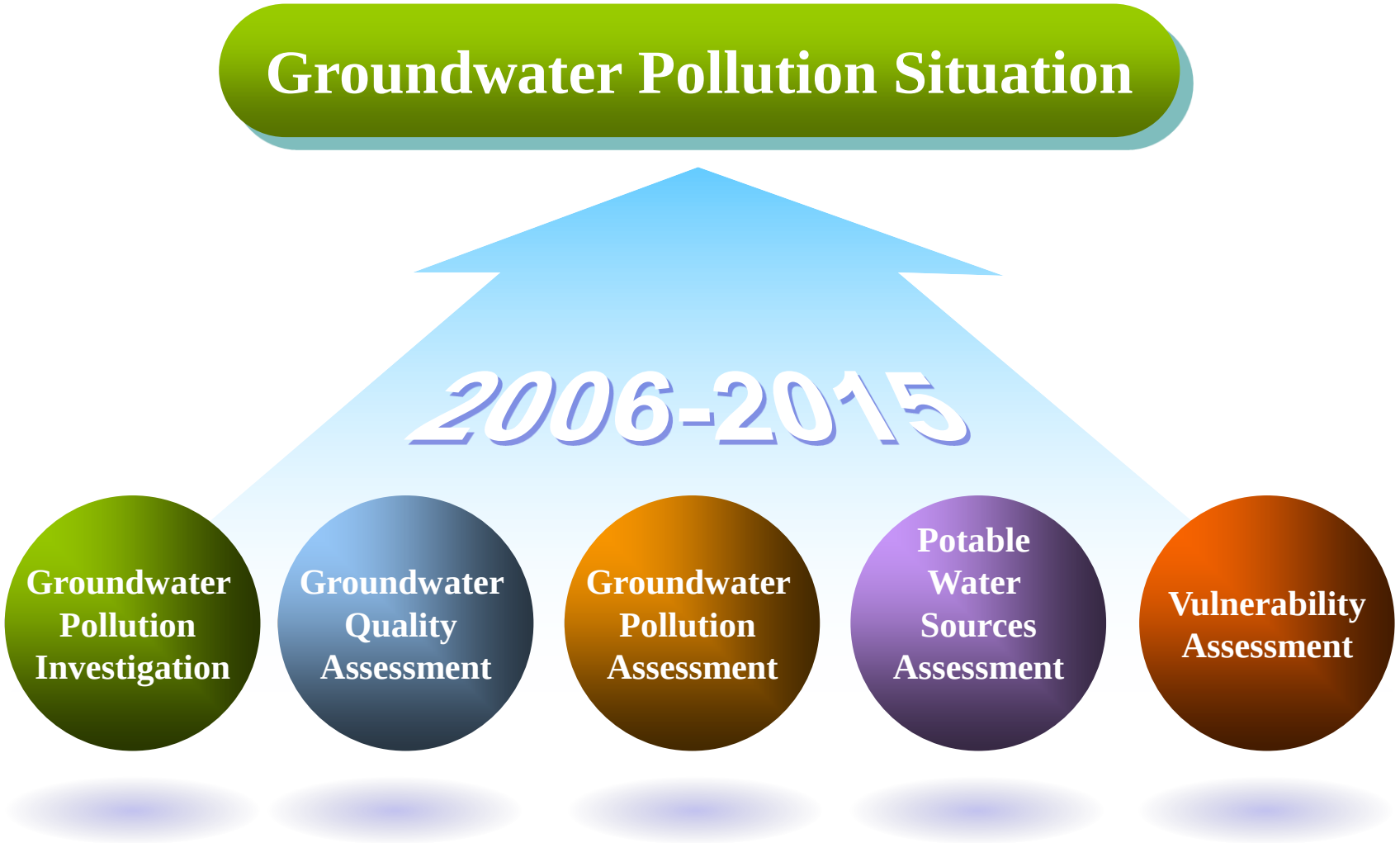
Regional Groundwater Quality Assessment in China



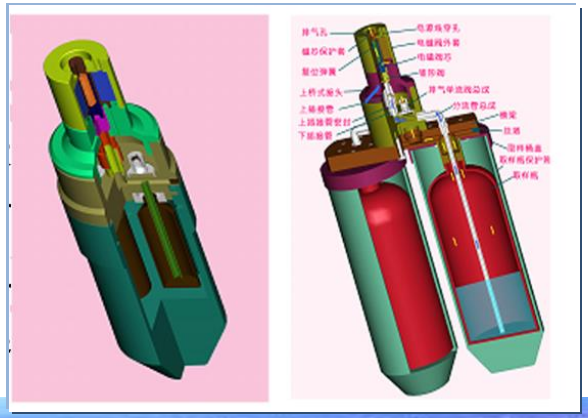
2006-2015, 10 years, 4,400,000km^2


Northeast Plain
2009-2014
North China Plain
2006-2010
Huai River Basin
2006-2010
Yangtze river delta
2006-2009
pearl river delta
2005-2008
Middle western region
2011-2015
2015年调查区
已完成调查区
已完成调查城市
0 100 200 300千米

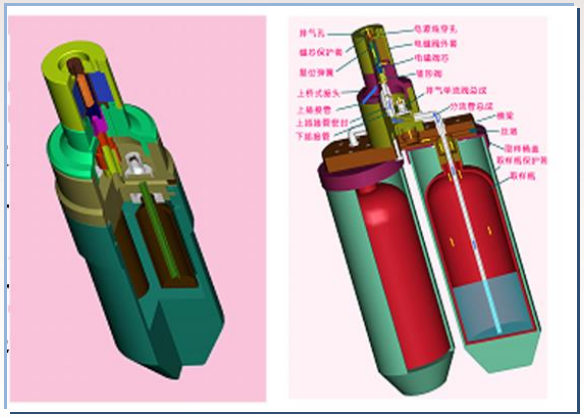
▪ Investigation and Evaluation of groundwater Pollution



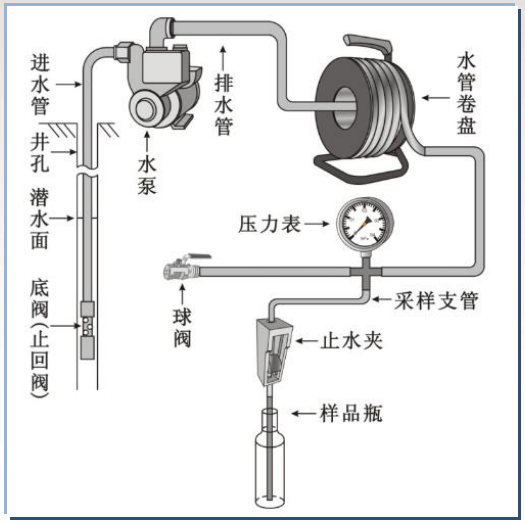
New Technologies used in field work

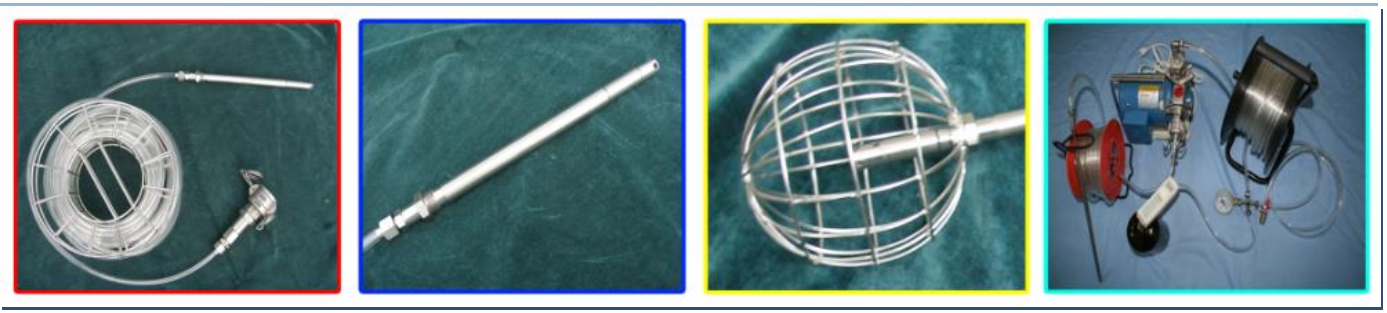


New equipment



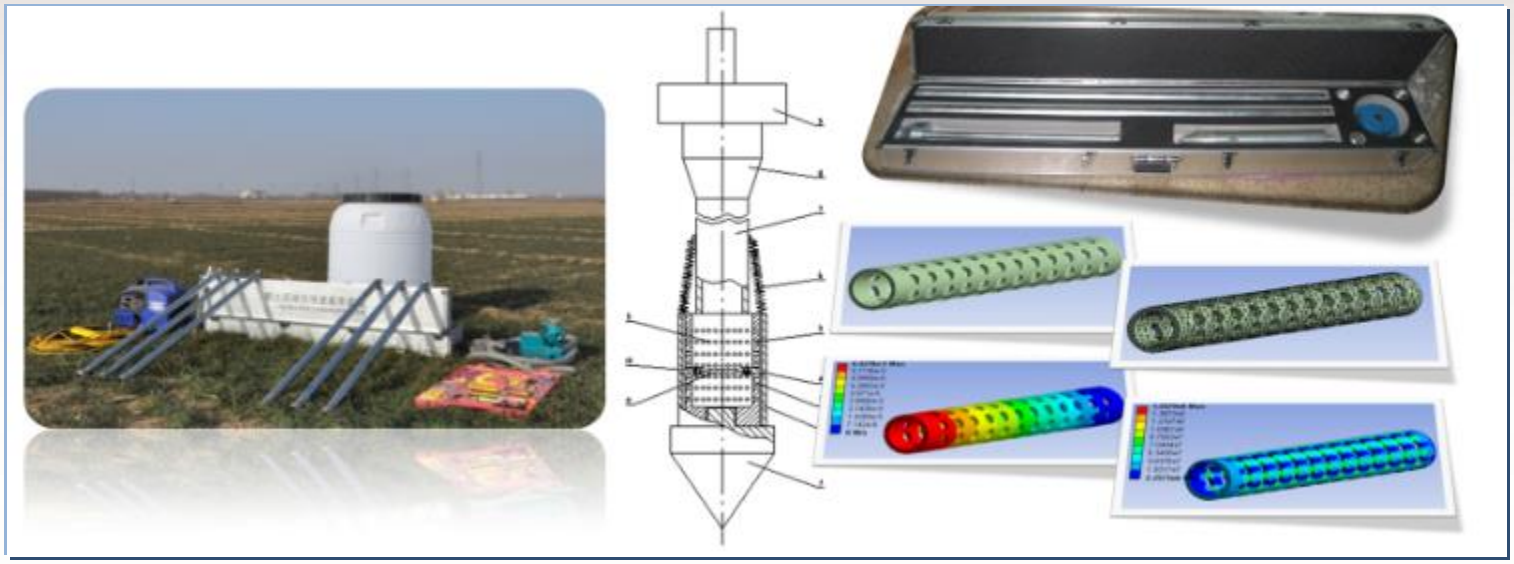
Setted depth in-situ sampling technique





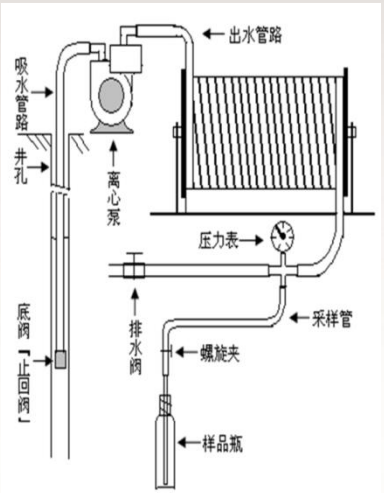
Pump suction sampling technique

New equipment

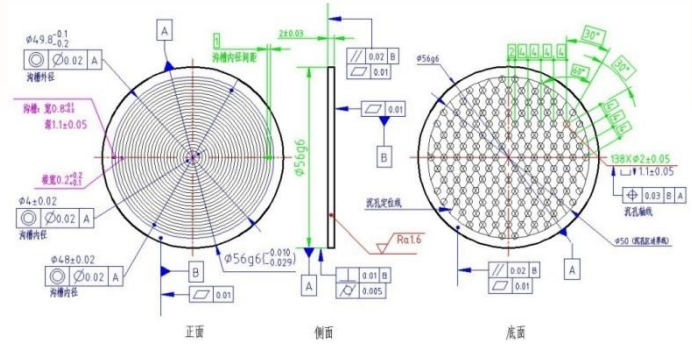


Shallow groundwater sampling technology in areas without well

New equipment



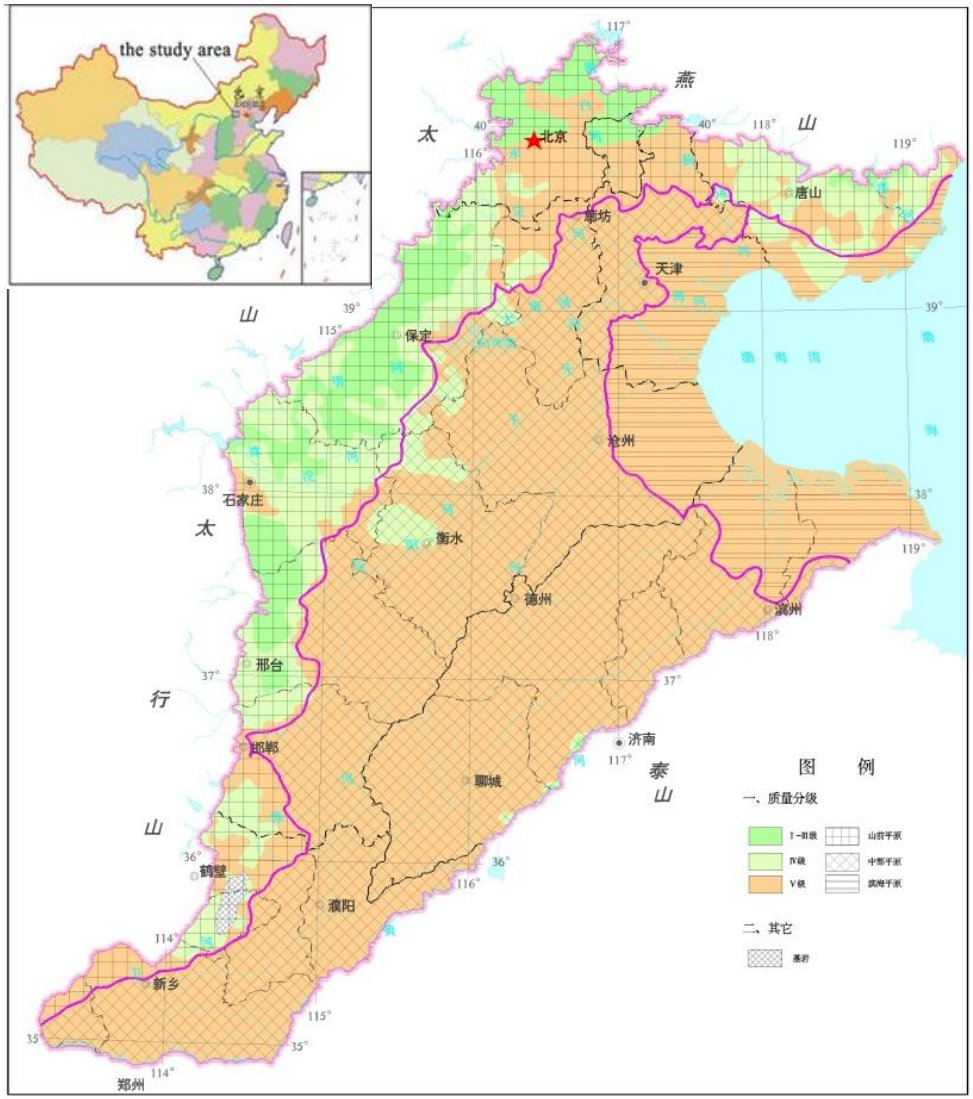
Positive pressure wells sampling technique



on-line filtration-dilution technique

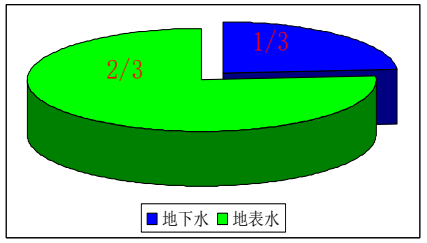
subnormal pressure wells sampling technique

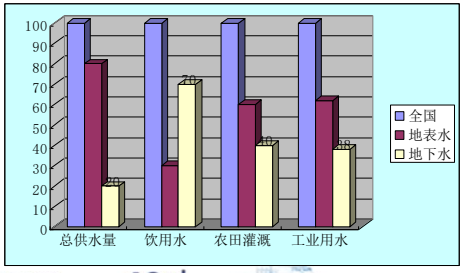
Groundwater Quality Characteristics in North China Plain

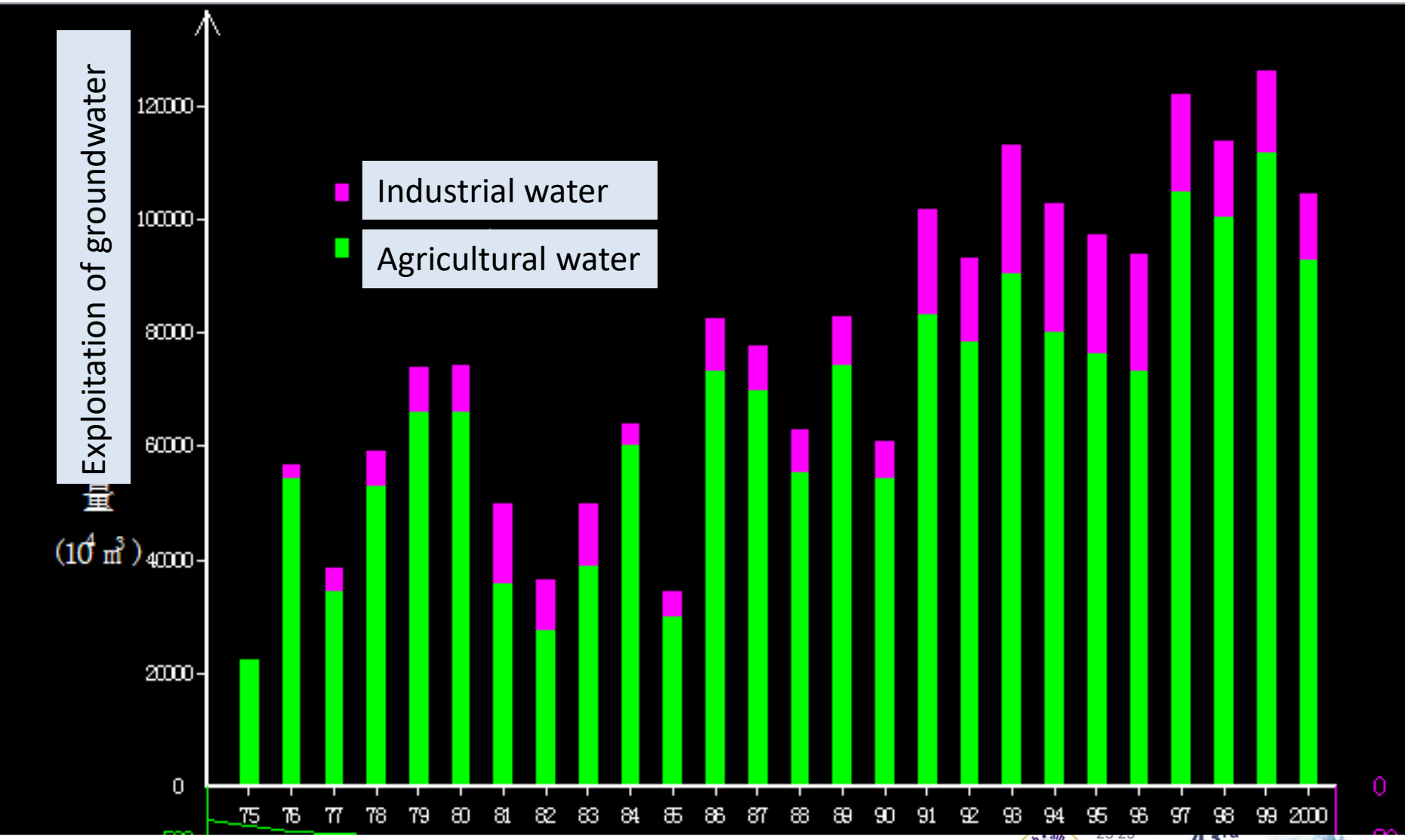

the study area
北京
天津
唐山
廊坊
保定
沧州
石家庄
衡水
德州
滨州
邢台
邯郸
聊城
济南
鹤壁
濮阳
新乡
郑州
太
行
山
燕
山
泰
山
图 例
一、质量分级
二、其它


昵图网 nipic.com/Mory

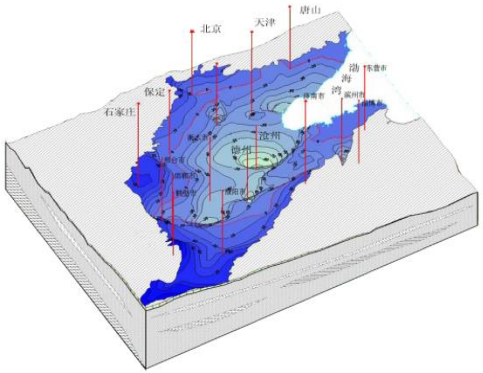

南水北调中线干线工程路线图
南水北调中线干线工程路线示意图
中线干渠全长
1277公里
北京
天津
保定
石家庄
邢台
邯郸
安阳
鹤壁
新乡
焦作
郑州
许昌
平顶山
南阳
丹江口水库
输水总干渠
黄河
明渠
涵管
穿黄工程


2/3
1/3
地下水
地表水


100
90
80
70
60
50
40
30
20
10
0
总供水量
饮用水
农田灌溉
工业用水
全国
地表水
地下水


Exploitation of groundwater
开采量
(10^4 m^3)
Industrial water
Agricultural water
120000
100000
80000
60000
40000
20000
0
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 2000
0

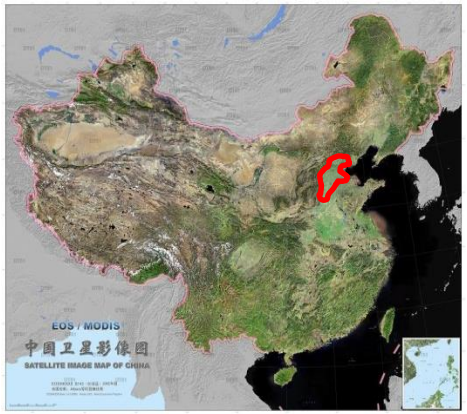
Typical Region of Human nature interaction

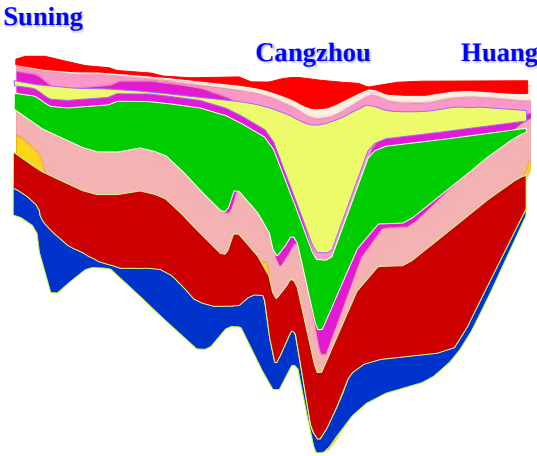


Deep Groundwater table depression

"Human Activity"

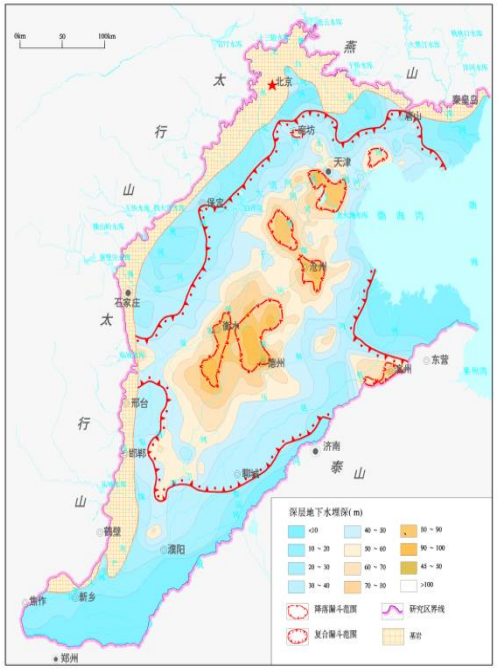
- ✓Human nature interaction
- ✓Groundwater table depression
- ✓ Salinization
- ✓saline intrusion





Urban intensive region

- ✓integration in Jing-Jin-Ji Area
- ✓Old industrial bases
- ✓Major grain producing areas
- ✓Circum-Bohai Sea Economic Zone



➢ Investigation


➢ Field testing


➢ Field sampling


7600 groundwater samples, 147,000km^2

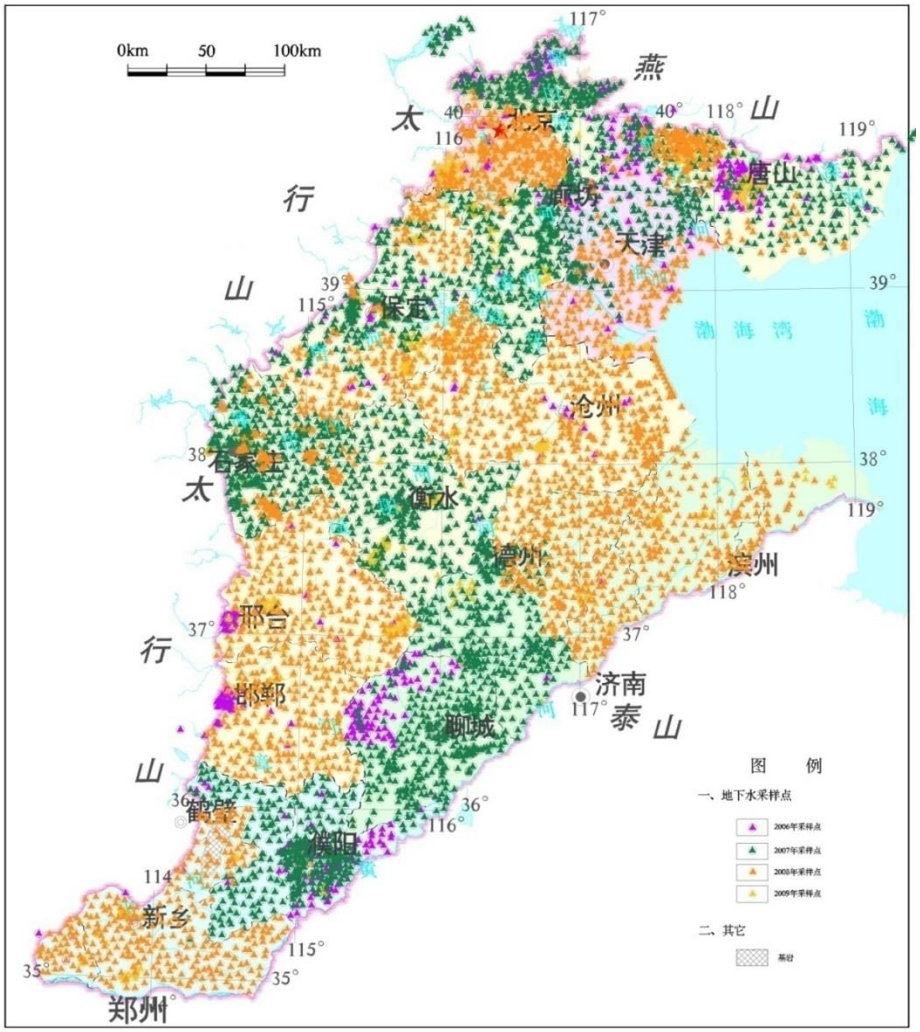
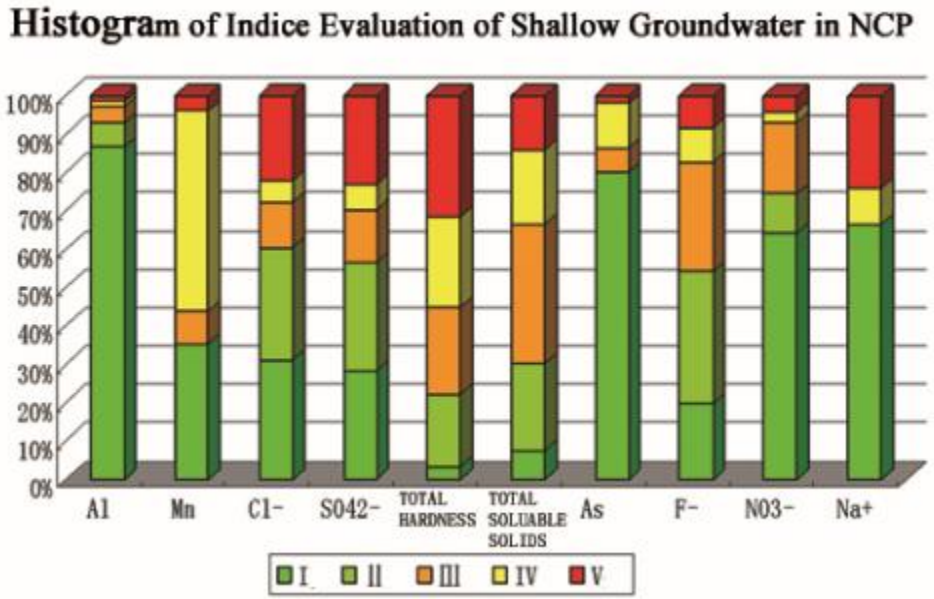


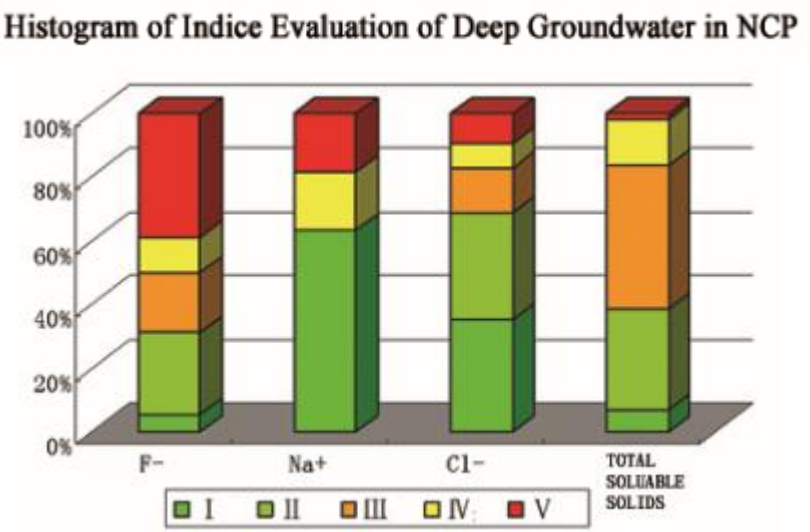

Table 1 System of evaluation indices

Classification	Organic indicators	Inorganic indicators
Conventional indicators	Trichloromethane, carbon tetrachloride	pH, Fe, Mn, Cu, Zn, Al, Na, chloride, sulfate, total hardness, TDS, COD, As, Cd, Cr, Pb, Hg, Se, fluoride, nitrate, ammonia nitrogen, iodide
Unconventional indicators	1,1,1-trichloroethane, trichloroethylene, tetrachloroethylene, dichloromethane, sym-dichloroethane, 1,1,2-trichloroethane, 1,2-dichloropropane, tribromomethane, vinyl chloride, 1,1-dichloroethane, sym-dichloroethane, chlorobenzene, *o*-dichlorobenzene, *p*-dichlorobenzene benzene, methylbenzene, para-xylene, ethylbenzene, styrene, hexachlorocyclohexane, γ-hexachlorocyclohexane, dichlorodiphenyltrichloroethane, hexachlorobenzene, benzo(a)pyrene	Ba, Mo, Ni

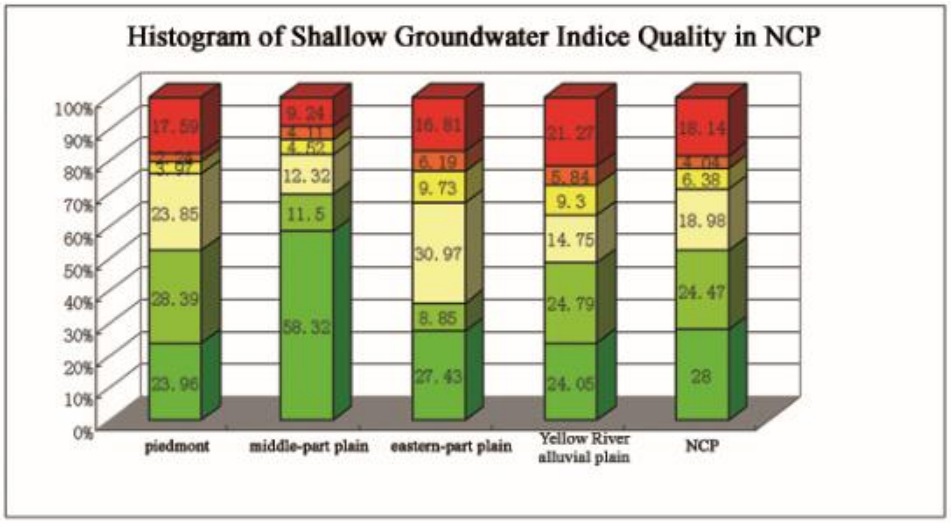
A total of 52 hydrophysical and hydrochemical indicators (shown in Table 1) were selected for comprehensive assessment of groundwater qualities.

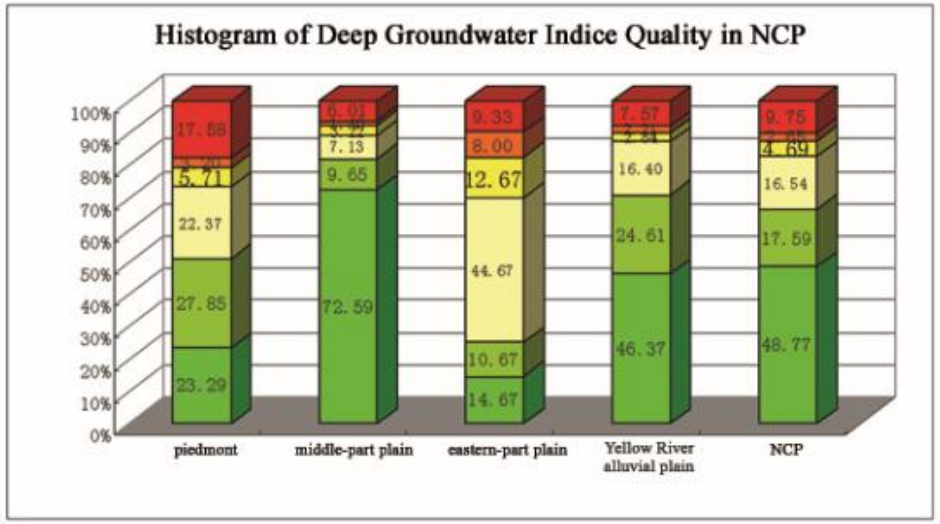
Li Y, Zhang Z, Fei Y, et al.Environmental Earth Sciences, 2016.





For most indictors, the majority of the samples belong to I and II type water. The proportion of above III type water samples in the middle and eastern area and the alluvial-proluvial plain is higher than that in the piedmont area. The typical indictors are Mn (56.16%), total hardness (55.16%), Na^+, SO_4^{2-}, Cl^-, and TDS. The zonal distribution of Mn in the piedmont area is comparatively obvious due to the strong groundwater recharge and runoff drainage.





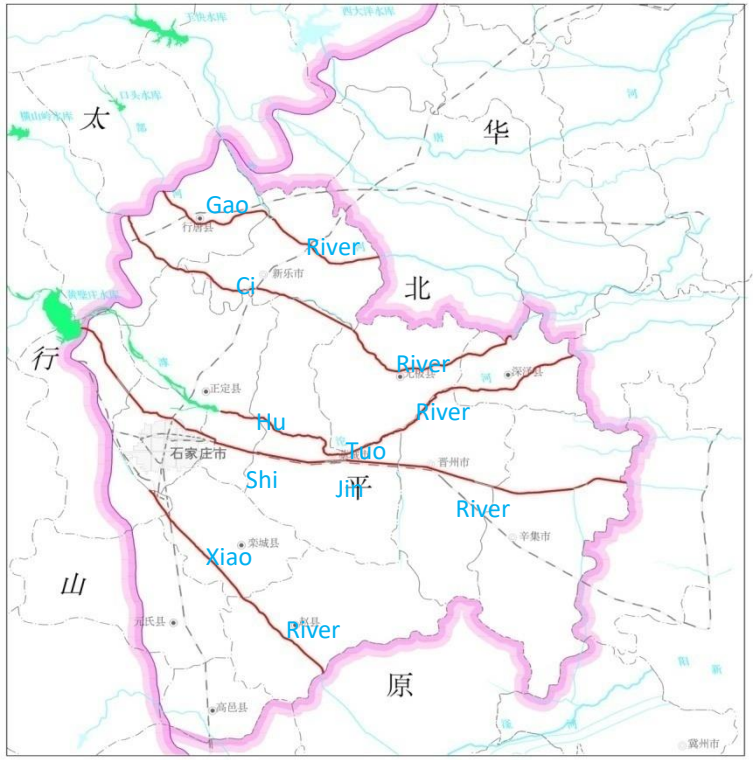
Among the 4280 shallow groundwater samples, unpolluted and slighter polluted samples account for 52.47%, heavily polluted samples account for 28.56%, and severely heavily polluted samples account for 18.14%, indicating that the overall shallow groundwater quality is in good condition, but it's far from satisfaction.

The groundwater is heavily polluted near the urban areas including Beijing, Shijiazhuang, Handan, Xingtai, etc. The Yellow River alluvial proluvial plain is also heavily polluted, while the middle part of North China Plain is slightly polluted.

The sources of contaminates

2-1 Seriously polluted surface water poses an immediate threat to groundwater quality.

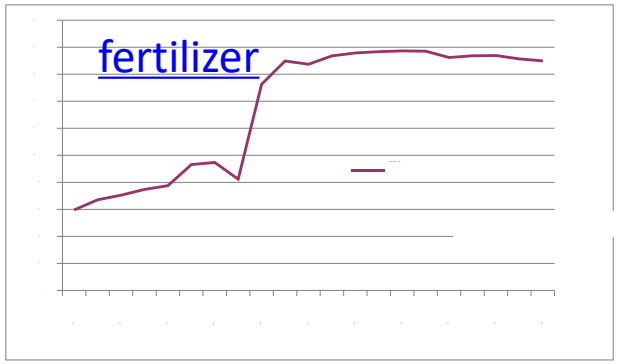
2-2 Long-term wastewater irrigation and Low processing rate of industrial and domestic sewage near cities cause pollution to the soil and groundwater.

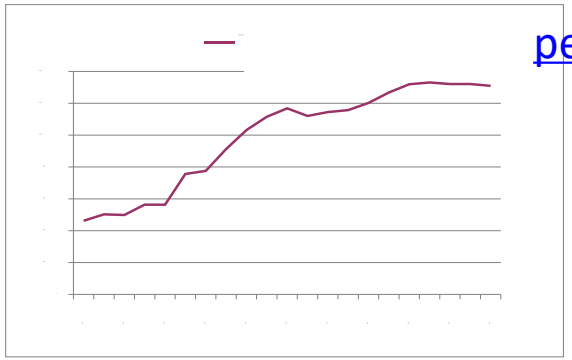


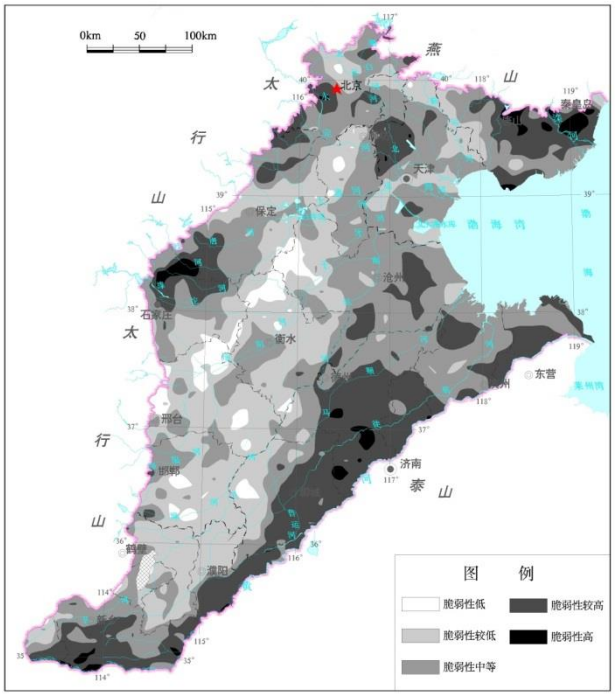
The sources of contaminates

2-3 Poultry litter abandoned everywhere by small farms caused soil and groundwater pollution.

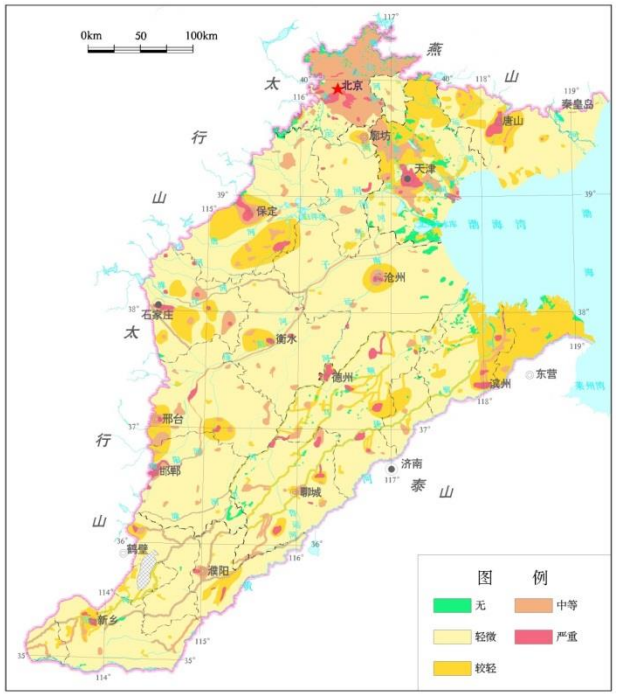
2-4 Overuse of chemical fertilizer and pesticides in agriculture have direct impacts on the quality of soil and groundwater.



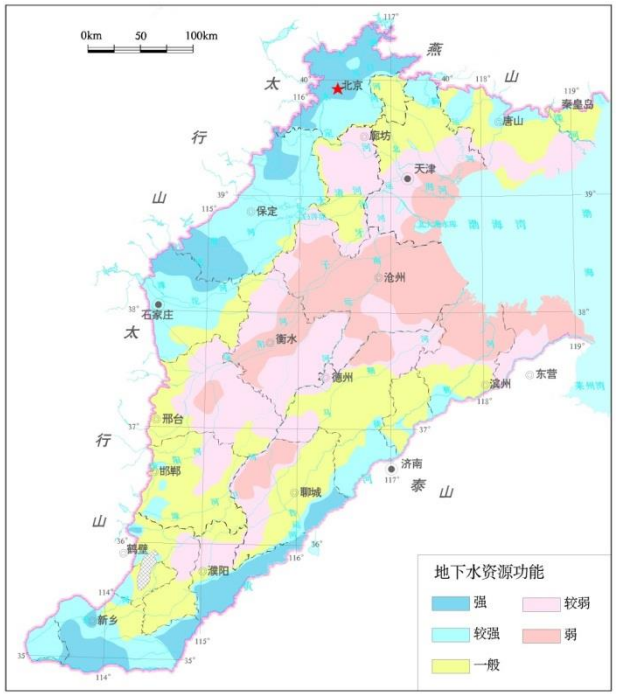




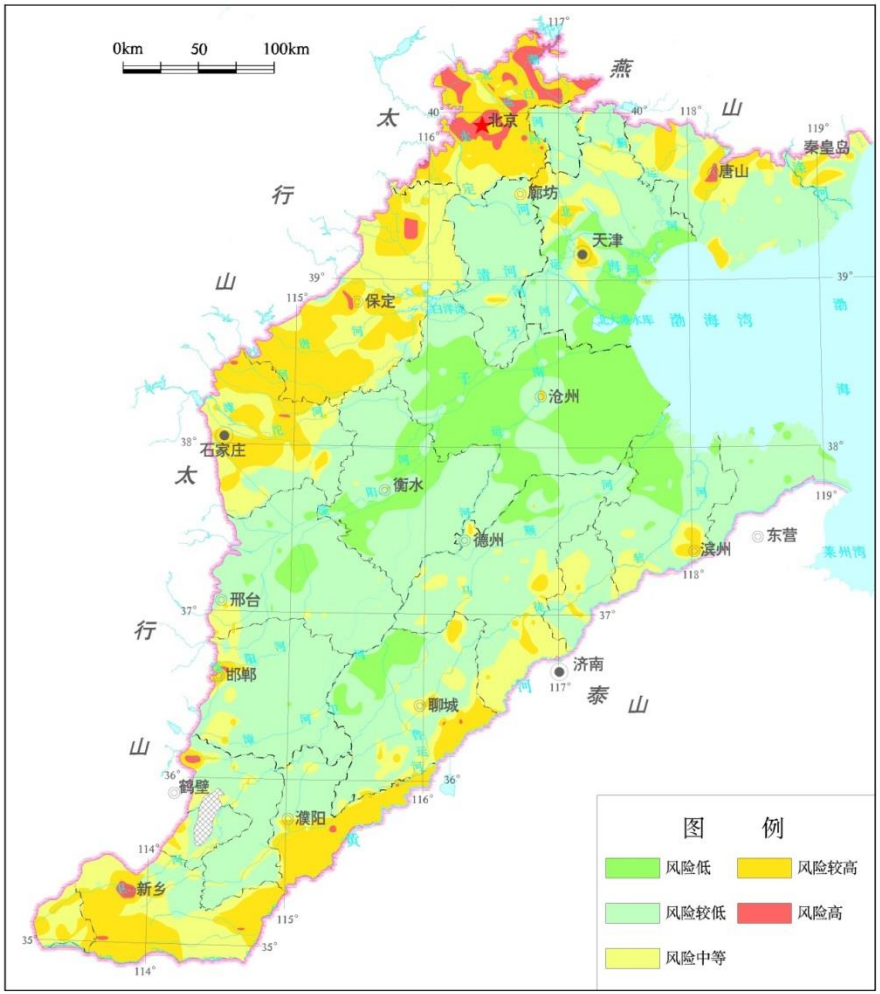
Groundwater vulnerability



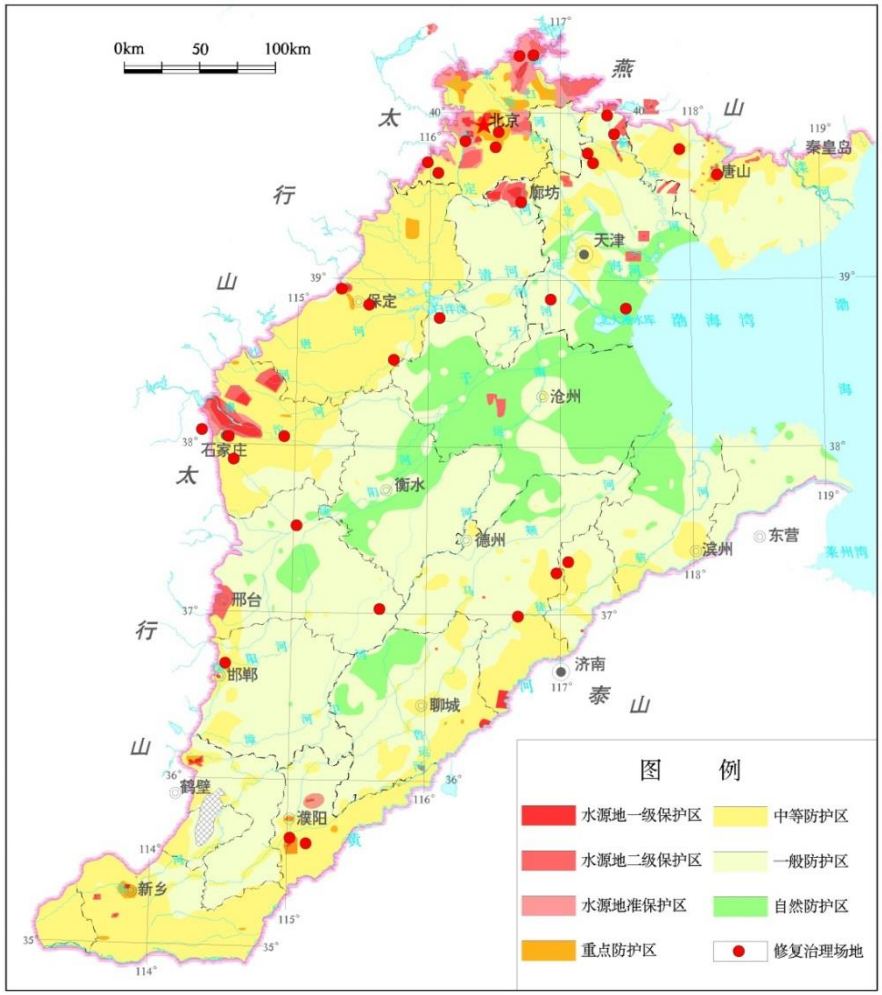
Pollution load



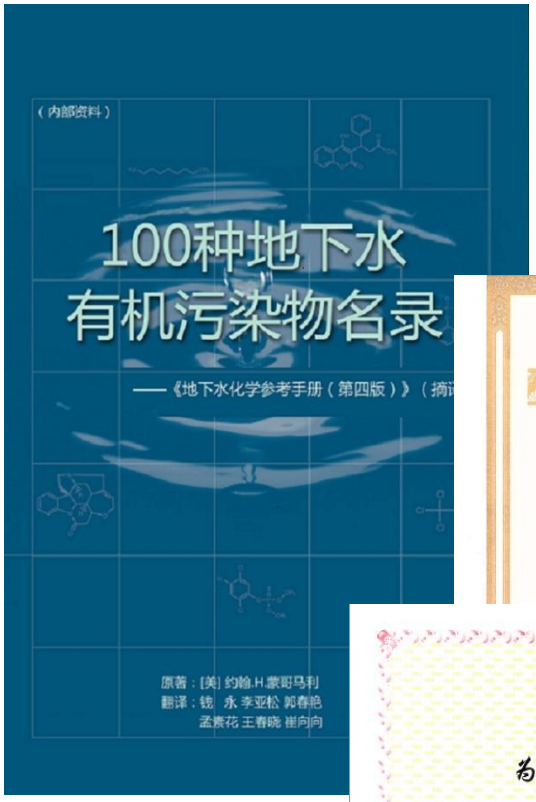
Groundwater resource function

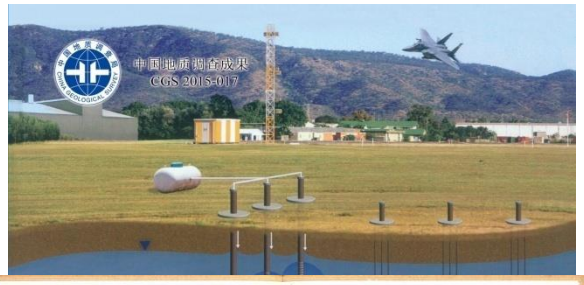


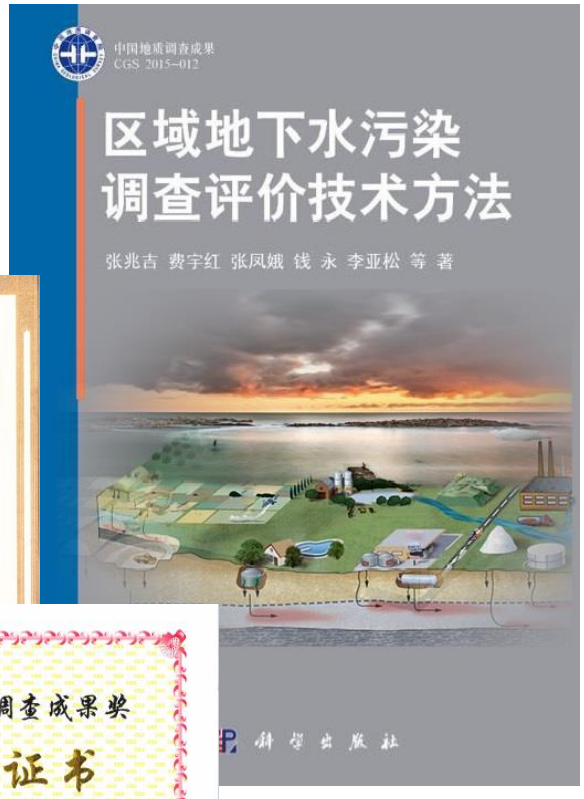
Groundwater pollution risk

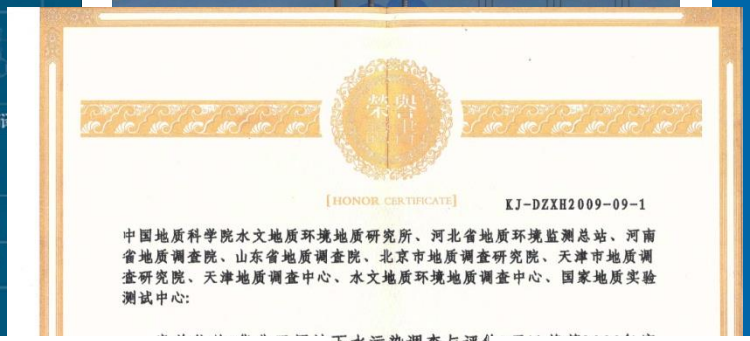


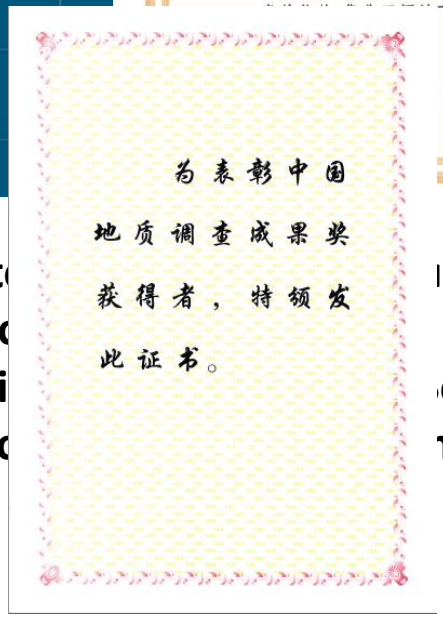
Groundwater pollution prevention and control





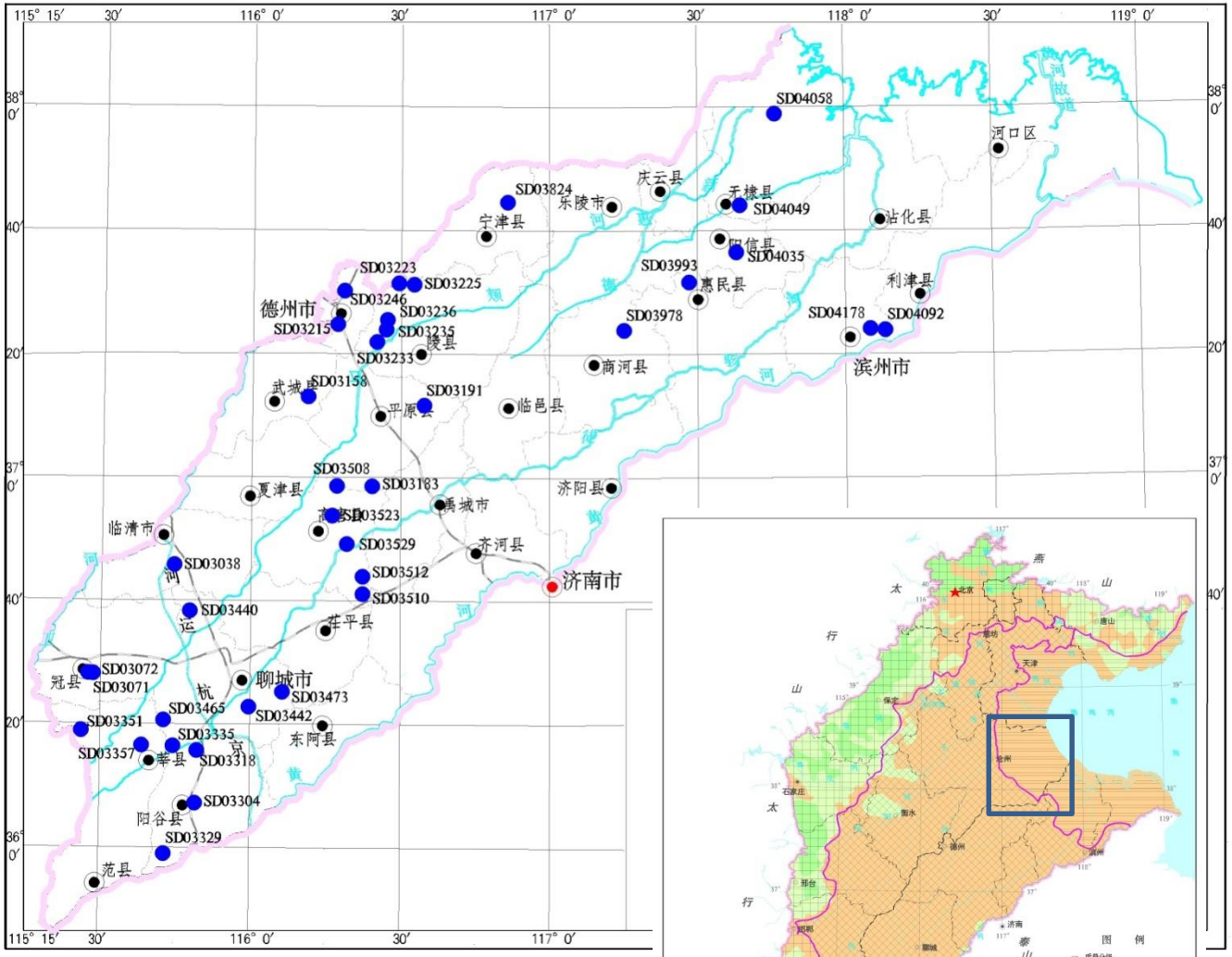






➢Investigation t ation m nal groundwater pollution researc
➢In Situ Remedi olvent P
➢Groundwater c he fourt

New contaminants in agriculture



In 2007, We got 37 shallow groundwater samples in poultry farms in North Shandong Plain, found that 24 samples were detected with arsenic and 17 samples had arsenic exceed the standard of drinking water of China, the highest value was 0.136mg/L.

USGS science for a changing world

Organic Compounds and Trace Elements in the Pocomoke River and Tributaries, Maryland

By Cherie V. Miller, Gregory D. Foster, Thomas B. Huff, and John R.

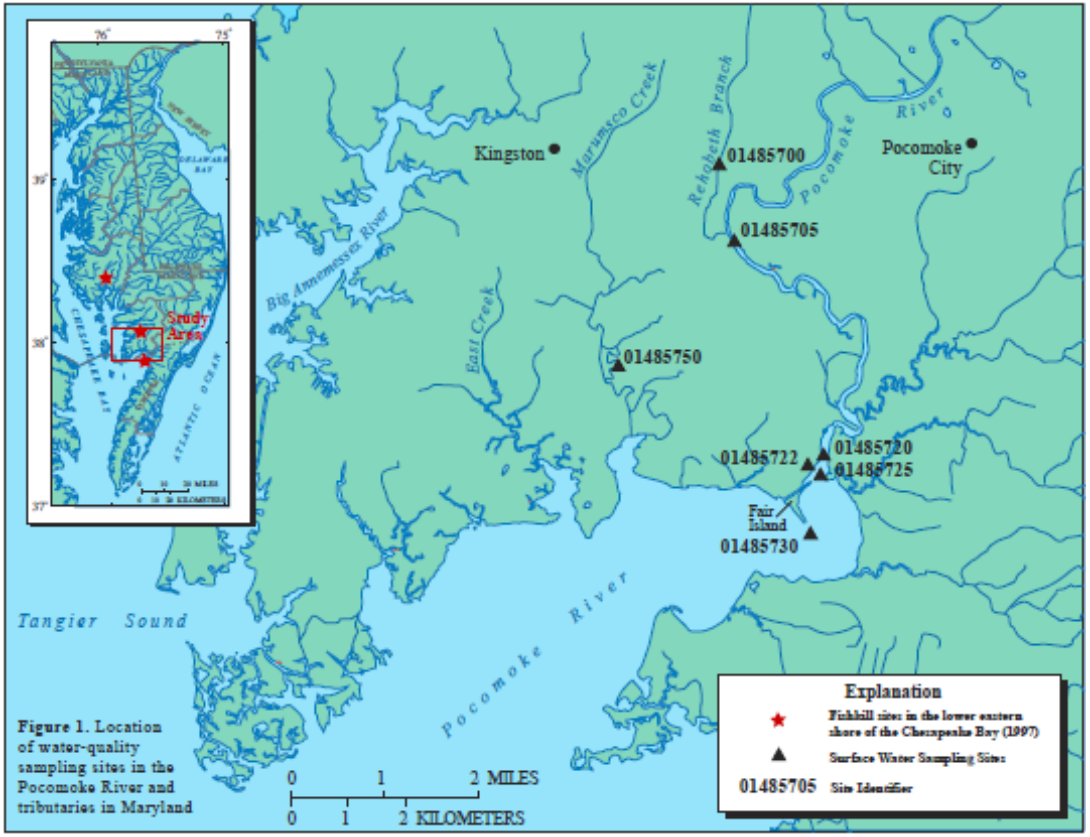
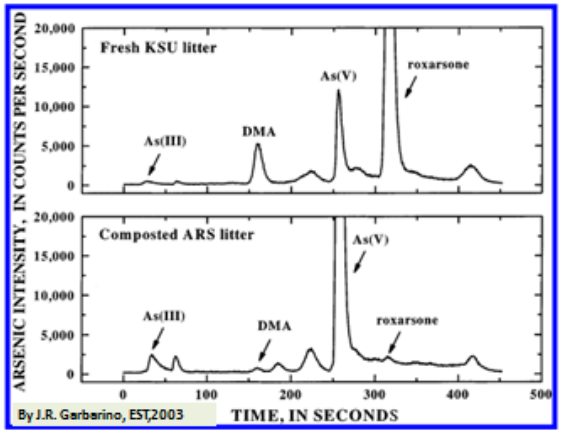
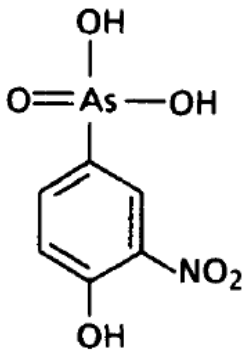


Figure 1. Location of water-quality sampling sites in the Pocomoke River and tributaries in Maryland



Experiments have indicated that roxarsone was stable in fresh dried litter, however, when water was added to litter at about 50 wt% and the mixture was allowed to compost at 40℃, the speciation of arsenic shifted from roxarsone to primarily arsenate in about 30 days. Increasing the amout of water increased the rate of degradation.

What's Roxarsone



ROXARSONE

CAS No. 121-19-7

$C_6H_6AsNO_6$ Molecular weight 263

Added to feed(effects)

- Antibiosis, anticoccidiosis
- Cure dysentery
- Promote growth
- Improving feed conversion ratio
- Increasing production rate

Only less to 10% could be adsorbed by poultry



harmfulless — Roxarsone — Discharged with excreta

microbial transformation; photochemistry

Toxicity is stronger — MMA As^{3+} DMA As^{5+} — Lead to serious arsenic pollution in unsaturated zone and groundwater

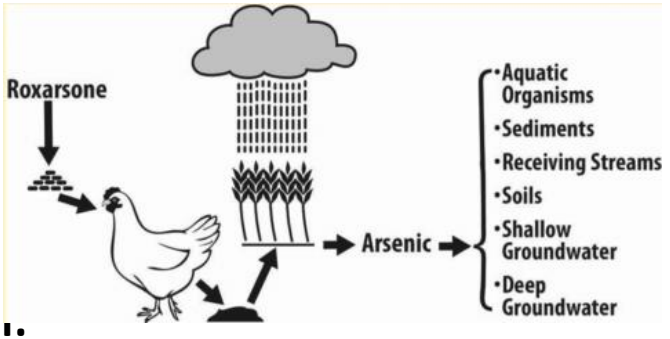
- Prohibition of using in Europe (1999)
- Arsenic-containing drug in chicken feed to be pulled from U.S.(2011)
- Still being used in China, Canada, New Zealand, Japan, South Africa…

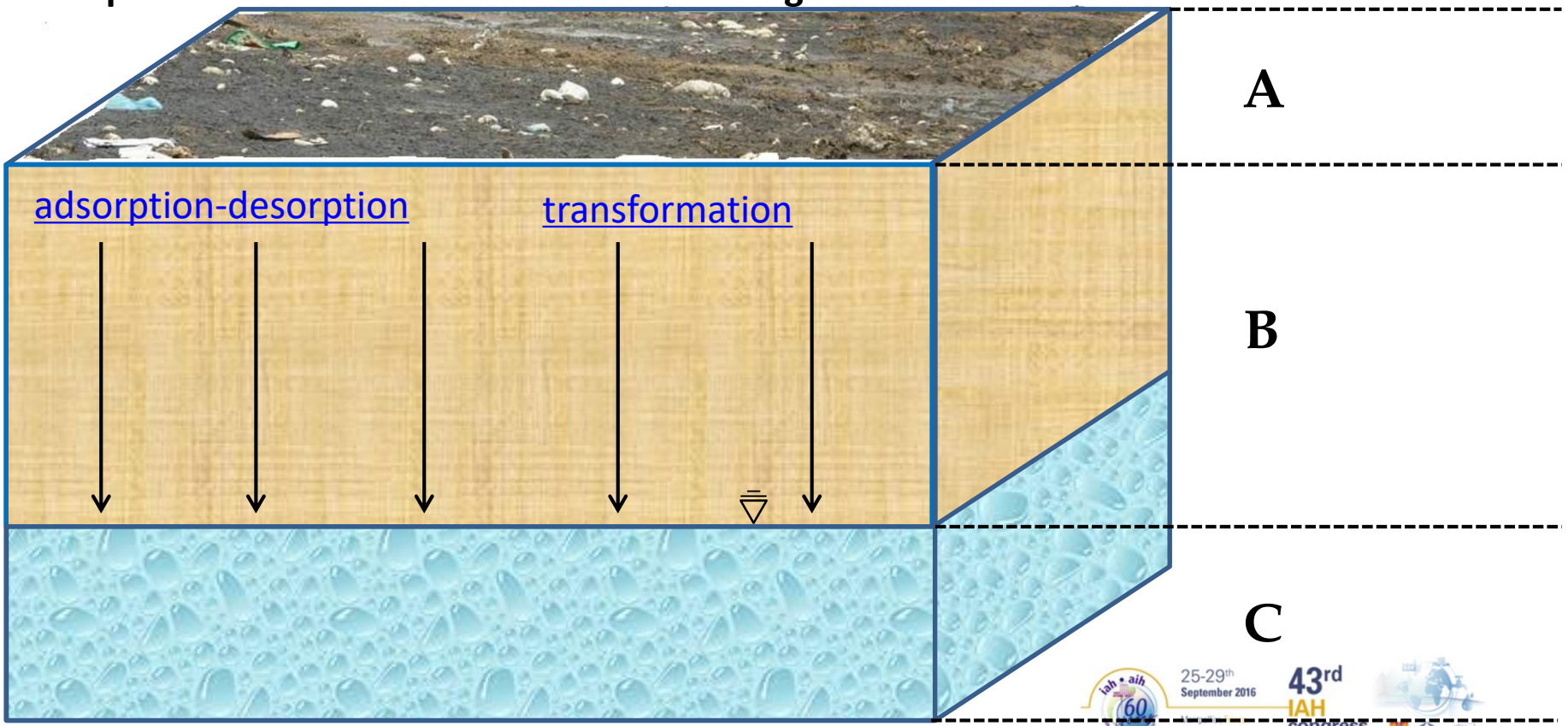
The key research contents

A: Source strength of Roxarsone in Poultry litter.

B: Migration and conversion behavior of Roxarsone in Vadose zone；

C: The speciation of Roxarsone and arsenate in groundwater.



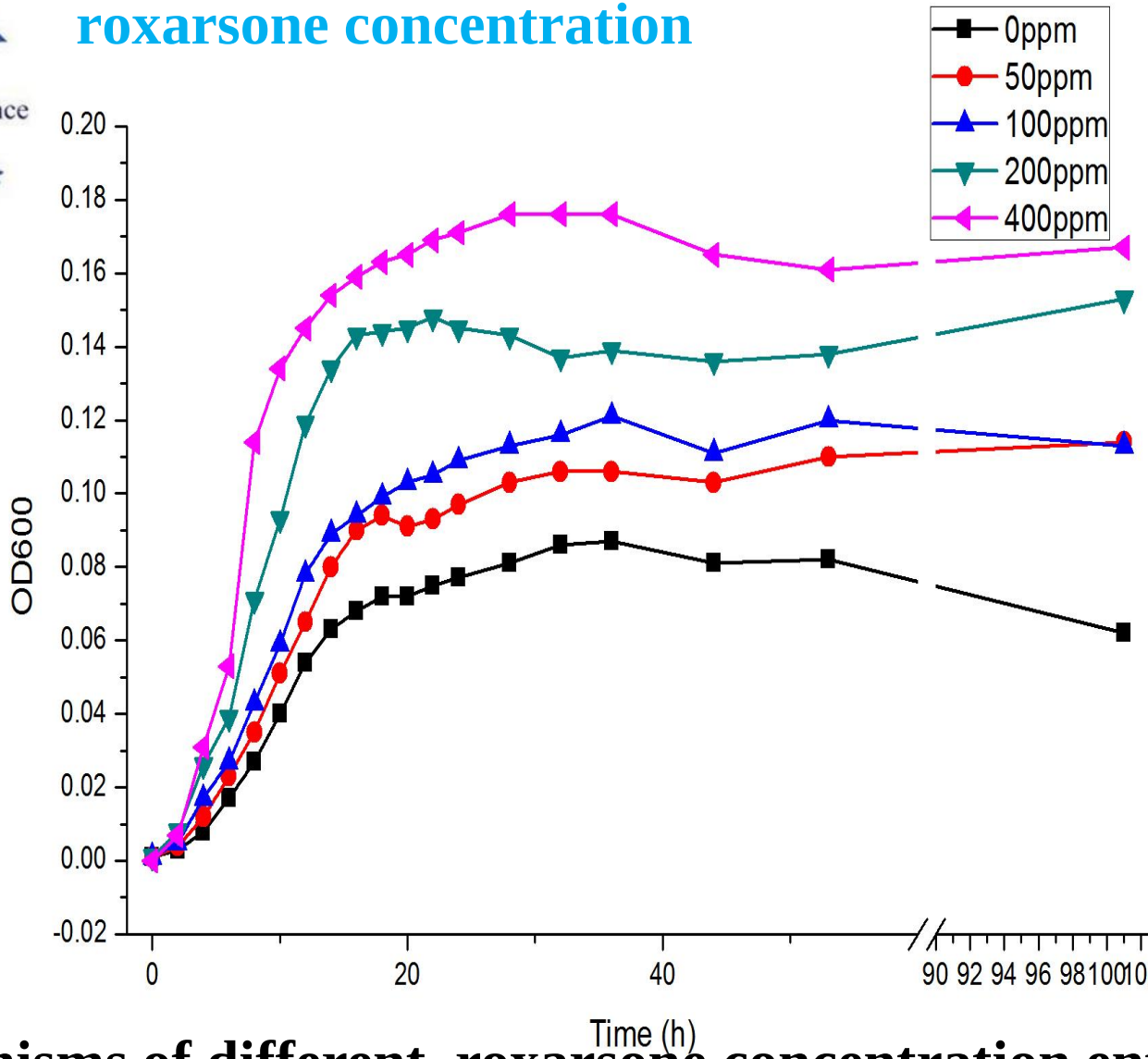


OD600 and arsenic compounds were detected every 2h

0ppm 50ppm 100ppm 200ppm400ppm

NSFC
National Natural Science Foundation of China
国家自然科学基金

Growth curves of microorganisms along different roxarsone concentration



Microorganisms of different roxarsone concentration entered into stationary phase after 20 h

CHINA SCHOLARSHIP COUNCIL

CSIRO

Land and Water

Dec 2016- Dec 2017

Seek cooperation opportunities

Welcome to China, Welcome to IHEG.