The Role of UNU-GTP in Geothermal Development in China

Professor Dr. PANG Zhonghe

Director, Geothermal Research Center

Institute of Geology and Geophysics, Chinese Academy of Sciences

President, Chinese Fellows Union for the UNU-GTP (CFUG)

z.pang@mail.iggcas.ac.cn

http://sourcedb.igg.cas.cn/cn/zjrck/200907/t20090713_2065517.html

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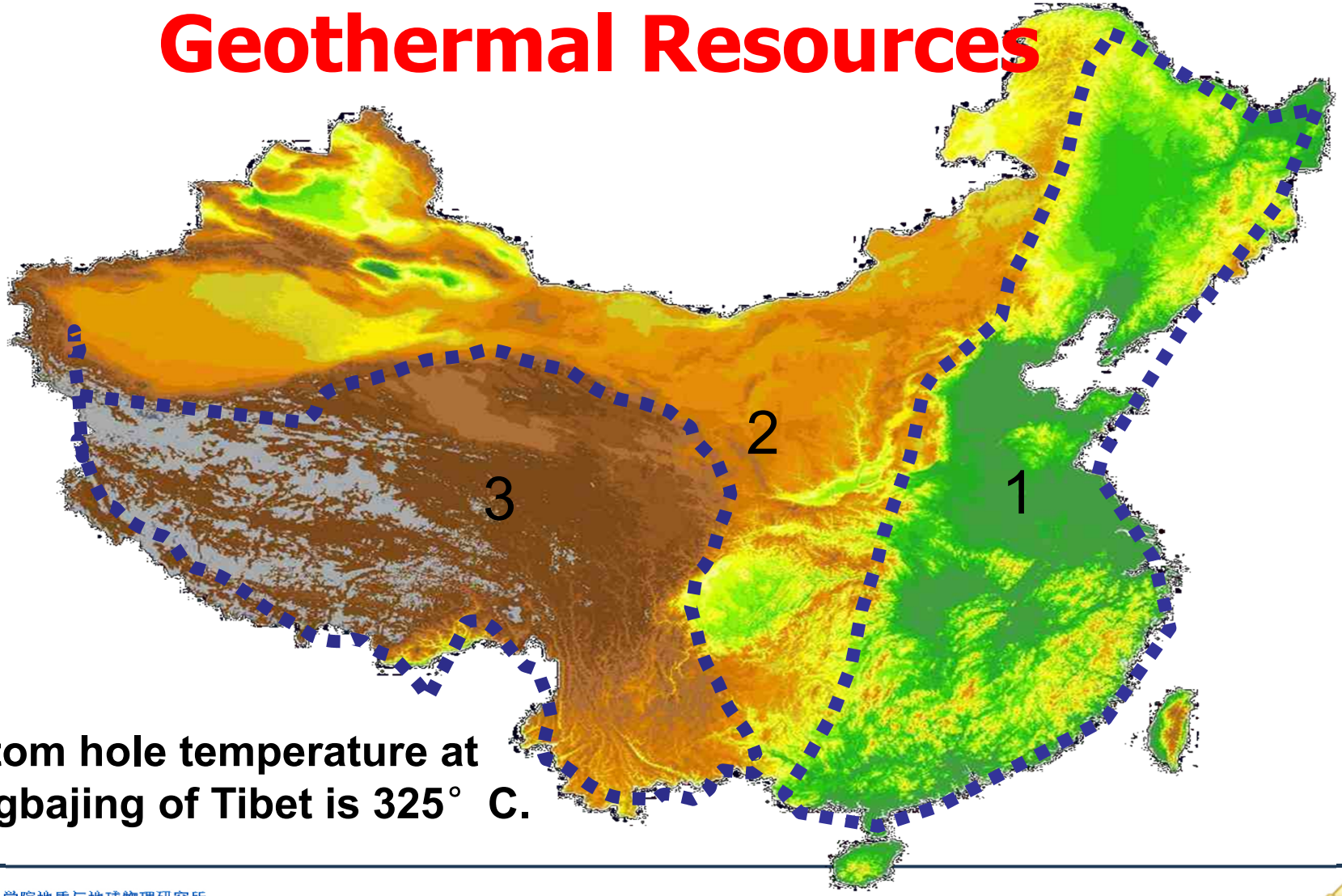
Geothermal Development in China

Last month, the Asian Development Bank provided a loan of 250 million USD to Arctic Green Energy and SINOPEC Green Energy, to develop geothermal for space heating in North China

Why?

China is rich in Geothermal Resources



Bottom hole temperature at Yangbajing of Tibet is 325° C.

Spectacular surface manifestations in China

Nianqintagula, Tibet

Tagejia, Tibet

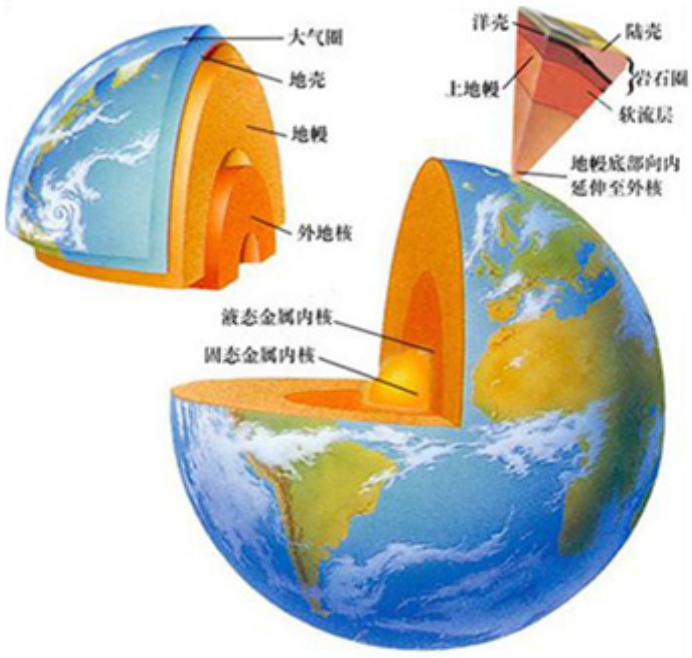
Yanbajing, Tibet

Kangding of Sichuann

Batang of Sichuan

Yuannan

Recoverable Resources is Half of Annual Mix



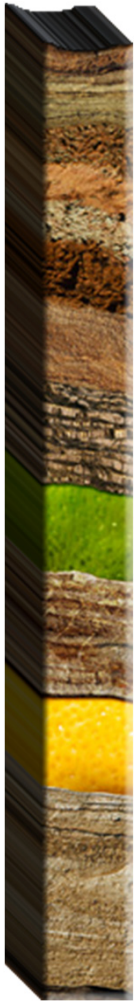
Concepts of shallow, medium deep and super deep geothermal resources

Earth's surface

0.2 km

4.0 km

10.0 km



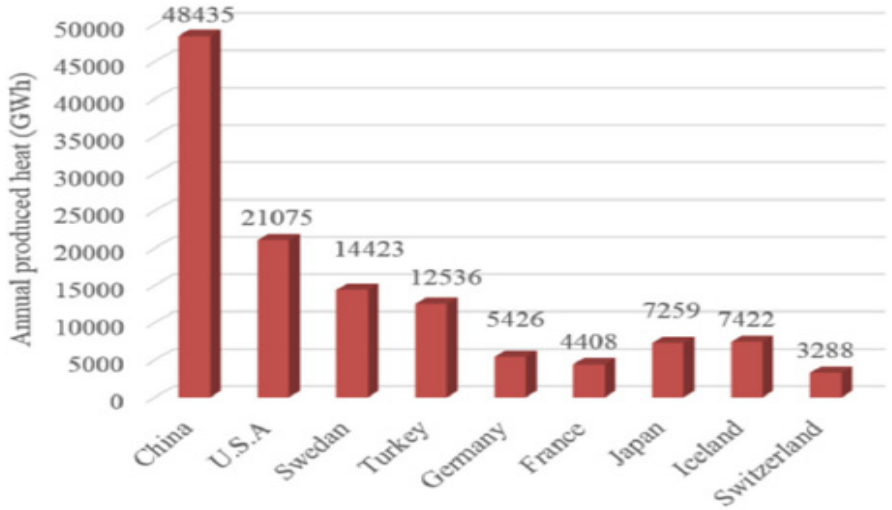
Shallow geothermal resources, in loose sediments and groundwater, <25° C, Conductive

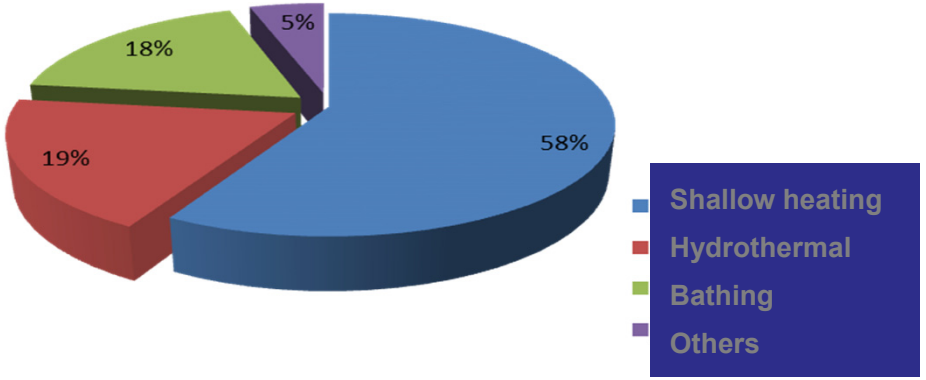
Deep geothermal resources, in hot water or steam, >25° C, Convective

Super deep geothermal resources, mostly in dry rocks, >180° C, Conductive

Current situation of direct utilizaiton

- Up to 2015, use of geothermal energy for direct purposes in China is equivalent of 20 million tons of standard coal per year, ranking 1st in the world





Geothermal direct use in the world and in China (2015)

UNU-GTP in China

In the last 40 years, 88 professionals from China have completed the training at UNU-GTP in Iceland.

There have regular visits of UNU-GTP leaders and teachers to China.

UNU-GTP in China

- It is clear that sustainable management of geothermal reservoirs has been an emphasis, and the application of chemistry in handling geothermal fluids has been a priority.
- It is also true that engineers in geothermal utilization, mainly for space heating have been very useful to the Chinese institutions.

Specialty	Number of fellows
Reservoir engineering	30
Chemistry of thermal fluids	22
Geothermal utilization	17
Environmental studies	9
Borehole geology	3
Borehole geophysics	2
Drilling technology	3
Geophysical exploration	2
Total	**88**

Number of fellows according to profession

UNU-GTP Fellows in China

- The fellows are from 15 different cities, provinces and autonomous regions of the country, including Beijing (27), Tianjin (24), Hebei (10),Tibet (5), Jiangxi (3), and Guangzhou (1).

- This geographical distribution coincides well with the key geothermal development projects in China.

Number of fellows according to location

Chinese Fellows Union: We work together

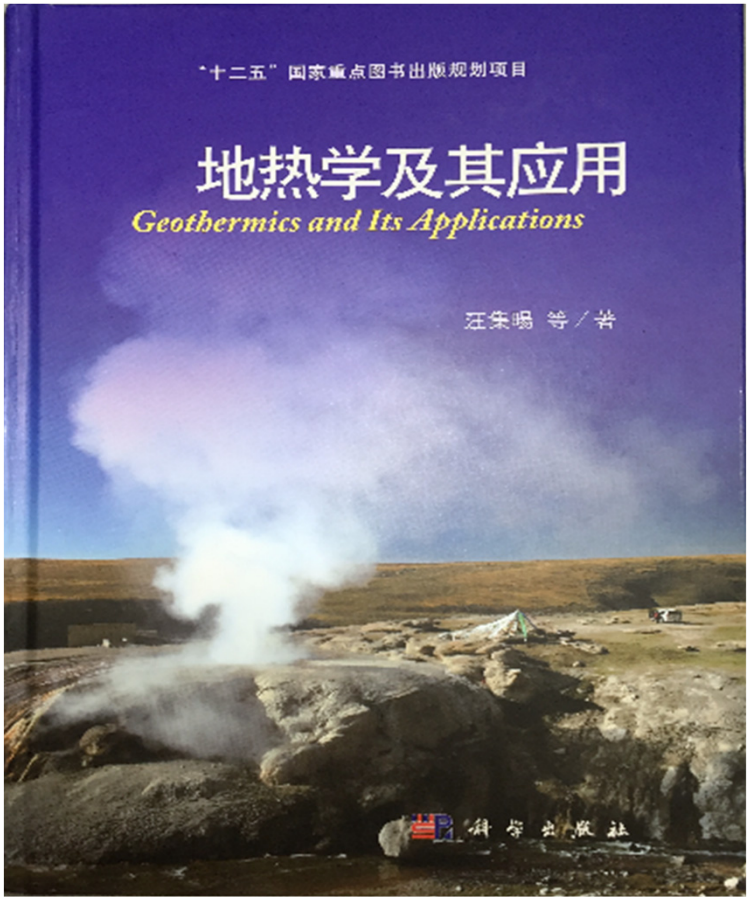
(founded in 2013)

Contributions to Research

UNU-GTP fellows as authors of the book (2015) “Geothermics and its applications”:

PANG Zhong-he, HU Shengbiao, ZHAO Ping,

HE Lijuan, SUN Zhanxue

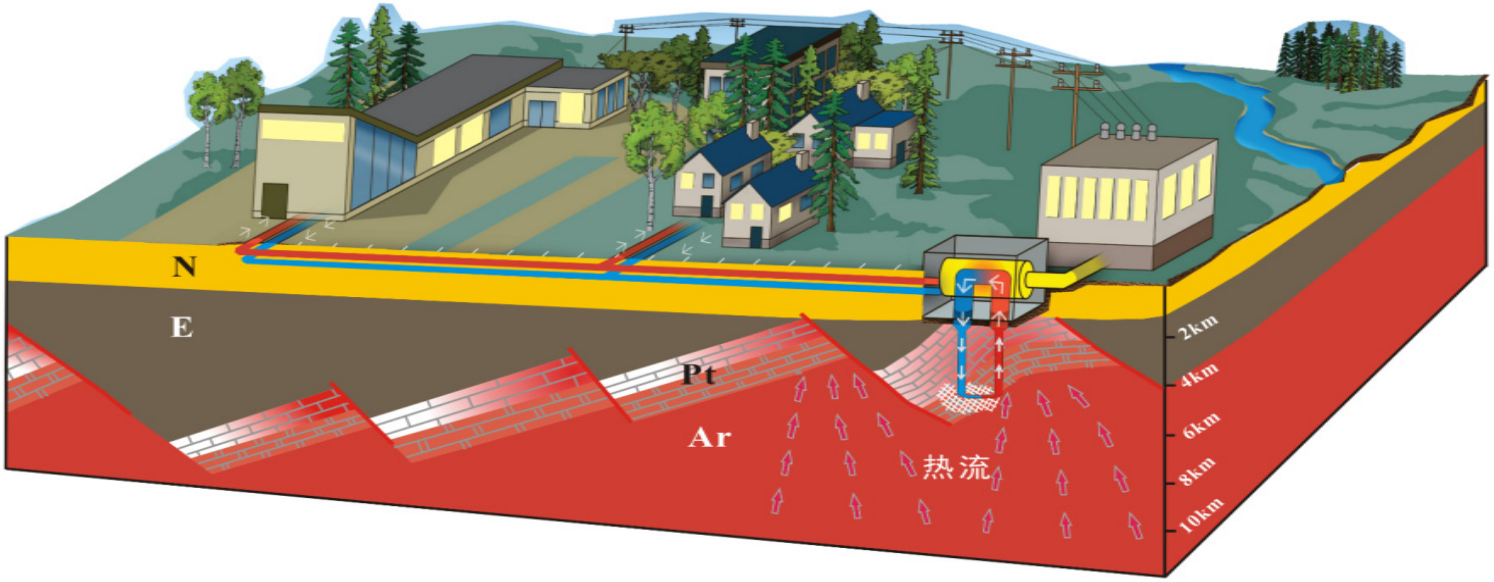


The great success of Xiongxian model for Geothermal Utilization is a proof of success of UNU-GTP

Xiongxian Hebei Province

- 100% geothermal for heating from a large carbonate reservoir;
- Implementation in the whole city;
- 4.5 million m2 of houses heated, largest using a single field for heating in the world.

Space heating using carbonate reservoirs: Xiongxian Model



Xiongxian city has been built into a smokeless city with 100% space heating using geothermal (left) and the conceptual model (right) of the space heating system (Pang et al., 2015)

Strong impacts have been created domestically and internationally

Xiongxian is a model of technological innovation in the large scale development and utilization of a large karst geothermal reservoir for space heating

The Xiong'an New Area Geothermal Project

On 1st April, 2017, Chinese government announced "Xiong'an New Area", to be built into a new city.

Xiongxian model is being upgraded into an even larger scale. Huge geothermal potential exists.

UNU-GTP fellow WANG Guiling is coordinating the exploration.

Geothermal Utilization Projects in Beijing

Beijing's Subcenter under construction in Tongzhou District, ~2.4 million m2 to be heated geothermally

UNU-GTP fellows YU Yuan and others are involved in the projects in Beijing.

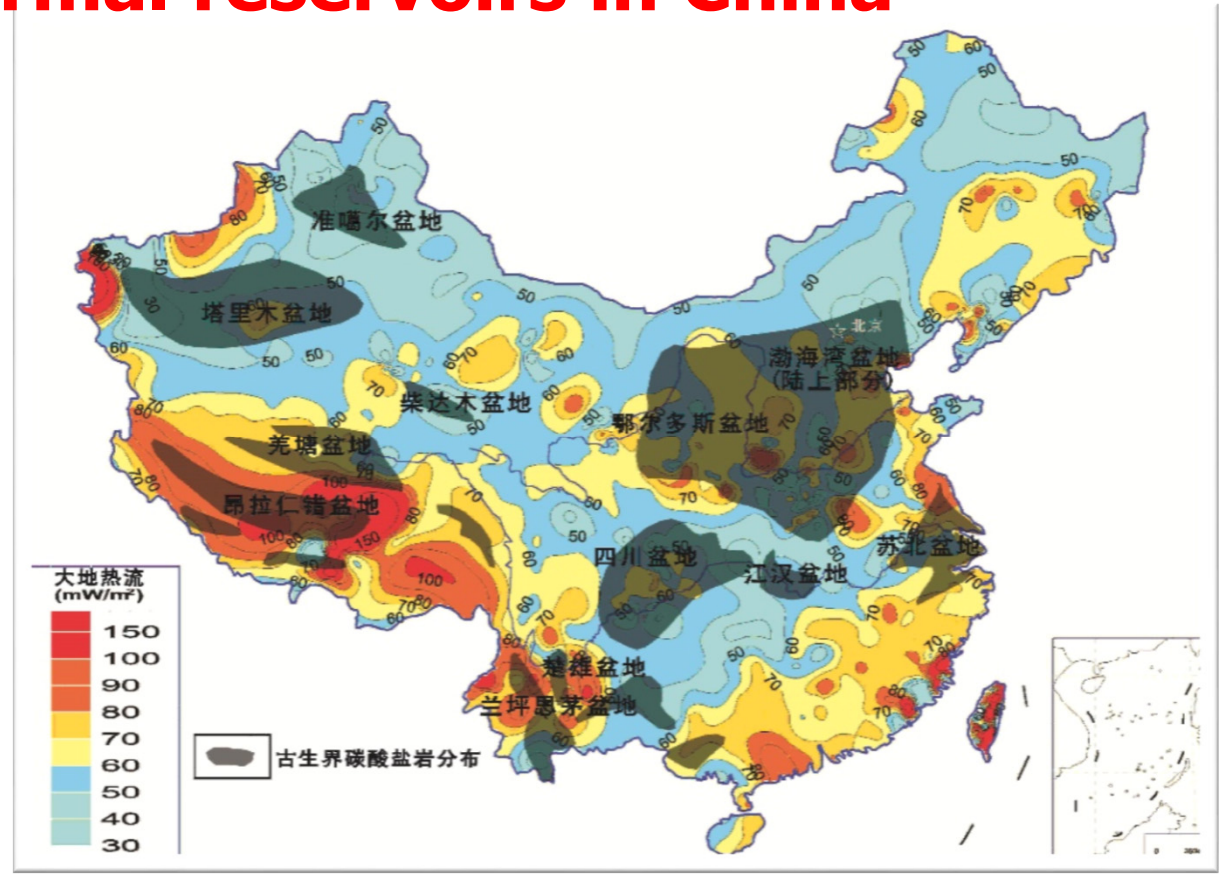
New airport in Daxin of Beijing, ~2.5 million m2 to be heated geothermally

Olympic Winter Games 2020 in Yanqing of Beijing

Huge potential estimated for Karst geothermal reservoirs in China

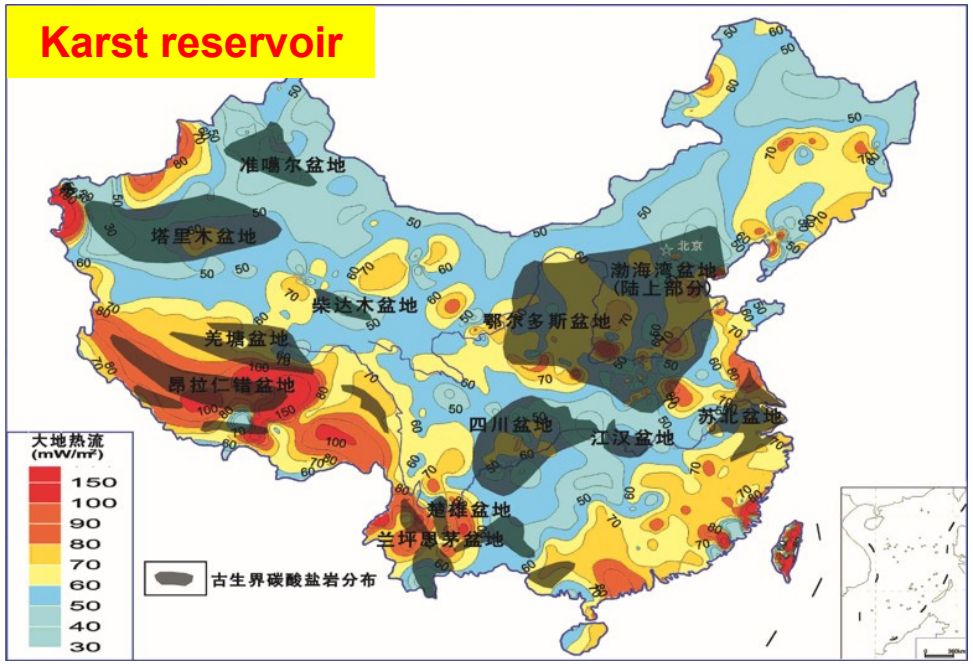
Advantages: large yield, low TDS, high reinjectivity…

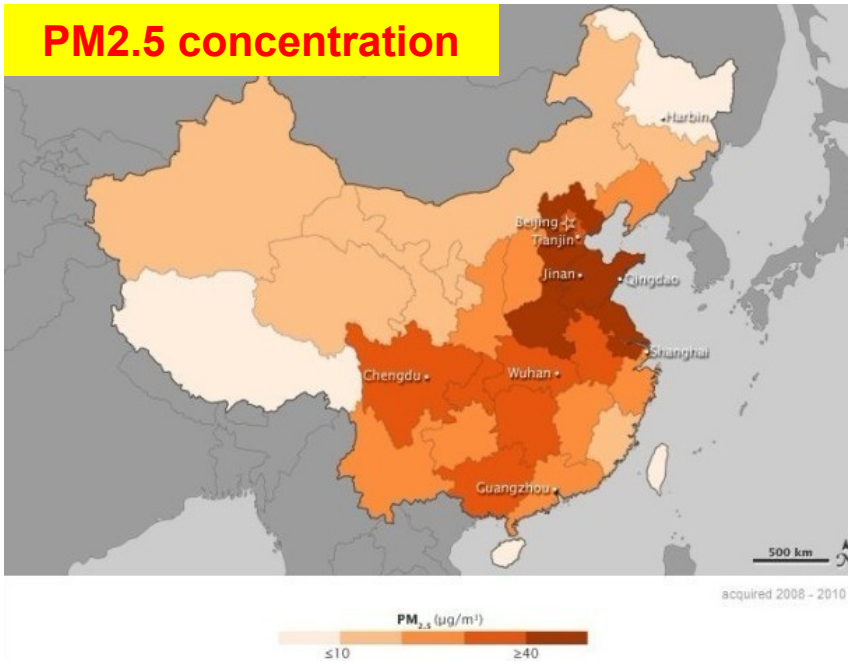
Disadvantages: reservoir heterogeneity and anisotropy and some times of low level of karstification



Potential: 100-1000 times of annual energy mix (Pang, et al., 2012)

Distribution of Karst reservoirs coincide with PM2.5 Concentrations



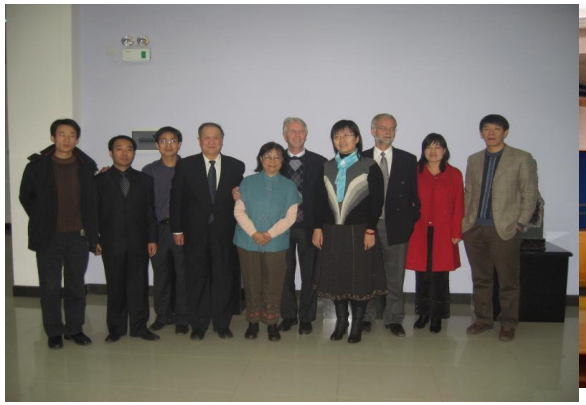


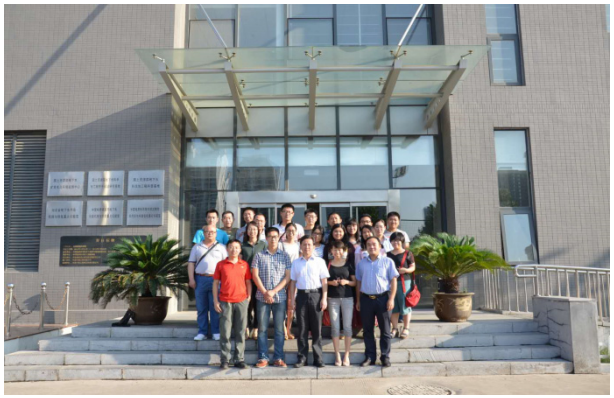
（Pang et al. 2012）　　（NASA, 2015）

Major contributions are expected from Karst reservoirs in mitigating serious air pollution in north and east China

Other Projects and activities with UNU-GTP fellow's involvement



The 13th Five-Year Plan (2016-2020): Ambitious Geothermal Targets

Space heating /cooling

To reach 1.6 billion m^2, to increase by 1.1 billion m2;

Power generation

To reach 500 MW installed capacity, increase by 475 MW.

Market estimate: hundreds of billions of US dollars in space heating/cooling alone.

There is a lot more to do in China !

Concluding Remarks

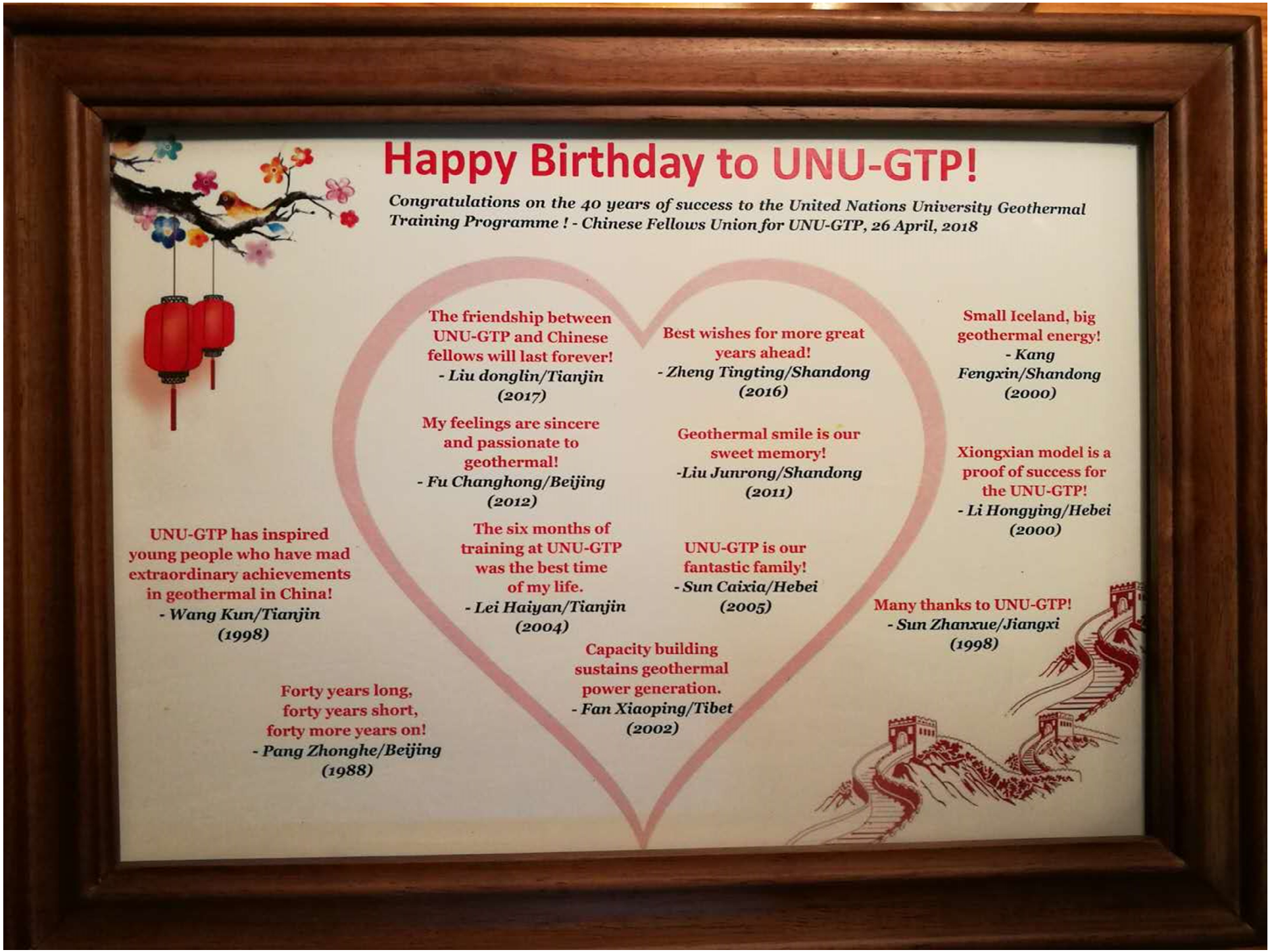
Geothermal development in China is a model of success in direct use of geothermal heat energy.

The Role of the UNU-GTP in China has been very effective in capacity building of professional manpower for China.

Geothermal direct use is a huge market with up to hundreds of billions of US dollars for investment in the future.

Congratulations on the 40 years of success of the UNU-GTP and a big thank you to everyone involved!

Greetings from former Chinese fellows on the following slide!


Happy Birthday to UNU-GTP!
Congratulations on the 40 years of success to the United Nations University Geothermal Training Programme ! - Chinese Fellows Union for UNU-GTP, 26 April, 2018
The friendship between UNU-GTP and Chinese fellows will last forever! - Liu donglin/Tianjin (2017)
Best wishes for more great years ahead! - Zheng Tingting/Shandong (2016)
Small Iceland, big geothermal energy! - Kang Fengxin/Shandong (2000)
My feelings are sincere and passionate to geothermal! - Fu Changhong/Beijing (2012)
Geothermal smile is our sweet memory! -Liu Junrong/Shandong (2011)
Xiongxian model is a proof of success for the UNU-GTP! - Li Hongying/Hebei (2000)
UNU-GTP has inspired young people who have mad extraordinary achievements in geothermal in China! - Wang Kun/Tianjin (1998)
The six months of training at UNU-GTP was the best time of my life. - Lei Haiyan/Tianjin (2004)
UNU-GTP is our fantastic family! - Sun Caixia/Hebei (2005)
Many thanks to UNU-GTP! - Sun Zhanxue/Jiangxi (1998)
Capacity building sustains geothermal power generation. - Fan Xiaoping/Tibet (2002)
Forty years long, forty years short, forty more years on! - Pang Zhonghe/Beijing (1988)