Current Progresses and Prospects on Uncoventional Uranium Resources(UUR) of China

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Outline

- Introduction
- Prediction and evaluation situation of UUR
- **Main types and basic characteristics of UUR in China**
- Potential of UUR in China
- Prospects for research work

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1. Introduction

- Unconventional uranium resources : important accessory to the conventional uranium resources (CUR).
- Improve economic benefit and environmental protection benefit.
- Research on UUR has great significance: **increasing strategic storage of uranium resources, recovering more uranium resources and protecting mine environment.**

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2. Prediction and evaluation situation of UUR

2. Prediction and evaluation situation of UUR

- China paid less attention to the prediction, evaluation, development and utilization of UUR in the past.

- Prof.Tan et al.(1998) : “We have special conditions in recovering uranium from phosphate salt rocks ….when developing phosphate chemical industry we should also synthetically recover uranium”.

2. Prediction and evaluation situation of UUR

- In recent 2 years, China pays more attention to UUR. Prof.Zhang, Prof. Li et al.(2008,2009): “there is large potential of unconventional uranium resource in China” .
- Project of “investigation and evaluation of UUR in China” be started in 2009.

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3. Main types and basic characteristics of UUR in China

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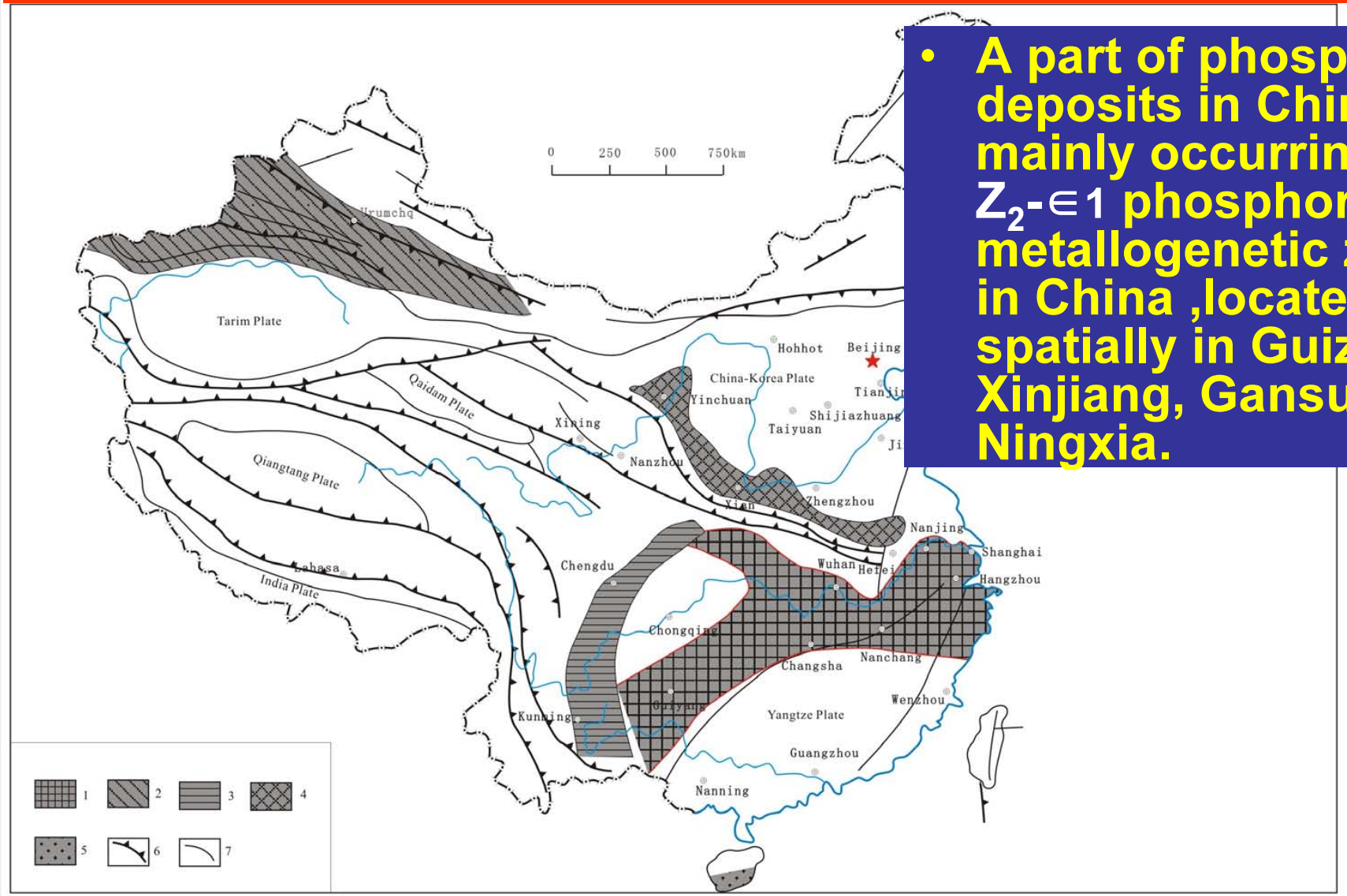
- **UUR can be divided into 5 types**

Type	Main distribution regions
uranium-bearing phosphorite type	Guizhou, Xinjiang, Gansu, Ningxia
uranium-bearing black rock system type	western Hunan province and neighbor region, southwestern China, Qinling region
salt lake type	Qinghai, Xinjiang, Inner Mongolia, Gansu, Ningxia, Tibet
evaporite type	Inner Mongolia, Qinghai, Xinjiang, Gansu
other types (coal rock type, mudstone type etc.)	**Identified uranium deposits**; Mesozoic-Cenozoic sedimentary basin in northern China

0.01%-0.03% U

3.1 The uranium-bearing phosphorite type

- A part of phosphoric deposits in China, mainly occurring in Z_2-∈1 phosphoric metallogenetic zone in China ,located spatially in Guizhou, Xinjiang, Gansu and Ningxia.

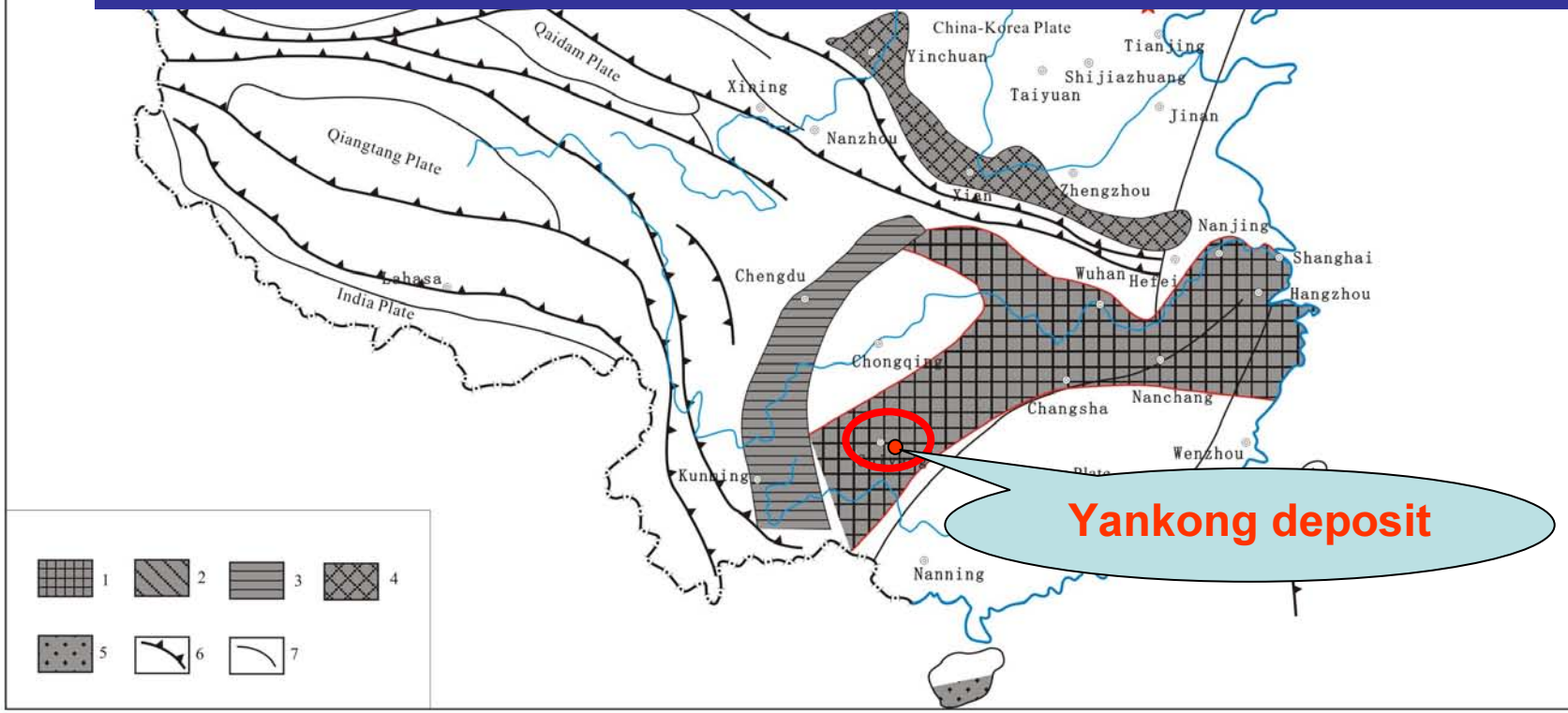


The distribution of phosphate metallogenic zones of upper Sinian-Cambrian Systems in China

1-The metllogenic zone of late Sinian-early Cambrian; 2-The metallogenic zone of Meishucun-Canglangpu Period of early Cambrian; 3-The metallogenic zone of Meishucun Period of early Cambrian; 4-The metallogenic zone of Canglangpu period of early Cambrian; 5-The metallogenic zone of middle Cambrian; 6-Subduction zone or structure line; 7- Fold

3.1 The uranium-bearing phosphorite type

In phosphoric metallogenetic zone of central Guizhou, U is generally high up to 0.02% in uranium-bearing phosphorite, and Yankong deposit had been discovered.



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3.1 The uranium-bearing phosphorite type

- **Basic characteristics of this uranium resource type are :**

  Uranium and phosphorus occur in concomitance;

  Phosphorus is the adsorbent for uranium;

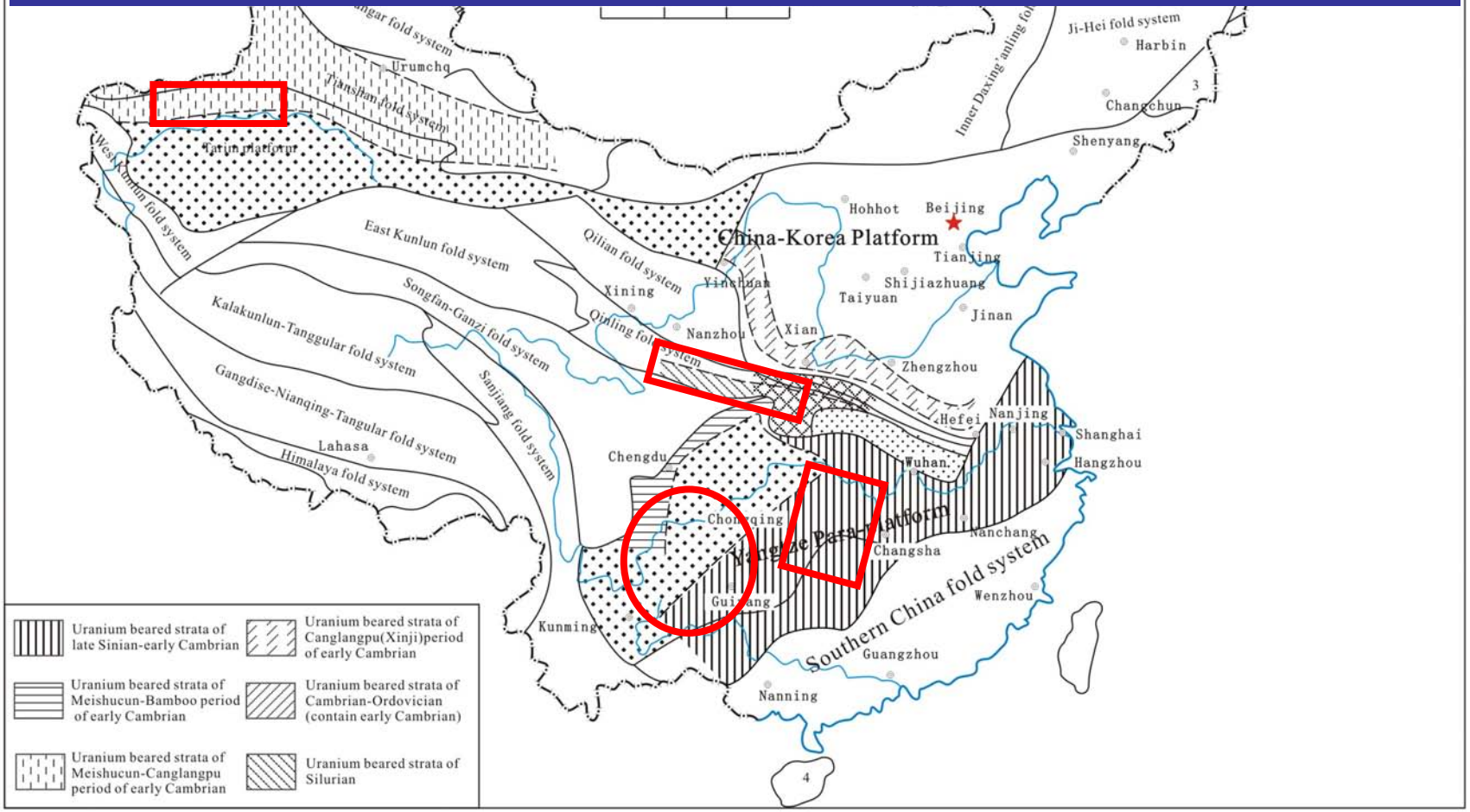
  U-mineralization controlled by phosphorus Mineralization layer, occurring as layer or layer-like, with large area.

3.2 The U-bearing black rock system type

- Uranium-bearing black rock system type of uranium resources is those with low grade between 0.01%-0.03%, hosted in marine black rock system, controlled by special marine sedimentary environment, facies and formation.
- Uranium-bearing black rock system with great economic value mainly formed in Sinian-Permian.

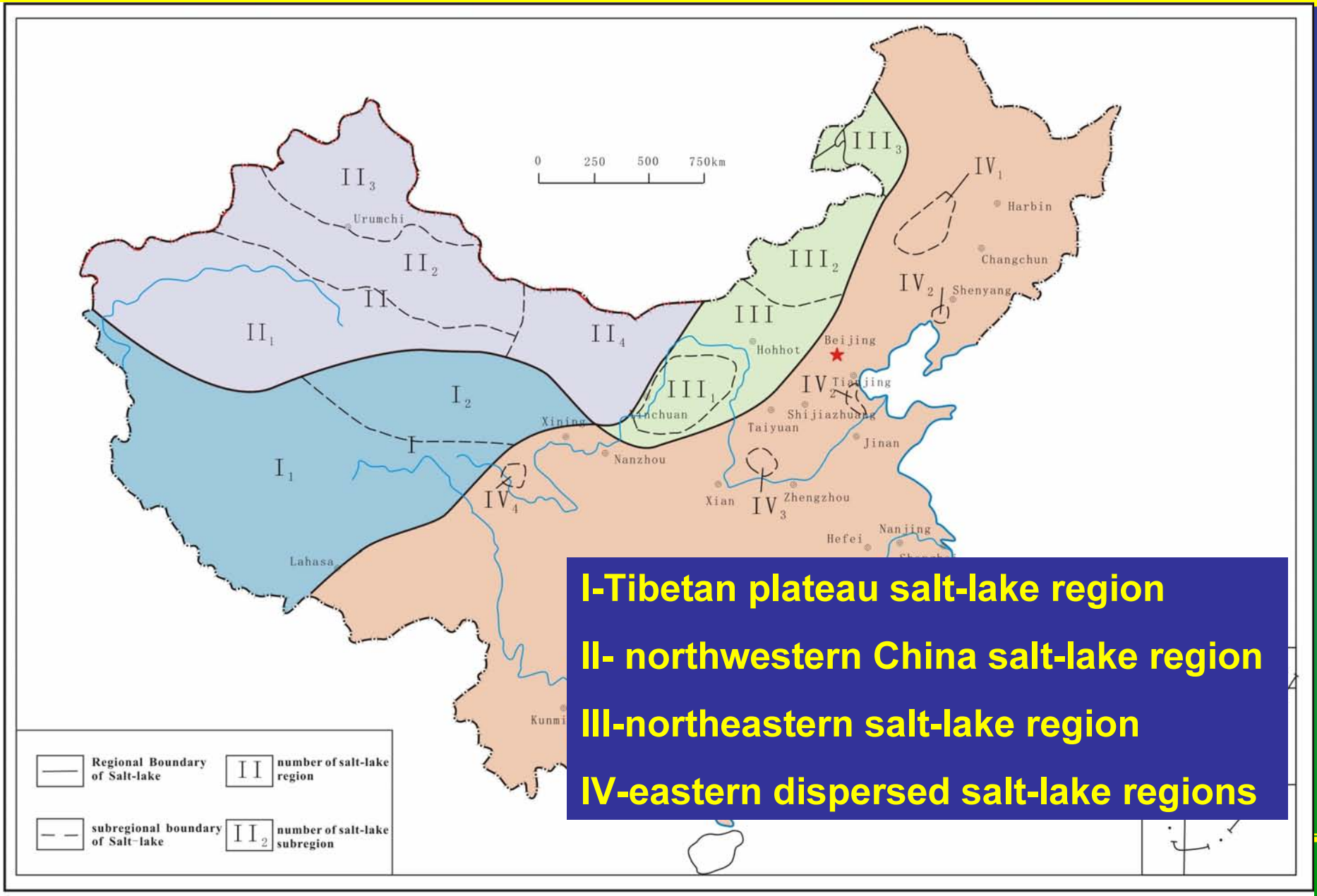
3.2 The U-bearing black rock system type

- This type of uranium resources mainly occurs Z_2-$\in 1$, spatially located in western Hunan and adjacent areas, southwestern China and Qinling district



The main uranium beared strata distribution of late Sinian-early Paleozoic in China

3.3 The Salt lake type



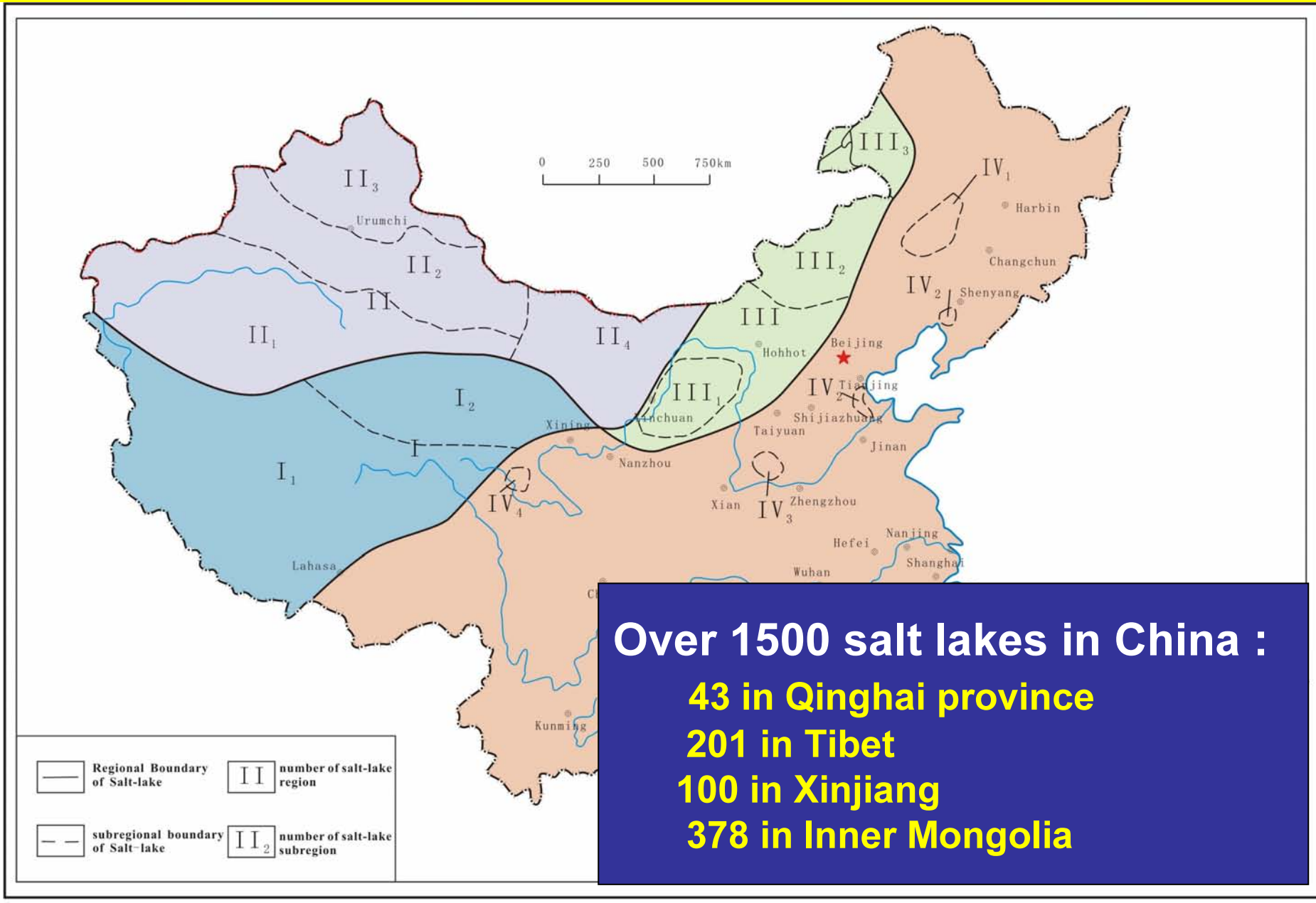
I-Tibetan plateau salt-lake region

II- northwestern China salt-lake region

III-northeastern salt-lake region

IV-eastern dispersed salt-lake regions

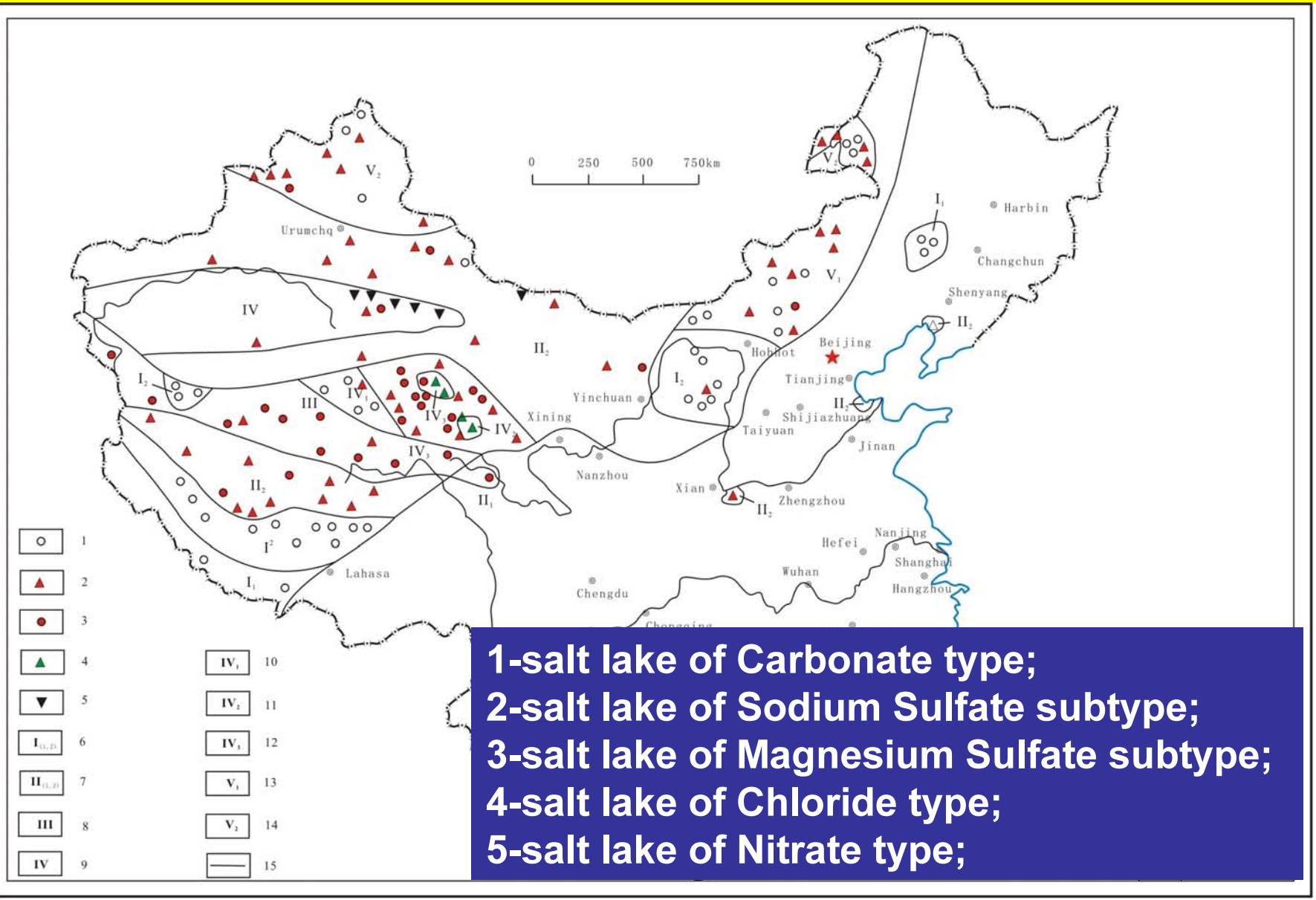
3.3 The Salt lake type



Over 1500 salt lakes in China :

- 43 in Qinghai province
- 201 in Tibet
- 100 in Xinjiang
- 378 in Inner Mongolia

3.3 The Salt lake type

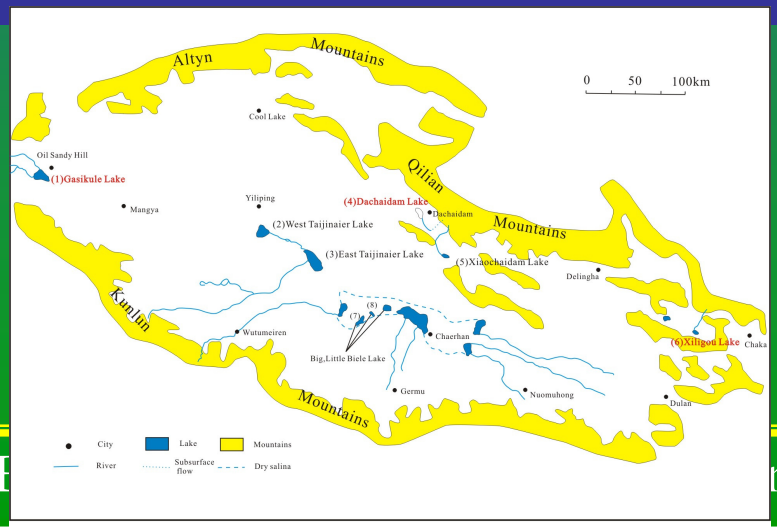


1-salt lake of Carbonate type;
2-salt lake of Sodium Sulfate subtype;
3-salt lake of Magnesium Sulfate subtype;
4-salt lake of Chloride type;
5-salt lake of Nitrate type;

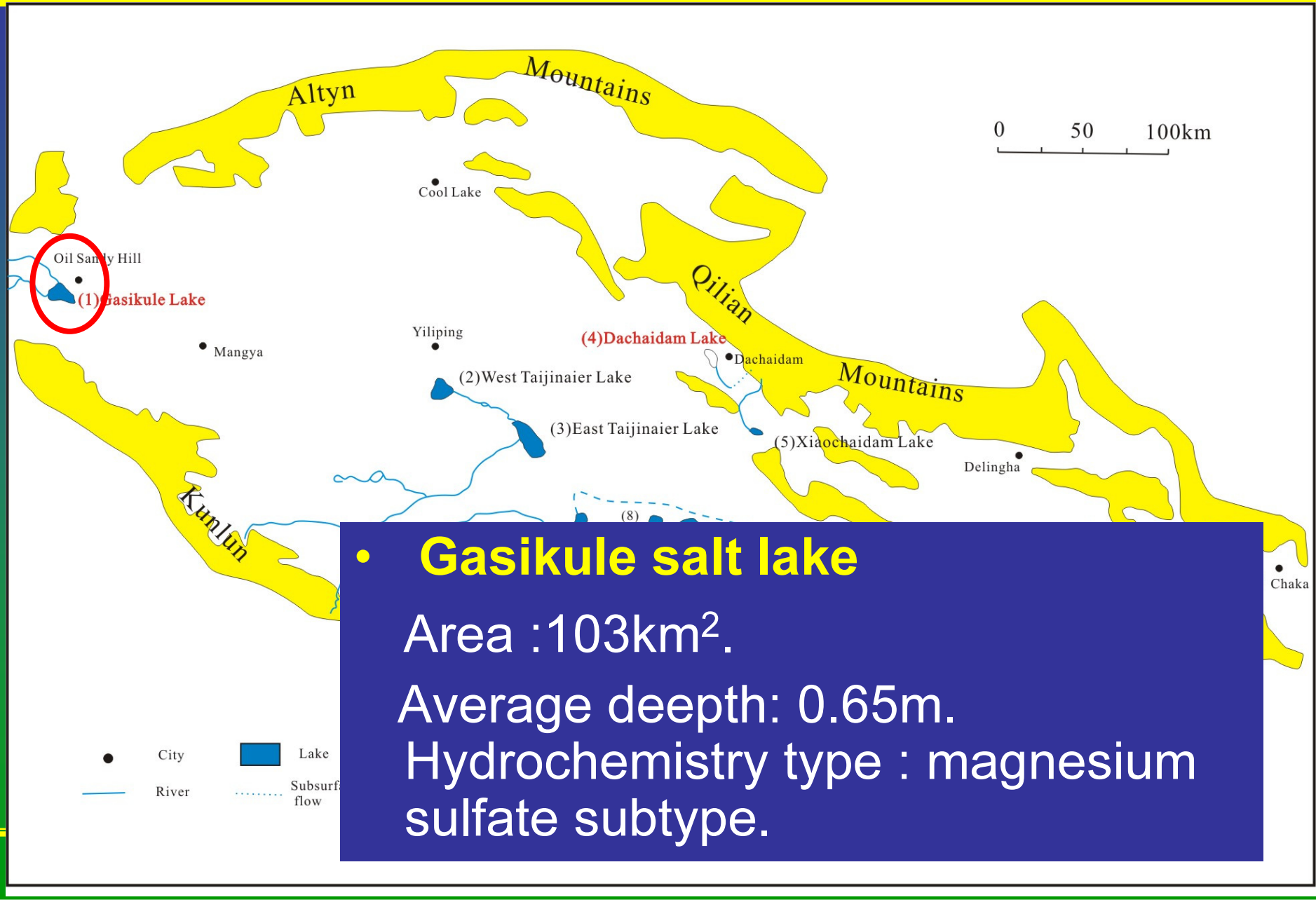
The hydrogeochemical type distribution of modern salt lakes in China

3.3 The Salt lake type

- Abundant salt resources, such as K, Mg, Li, B etc., are stored in salt lakes.
- Abundant uranium resources stored in salt lakes in China, especially in Qinghai and Xinjiang.
- Presently it is found that the uranium content reaches 60mg/l in re-treated brine water.



3.3 The Salt lake type



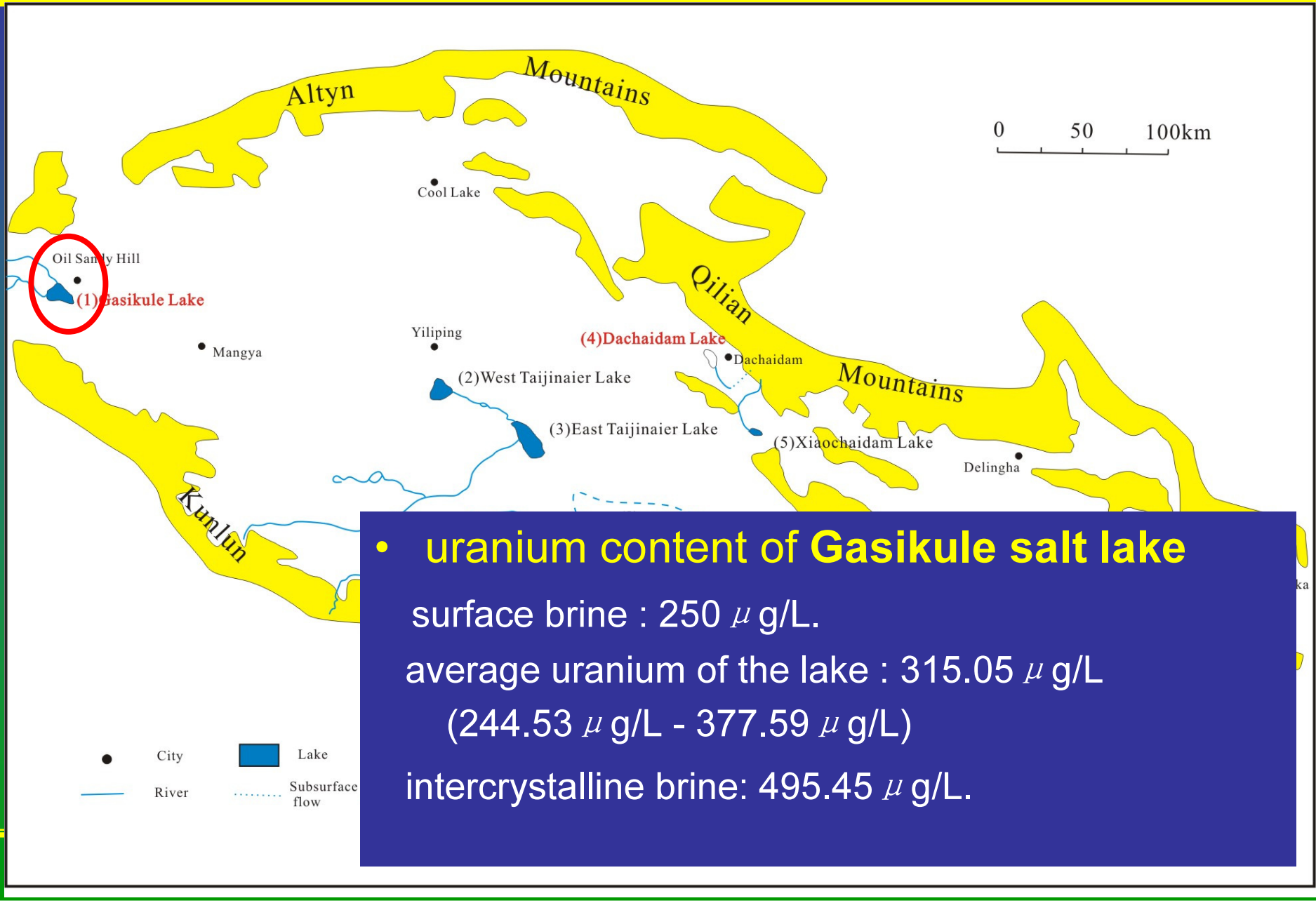
- **Gasikule salt lake**

  Area :103km^2.

  Average deepth: 0.65m.

  Hydrochemistry type : magnesium sulfate subtype.

3.3 The Salt lake type



- uranium content of **Gasikule salt lake**

surface brine : 250 μ g/L.

average uranium of the lake : 315.05 μ g/L

(244.53 μ g/L - 377.59 μ g/L)

intercrystalline brine: 495.45 μ g/L.

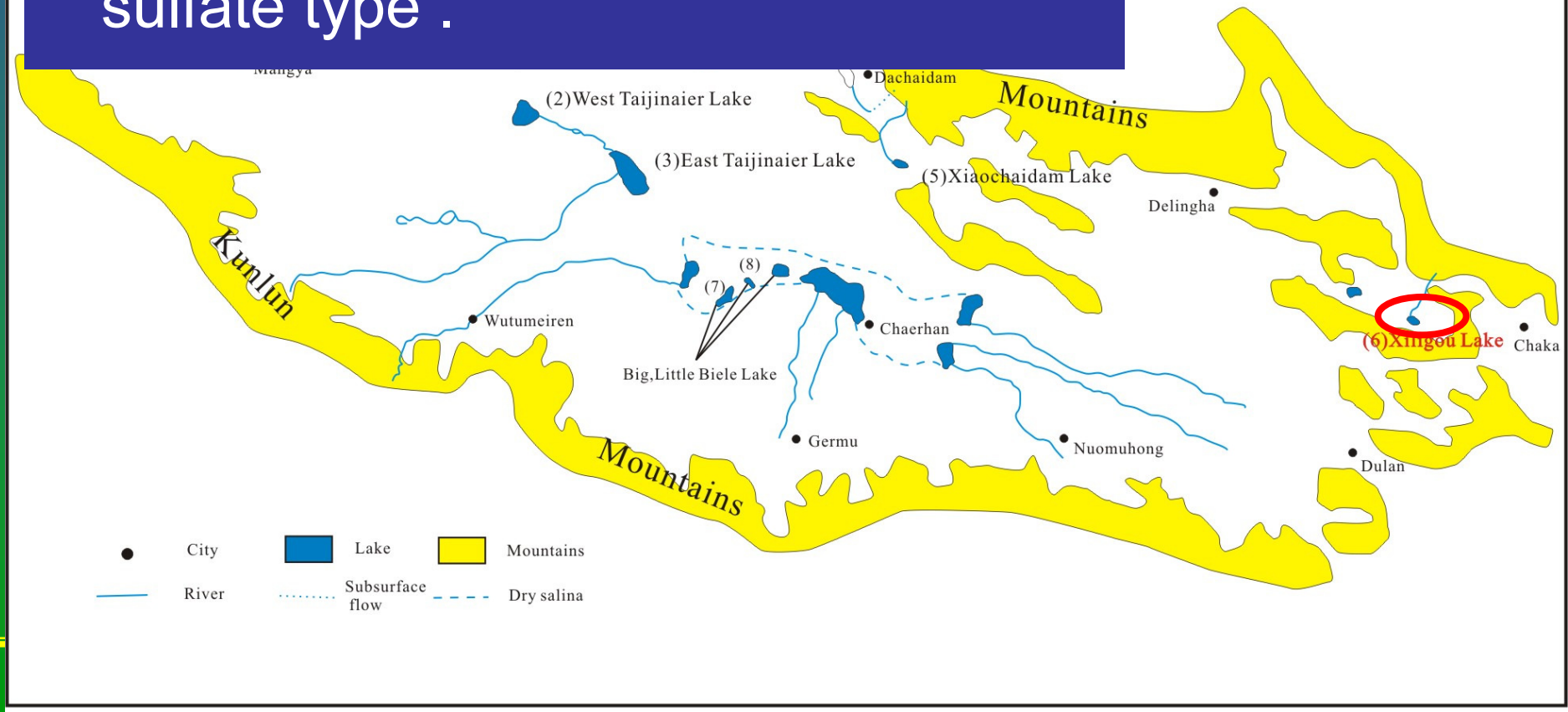
3.3 The Salt lake type

- **Xiligou salt lake**

  Area :19.5km^2.

  Average deepth: 0. 5m.

  Hydrochemistry type : sodium sulfate type .



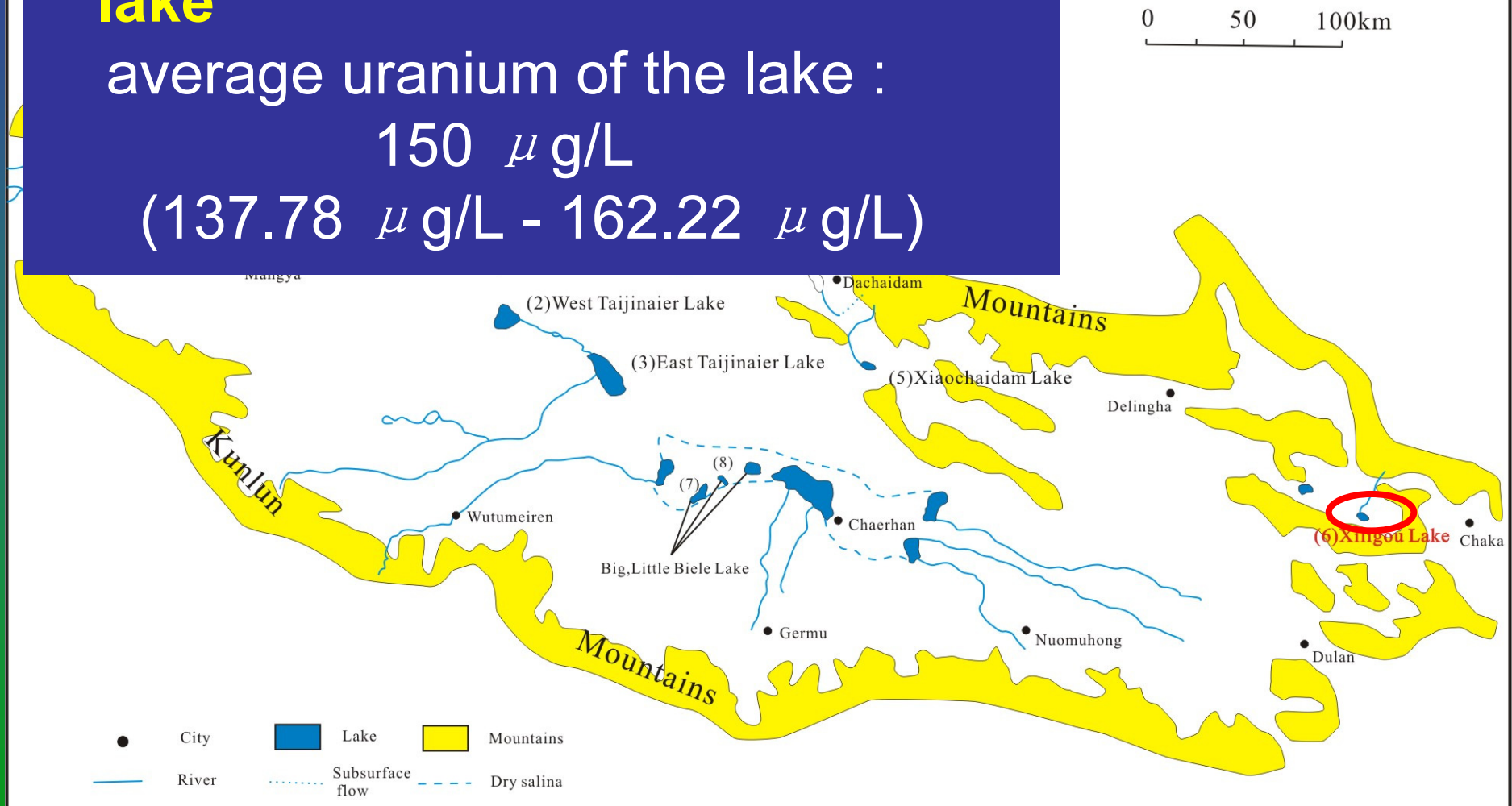
3.3 The Salt lake type

- uranium content of **Xiligou salt lake**

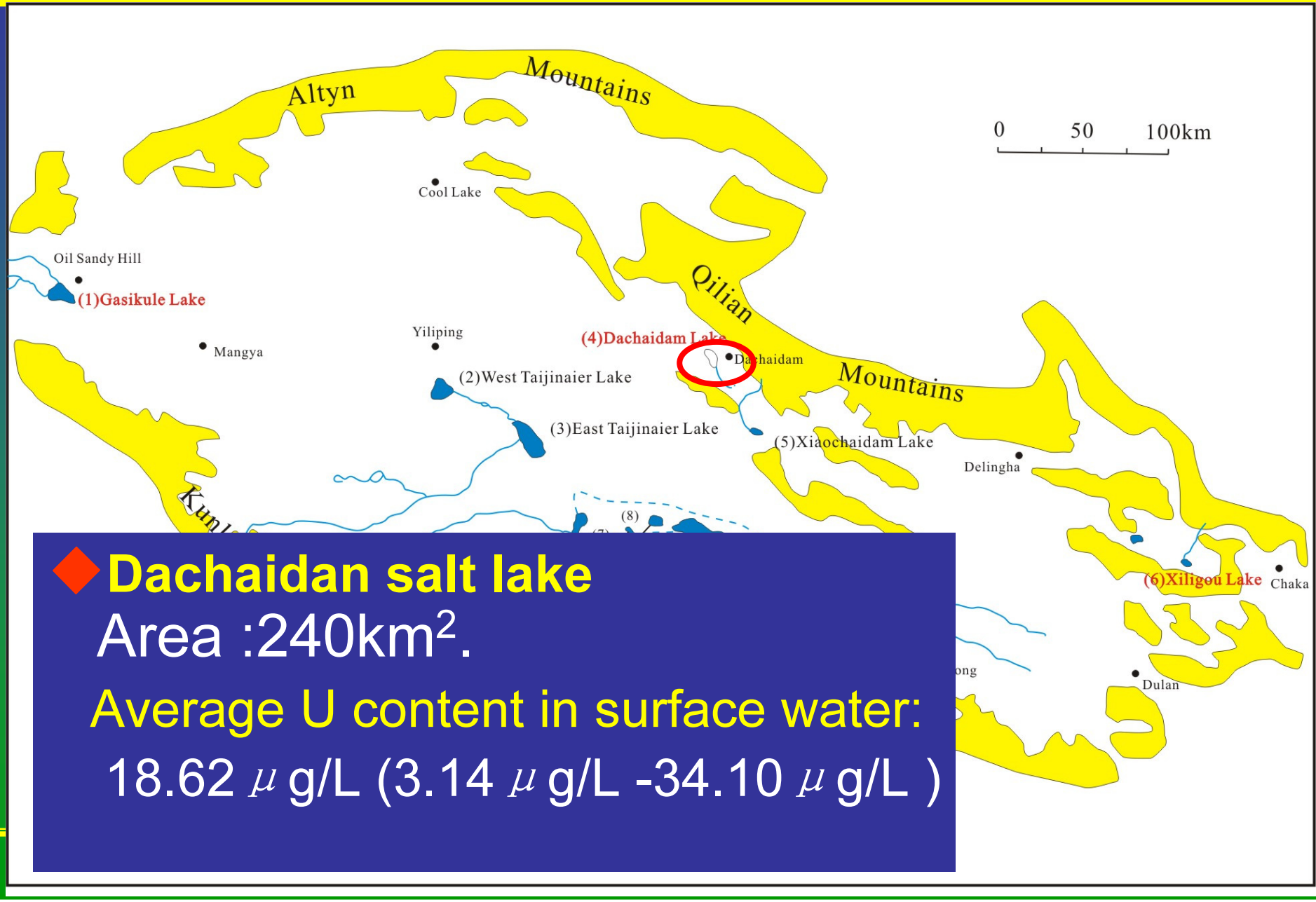
  average uranium of the lake :

  150 μg/L

  (137.78 μg/L - 162.22 μg/L)



3.3 The Salt lake type



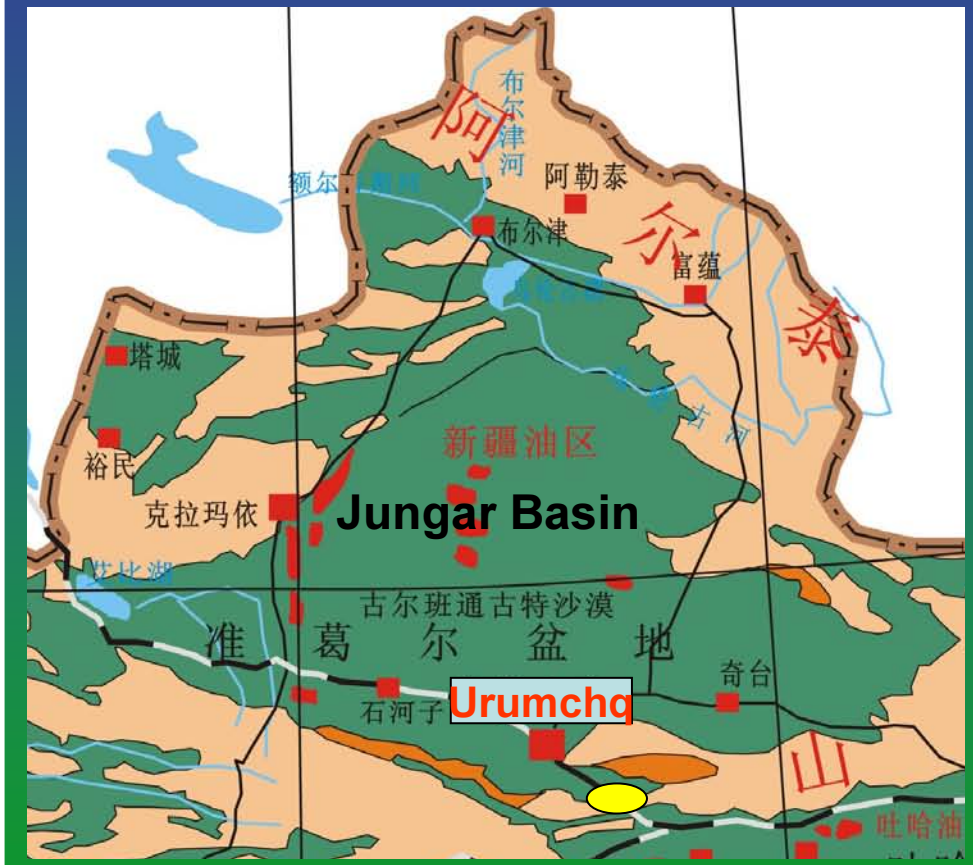
Dachaidan salt lake

Area :240km^2.

Average U content in surface water:

18.62 μg/L (3.14 μg/L -34.10 μg/L)

3.3 The Salt lake type

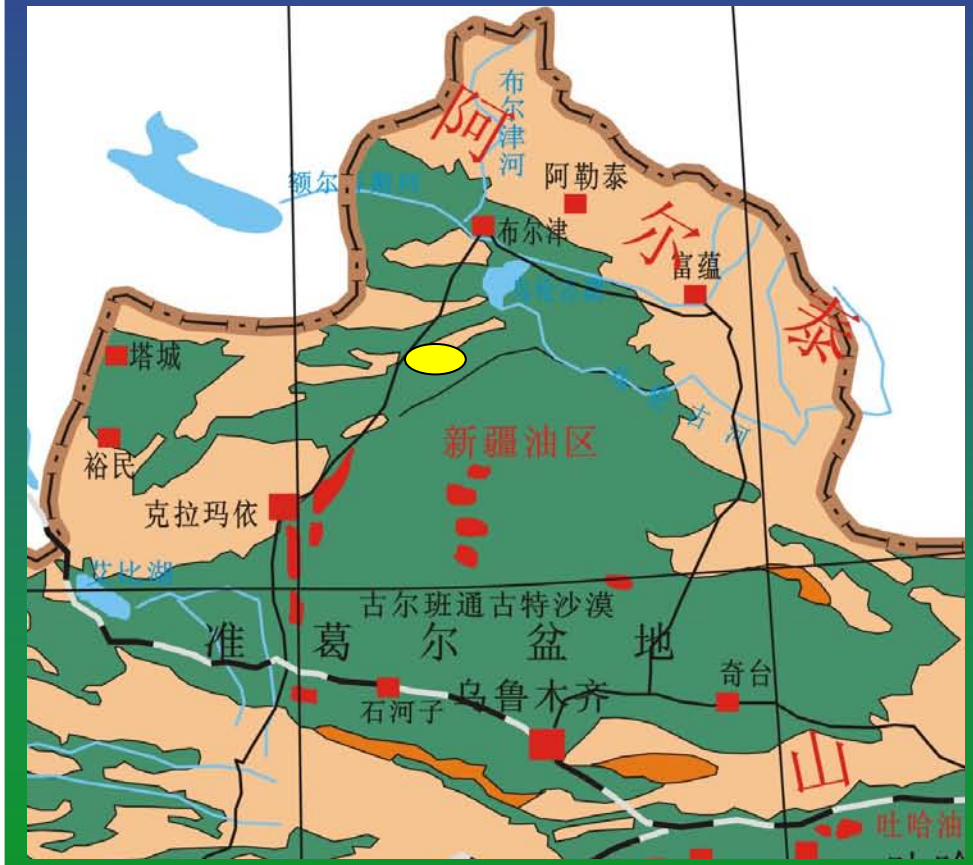


- **Beishawo salt lake**

  Area :5 km^2. dry salt lake .

  U-content in sedimentary salt mineral: ?～0.02％, in intercrystalline brine : 10-40mg/l (Cheng, 2009) .

3.3 The Salt lake type



- **Manasi salt lake**

  Area :250km^2.

  Hydrochemistry type: sulfate type

  U-content in in intercrystalline brine : 8.9 mg/l (Cheng, 2009) .

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4.The potential of UUR in China

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1) Great potential of UUR in China.

- The resources capacity of single deposit will be increased by 1-3 times when calculated by boundary grade of 0.01%.
- More than 350 proved uranium deposits :low grade (0.01-0.03%) uranium resources are considerable .

4.The potential of UUR in China

2)Uranium-bearing phosphorite type and uranium-bearing black rock system type have great potentiality.

- Abundant phosphorous resources near 20 billion tons in China. Uranium content is generally high in many phosphate deposits.
- Uranium-bearing black rock system is distributed widely in China. Prediction and evaluation for this type of UUR is blank, so the exploration potentiality is great.

4.The potential of UUR in China

3) Great potential in salt lake type uranium resources .

- Many U-enriched salt lakes are distributed in China. Limited data suggest that the concentration degree of uranium is high in some salt lakes. As a whole, their uranium resources potentiality is very optimistic.

UUR such as evaporite type, uranium-bearing coal rock type and mudstone type etc. have some prospecting potential.

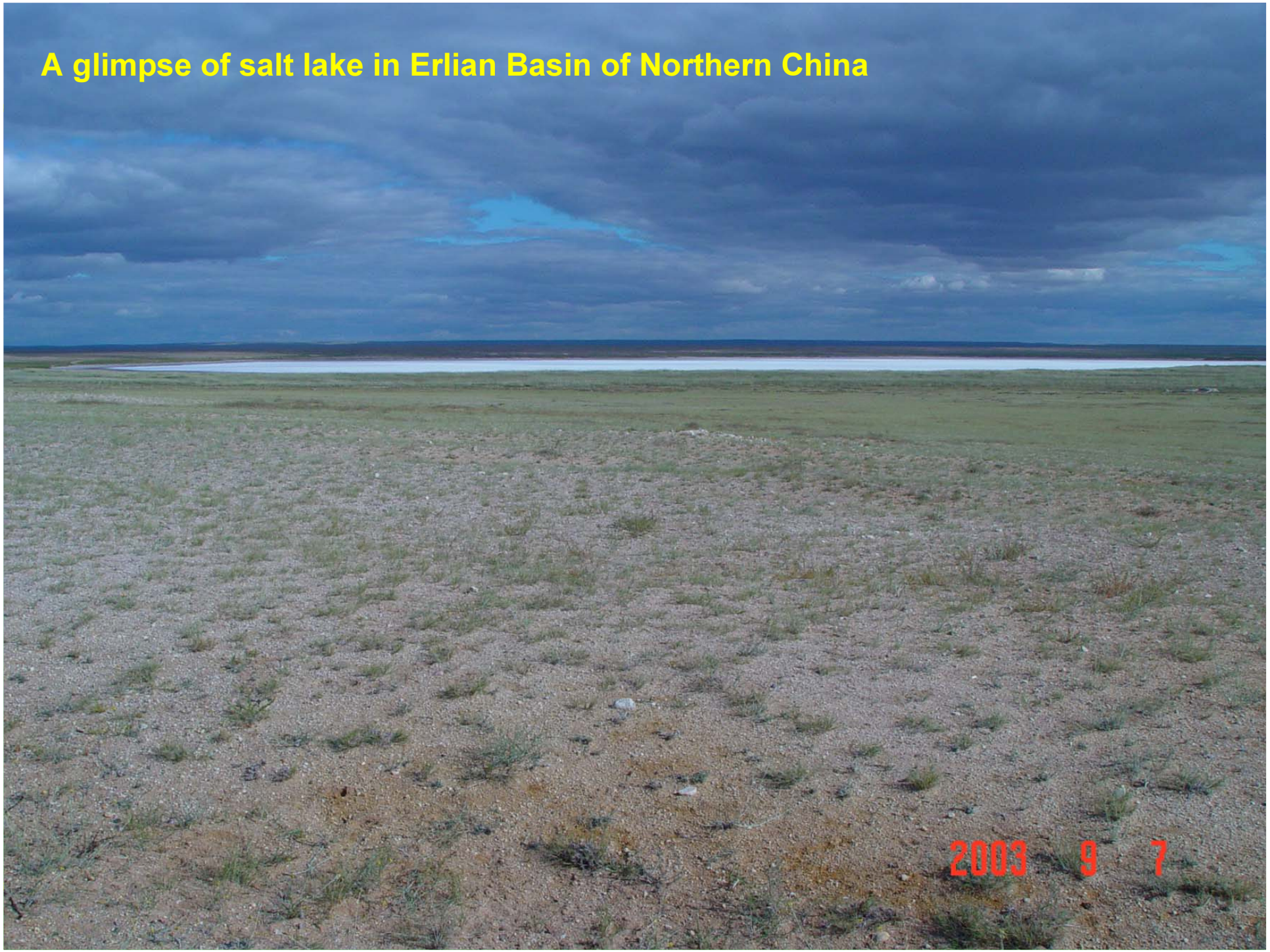
5.Prospects for research work

Some basic or front problems on UUR might be studied in future in China:

- ✓ **Theoretical system of the prediction and evaluation of UUR**
- ✓ **Distribution regularities and the types of UUR**

5.Prospects for research work

- ✓ Uranium existence form, concentration mechanism and environment of various types of UUR.
- ✓ Methods of prediction and evaluation for UUR.
- ✓ The total potential resources of UUR by quantitative estimation in China.


A glimpse of salt lake in Erlian Basin of Northern China
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