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CO_2 地质埋存技术

THE TECHNOLOGY OF CO_2 GEOLOGICAL SEQUESTRATION

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CO_2 地质埋存技术

●1988年12月第四十三届联合国大会通过43/53号决议《为人类当代和后代保护全球气候》

●1992年5月9日在纽约联合国总部通过《联合国气候变化框架公约》

●1997年12月第三次缔约方大会在日本京都举行，通过《京都议定书》明确了发达国家量化的温室气体减排“指标”

●中国政府于2002年8月正式核准《京都议定书》

- The forty-third General Assembly approved the No.43/53 resolution, Protection of Global Climate for Present and Future Generations of Mankind, in December 1988.
- The resolution of United Nations Framework Convention on Climate Change was approved at the headquarters of U.N. in ninth May 1992;
- In 1997, the third congress of contracting party was hold at Kyoto in Japan. The congress approved the Kyoto Protocol and gave the quantization indicators of subtracting of greenhouse gasses for developed countries.
- Chinese government made the official sanction for Kyoto Protocol in August 2002.

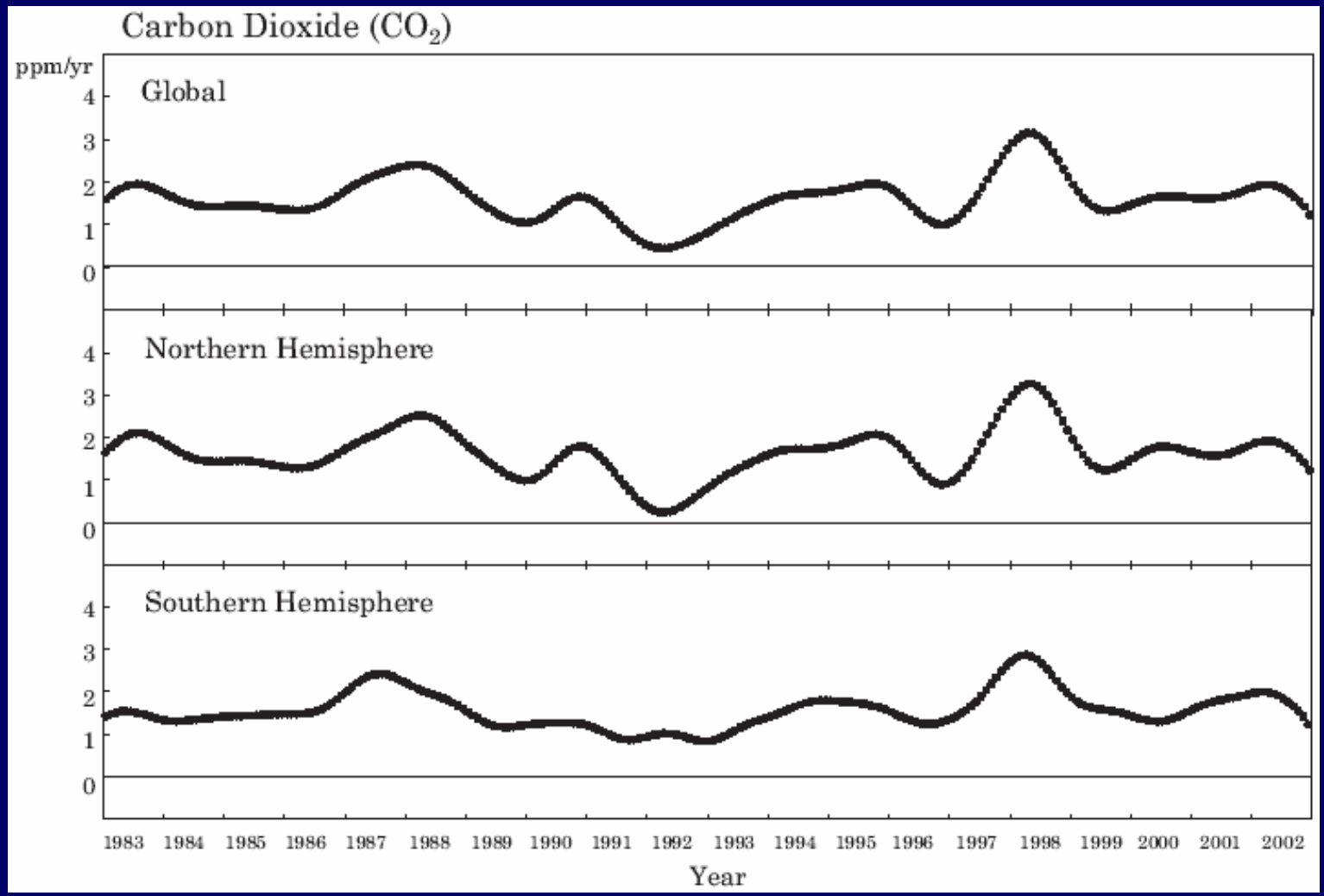
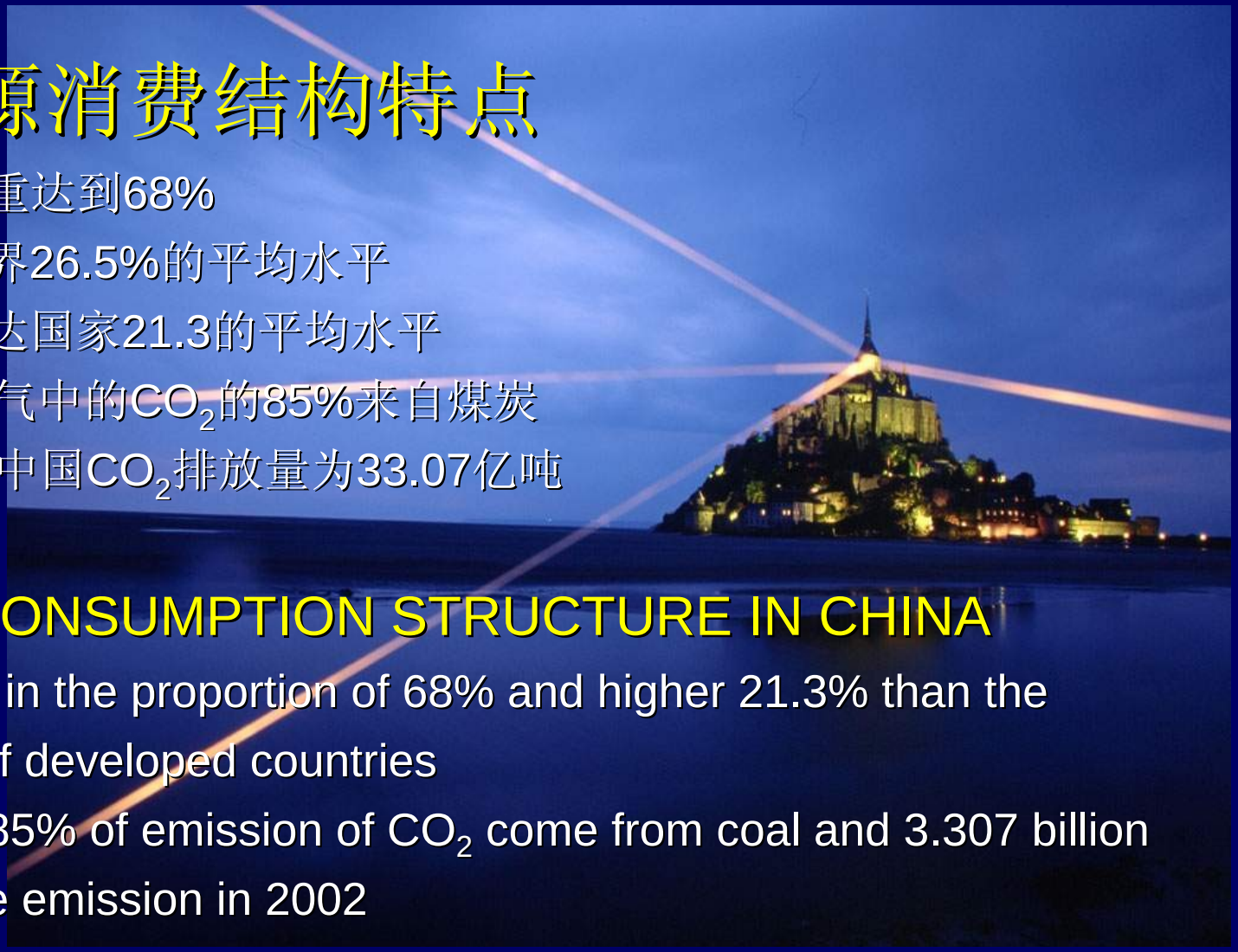


Fig1. 1983-2002年全球大气二氧化碳浓度年增长趋势



中国能源消费结构特点

- 煤炭比重达到68%
  高于世界26.5%的平均水平
  高于发达国家21.3的平均水平
- 排入大气中的CO_2的85%来自煤炭
  2002年中国CO_2排放量为33.07亿吨

ENERGY CONSUMPTION STRUCTURE IN CHINA

- Coal is in the proportion of 68% and higher 21.3% than the average of developed countries
- About 85% of emission of CO_2 come from coal and 3.307 billion tons of the emission in 2002

积极探索减量排放措施

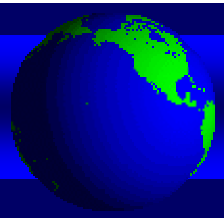
- 利用CO_2资源，开发CO_2应用于冶金、化工、建材、轻工、电子、医药、机械等行业实用技术
- 改善能源结构，开发低碳或无碳能源，满足能源需求而不增加碳排放，主要包括利用水能、风能、太阳能、氢气、天然气、煤层气、太阳能、地热、核能等
- 利用陆地生态系统吸收CO_2，增加碳汇
- 试验利用海洋埋存CO_2
- 开发向地下注入CO_2的“碳封存”技术，利用地下空间埋存CO_2

THE CHOICES FOR CHINA:

- make full use of CO_2 resources ;
- improve the energy structure, develop the low carbon and non-carbon energy ;
- use the terrestrial ecosystem to absorb CO_2, and to increase the capability of carbon-sink ;
- develop the technology of sequestration under the ocean ;
- develop the underground sequestration technology of CO_2. Developing CO_2 sequestration technology is the best choice at the present time.

a. 变被动为主动，积极利用CO_2

MAKE FULL USE OF CO_2 ACTIVELY



CO_2 地质埋存技术

- CO_2的埋存应与资源（油气、煤层气等）开发利用有机结合
- CO_2的来源广泛，如合成氨厂、制氨厂排出的废气等
- CO_2用途广泛：CO_2气体保护电弧、粉末灭火器压出剂等
- 在化学方面，应用于含碱废水的PH控制、制造碳酸盐等
- 在生物化学方面，应用于制造CO_2激光器等

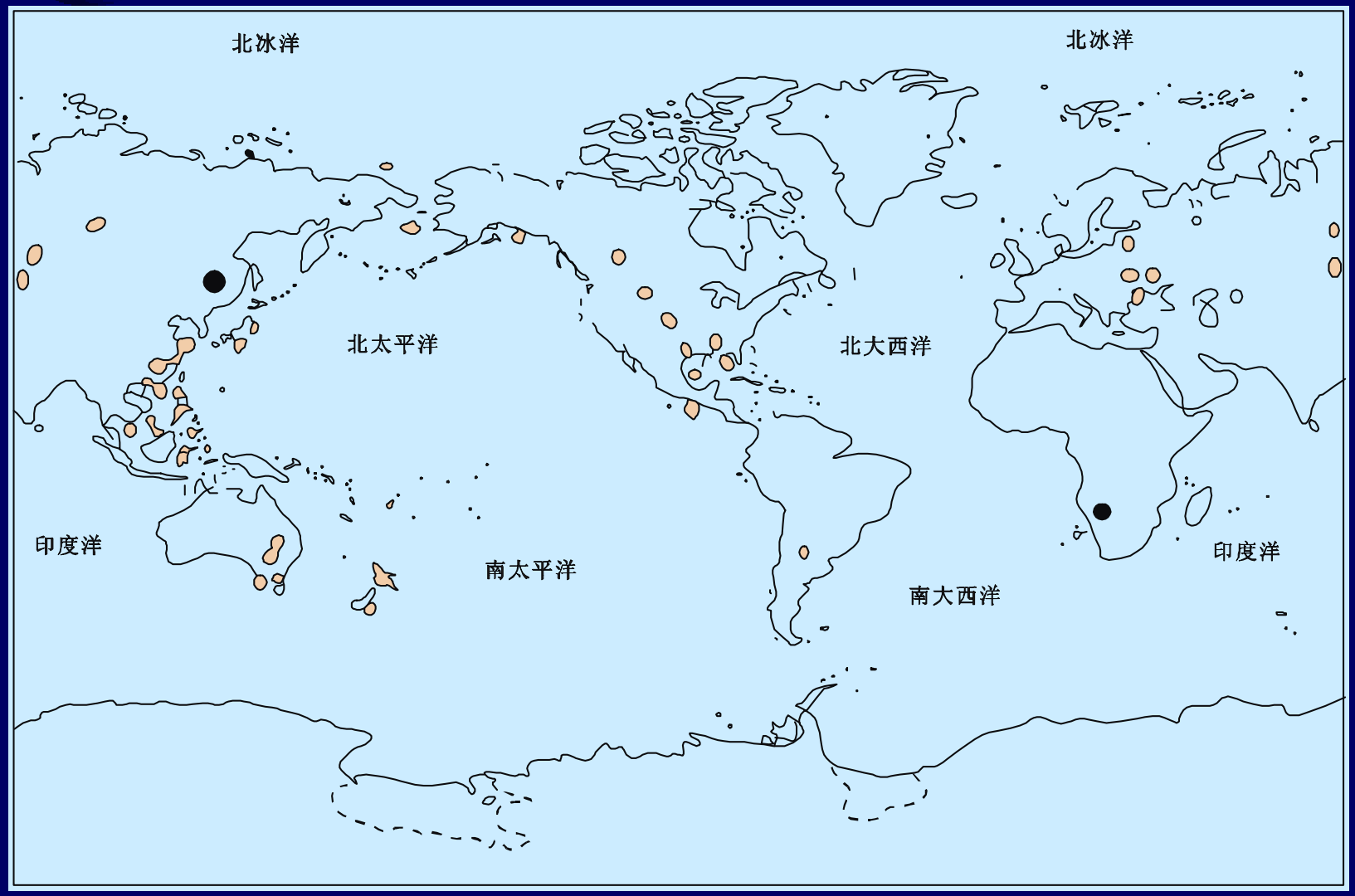
CO_2 sequestration must be combined with the usage and development of resources, including oil gas and coaled gas resource exploitation technologies.

The source range of CO_2 is wide, like synthetic ammonia plant, exhaust gas from the ammonia manufactory, oil field gas, cement works, calcium carbide works... The fraction of CO_2 even can be 99%

CO2 widely used , such as： the CO_2 gas can be used in shielded arc welding, the extrude agent of powder fire extinguisher…the propellant of concrete fragile aerosol, and secondary recovery of oil /In chemistry aspects, it can be used in PH control of alkali waste water, manufacture of carbonate…

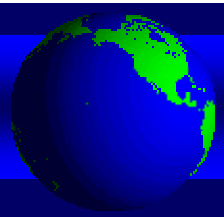
In the biochemistry aspects, CO_2 can be used in CO_2 fertilization, blowing up packaging…/In the domain of physics and medical treatment, it can be used for manufacture of CO_2 laser /widely used in food refrigeration and low-temperature transportation

CO_2 地质埋存技术



全球CO_2分布示意图

Fig2. Distribution of CO_2 in the world



CO_2 地质埋存技术

Fig3. 2000年美国、西欧、日本液体CO_2消费情况（单位万吨）

Liquid CO2 consumption in U.S.A, west Europe and Japan in 2004 (ten thousand)

消费领域	美国	西欧	日本
食品工业	324.8	36.0	#
碳酸饮料	107.0	105.0	16.3
焊接	#	9.0	34.6
其它行业	230.4	45.0	28.7
合计	662.2	195.0	79.6
备注	#，数据包括在其他行业中		

可行性：充分利用CO_2资源

- 优先考虑在油气藏中埋存CO_2
- 利用好中国丰富的煤层气资源，如华北地区（山东、河南、河北、山西）、西北地区（鄂尔多斯盆地、准噶尔盆地、吐哈盆地）等
- 提高CO_2的捕集技术，如对火力发电厂进行CO_2捕获、分离（提纯），逐步推广到化工、冶金等其它行业
- 降低CO_2地下埋存的成本（捕集成本，运输成本，埋存成本），如采用远距离输送高压液态CO_2等

Among all solutions of CO_2 discharge, making full use of it is the best one, because:

- we give priority to Sequestrating CO_2 in the hydrocarbon reservoir. We have profound geological understanding about our known oil-gas field and it is not necessary to pay more money for CO_2 geological exploration.
- we should try to make good use of our abundant coaled gas resources. China has about 30×10^{12} to 35×10^{12} m^3 of coaled gas resources.
- improving CO_2 capture technology, including capture and separation (purification) of CO_2 which comes from thermoelectric power station.
- decreasing the cost of sequestration including the steps of capitation, transportation and sequestration.

中国CO_2消费结构情况（2002年）

Fig4. Consumption of CO_2 of China in 2002

消费领域	消费量（万吨）
碳酸饮料	12
焊接	10
食品储运及加工	7
石油及天然气开发	4-5
烟业	4-5
化工业	15
其它	10
合计	62-64

b. CO_2 地质埋存技术要点

THE KEY POINTS OF CO_2 GEOLOGICAL SEQUESTRATION TECH

CO_2地质埋存技术：三大类型

●地质埋存 ●海洋埋存 ●植被埋存

The CO_2 Geological sequestration tech can be sorted to three major headings: ocean sequestration, geological sequestration and vegetation sequestration

CO_2 地质埋存技术

地质埋存（地下埋存）可行性

- 油气田开发中已经积累了CO_2埋存专业技术经验
- CO_2强化采油和强化煤层气开采方面，已经通过试验获得经济效益
- 天然CO_2气藏的赋存状态，证明有利的地质构造能够长时间埋存CO_2。

- Geological sequestration is one kind of tech that depositing the CO_2 under the ground, in the natural pore. The tech is the most economic and reliable operative one at present. Geological sequestration has some advantages as follow:
  - We have accumulated quite a lot of profession skill experience during the process of CO_2 sequestration in oil-gas field exploitation.
  - Using the CO_2 to forced production and forced coaled gas exploitation has passed the test and approved that it has economic benefits
  - The natural form of the CO2 occurrence state proves the long-term for CO_2 sequestration very well.

CO_2 地质埋存技术

1. 利用沉积盆地深部咸水层贮存CO_2

（液体填埋/溶解填埋/矿物填埋）

Using the deep part saline aquifer of sedimentary basin for storing CO_2

2. 利用油气田贮存CO_2

- 利用废弃油气田贮存CO_2（“酸气”封存技术）
- CO_2-EOR技术（EOR为Enhance Oil Recovery）

Using the oil-gas field for CO_2 sequestration:

▲using the discarded oil-gas field.

▲CO_2 -EOR tech (Enhance Oil Recovery Technology)

3．利用弃采煤层贮存CO_2

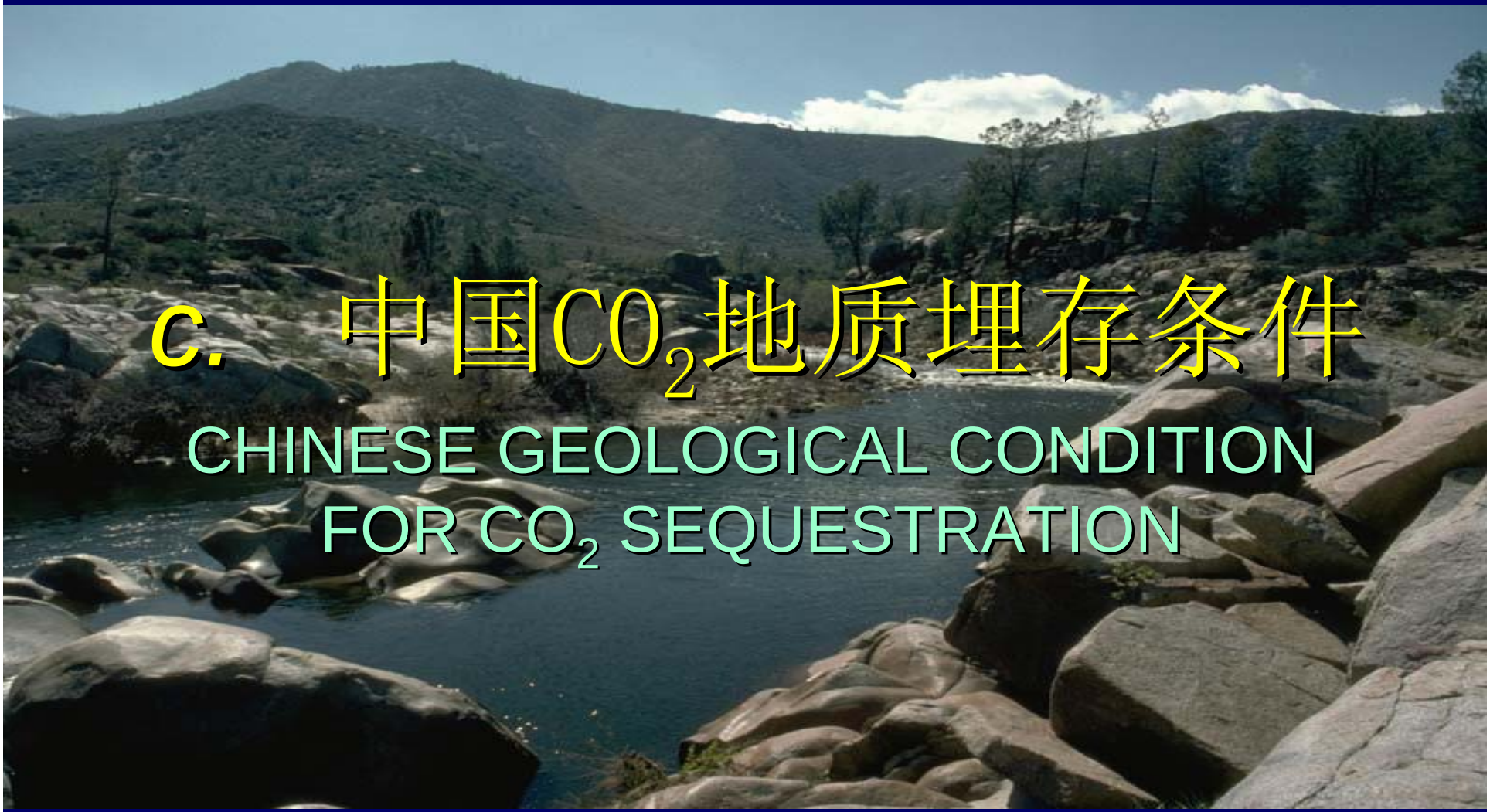
弃采煤系地层

- 不可采薄煤层
- 埋藏超过终采线的深部煤层
- 构造破坏严重的煤层等

Using the abundant coal bed for reserving CO_2

Abandoned coal strata:

Unminable thin seam, overembed deep coal bed and destroyed strata by structure



C. 中国CO_2地质埋存条件

CHINESE GEOLOGICAL CONDITION FOR CO_2 SEQUESTRATION

CO_2 地质埋存技术

层间隔水层构成较好密封条件

● 松辽盆地、渤海湾盆地、鄂尔多斯盆地、四川盆地、准噶尔盆地、塔里木盆地

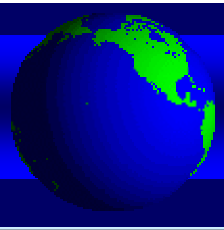
近海海域主要沉积盆地

● 如渤海盆地、北黄海盆地、南黄海盆地、东海盆地、冲绳海槽盆地、台西盆地、台西南盆地、台东盆地、珠江口盆地、北部湾盆地、莺歌海–琼东南盆地、南海南部诸盆地等

● By the influence of neotectonic movement, the large basins in China formed multilayer sedimentary system, the number of the bed always above decade, or even scores of layers. Between two conterminous layers, relative water insulation course or poorly permeable strata form preferably sealing condition, like Songliao basin, Bohai bay basin, Eerduosi basin…and the main sedimentary basins of sea approach area, like Bohai sea basin, East China Sea basin, Taixi basin, Taidong basin…and some basin in the south of South China Sea.

● All of the large petroliferous basins on the Chinese onshore had been tested for CO_2 encroachment. Some of them can be considered as target area CO_2 sequestration.

CO_2 地质埋存技术



盆地 / 产层	松辽	渤海湾		苏北	三水	张北	民和（窑街）
		黄骅拗陷	济阳拗陷				
新近系							
古近系							
上白垩统							
下白垩统							
侏罗系							
三叠系							
二叠系							
石炭系							
泥盆系							
志留系							
志留系							

砂质岩　碳酸盐岩　火成岩　煤　岩

我国主要CO_2气藏分布层位及储集层岩性

Fig.5 Main CO_2 sedimentary system in China

CO_2 地质埋存技术

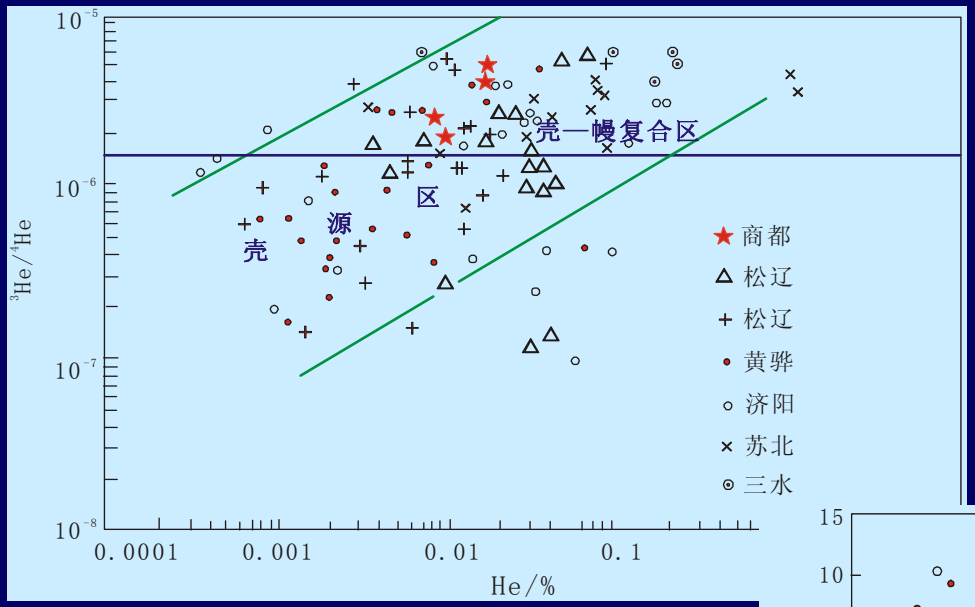
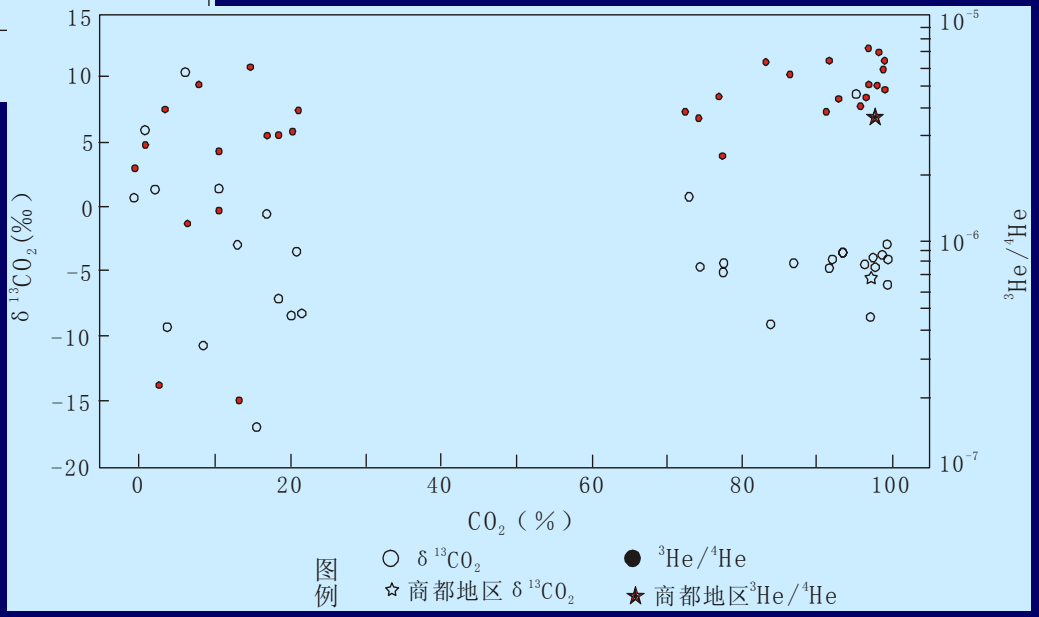


Fig.6 中国东部$^3He/^4He$–He%关系图（据徐永昌，1996）

Scatter of relation of $^3He/^4He$–He% in the east of China

Fig.7 中国东部气井中CO_2浓度与$\delta^{13}C_{CO_2}$和$^3He/^4He$关系图（据徐永昌，1996）

Scatter of relation of consistentration of CO2 and $^3He/^4He$–He% in gas hole in the east of China



CO_2 地质埋存技术

1．深部咸水层的CO_2地质埋存

（1）东部平原（松辽平原、黄淮海平原等）

（2）长江三角洲（陆相堆积系列、海陆过渡相沉积系列和海相沉积系列）

（3）西北内陆盆地（准噶尔、塔里木等盆地

（4）四川盆地（成都平原等）

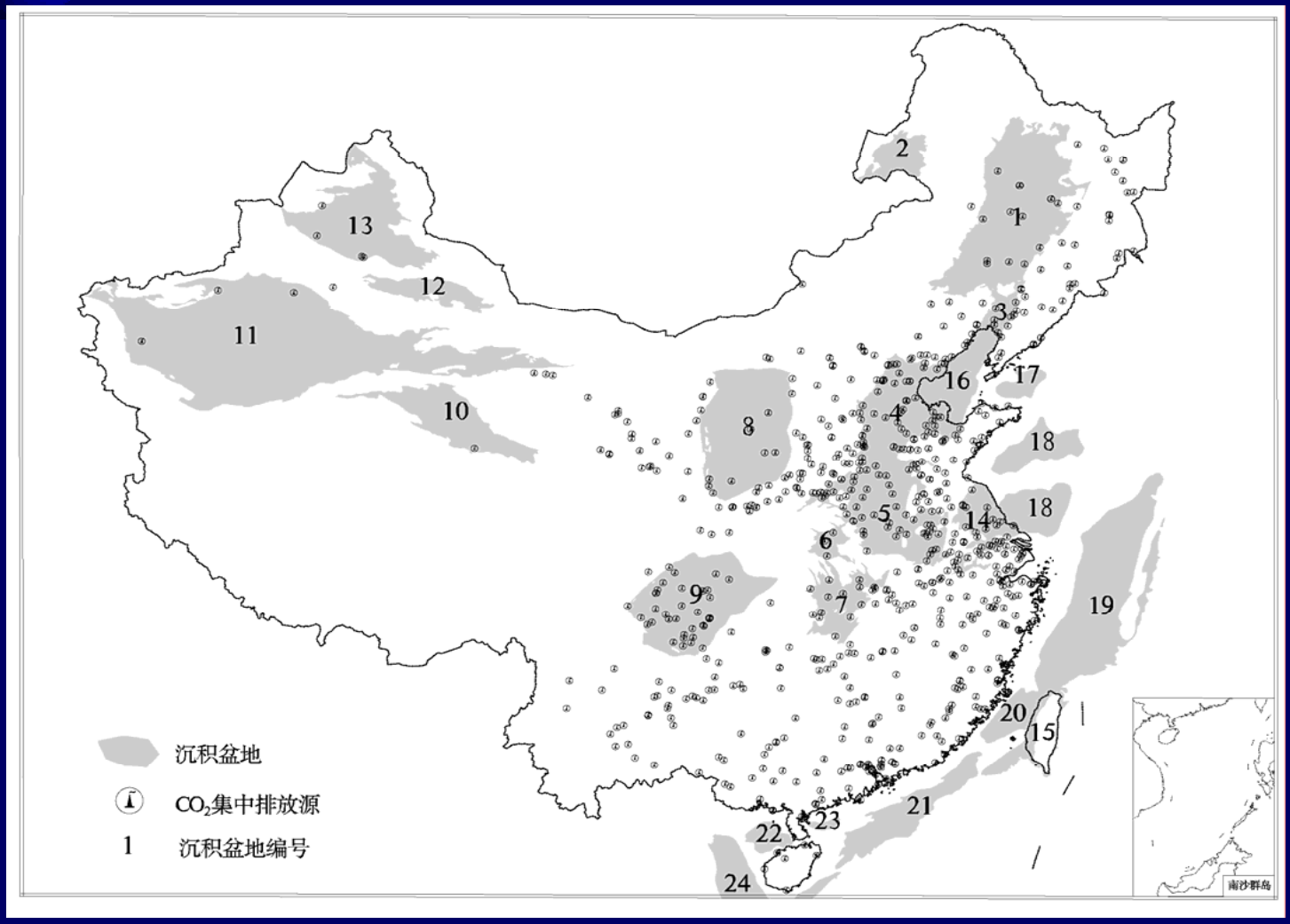
初步统计，中国可用于CO2埋存的深部咸水层面积为34万km^2。

Deep part salaquifer for CO_2 geological sequestration

- East Plain
- Yangtse Rive Delta
- Northwest inland basins
- Sichuan basin

- By elementary statistics, China has about 0.34 million km^2 total area of deep layer saline aquifer that can be used for CO_2 sequestration.

CO_2 地质埋存技术



中国沉积盆地咸水含水层及其CO_2储存量分布图

Fig.8 Sediment basins deep part salaquifer for CO_2 in China

● CO_2容量估算1：圈闭体积法(深部咸水层)

Fig.9: Estimated capacity of CO_2 : Enclose volume method

$$SCO_2 = A \times m \times 0.01 \times 0.02 \times n/100 \times \rho_{CO2} \times 10^{-3}$$

SCO_2为CO_2含水层处置容量（10^6t） SCO_2 is the capacity of containing water

A为沉积盆地的地表面积（km^2） A is surface area of sediment basin

m为含水层厚度（m） m is thickness of containing water

n为含水层孔隙度（%）n is degree of hole of containing water

p为CO_2密度 P is density of CO_2

（假设m=100m，n=20%，据 Hendriks）

● CO_2容量估算2：溶解度法(深部咸水层)

Fig.10 Way 2: Estimated capacity of CO_2 **:Solubility method**

$$SCO_2 = a \times A \times h \times \eta \times \Phi \times R \times \rho_w \times M_{CO_2}$$

SCO_2为CO_2含水层处置容量（g）

a为咸水含水层平面分布范围占总盆地的比例（取0.1）

A为面积（m^2），h为沉积层厚度（m）

η 为含水层厚度占总厚的比例（0.075-0.1，其它盆地取0.1）

Φ 为孔隙度（0.05-0.25，无资料的取经验值0.2）

R为地层水中CO_2的溶解度(mol/kg，为温、压、NaCl浓度的函数，据Duan）

ρ_w 为处置深度条件下饱和CO_2的咸水密度（kg/m^3），为含盐量的函数

M_{CO_2} 为CO_2的摩尔质量，44g/mol。

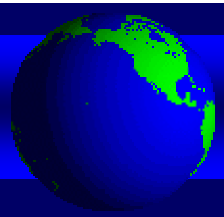


Fig. 11 咸水层CO_2处置容量计算参数(calculate parameters and results)

盆地名称	盆地总面积/10^6m^2	面积法量/10^8t	厚度加权/10^6m^2	含水层厚/m	孔隙度	厚度加权（t/m^3）	溶法/10^8t
松辽盆地	271146.85	3.21	74021.27	200	0.25	1.20	4443.67
海拉尔盆地	38422.58	16.27	1727.09	500	0.14	1.27	150.35
渤海湾_辽宁	22582.45	2.31	27730.41	200	0.10	1.25	695.29
渤海湾_华北	185760.65	1.35	68393.53	400	0.25	1.18	8042.31
河淮盆地_西北	82877.34	11.15	39229.76	200	0.20	1.11	1745.28
河淮盆地_东南	23091.67	6.36	24024.78	200	0.20	1.11	1068.83
江汉－洞庭盆地	80769.21	1.08	29641.46	400	0.19	0.70	1592.76
鄂尔多斯盆地	203540.88	3.77	200812.33	200	0.15	1.21	7315.93
四川盆地	184853.85	12.21	214485.16	420	0.08	0.95	6406.46
柴达木盆地	102303.92	11.09	116449.81	500	0.18	1.04	10936.22
塔里木盆地	591943.40	6.14	655519.44	400	0.12	0.89	27869.27
吐－哈盆地	43095.10	35.52	17244.55	400	0.18	1.09	1341.73
准葛尔盆地	156426.38	2.59	120618.16	200	0.16	1.21	4687.82
苏北盆地	53527.97	9.39	6911.23	400	0.23	1.15	730.44
台西盆地	8828.37	3.21	10604.89	200	0.15	1.11	353.85
渤海湾盆地	64982.57	0.53	62812.88	400	0.29	1.15	8408.12
北黄海盆地	18777.98	3.90	7400.07	400	0.10	1.17	345.77
南黄海盆地	51208.30	1.13	33868.40	400	0.20	1.17	3165.03
南黄海盆地2	55001.74	3.07	5327.63	400	0.20	1.17	497.87
东海盆地1	271292.16	3.30	197727.72	400	0.20	1.17	18477.83
台西海盆地	34932.20	16.28	42411.76	600	0.20	1.17	5945.13
珠江口盆地	83028.26	2.10	101581.03	600	0.30	1.30	23712.58
北部湾盆地	18925.67	4.98	22162.34	600	0.20	1.12	2981.12
滹州岛盆地	4582.02	1.14	2858.61	600	0.20	1.12	384.52
莺歌海盆地	44462.65	0.27	48021.98	200	0.20	1.15	2205.58

2. 油气田CO_2的地质埋存

●老油气田开采区或废弃开采井田（大庆、胜利、辽河、克拉玛依、四川、华北、大港、中原、吉林、河南、长庆、江汉等46个油田）

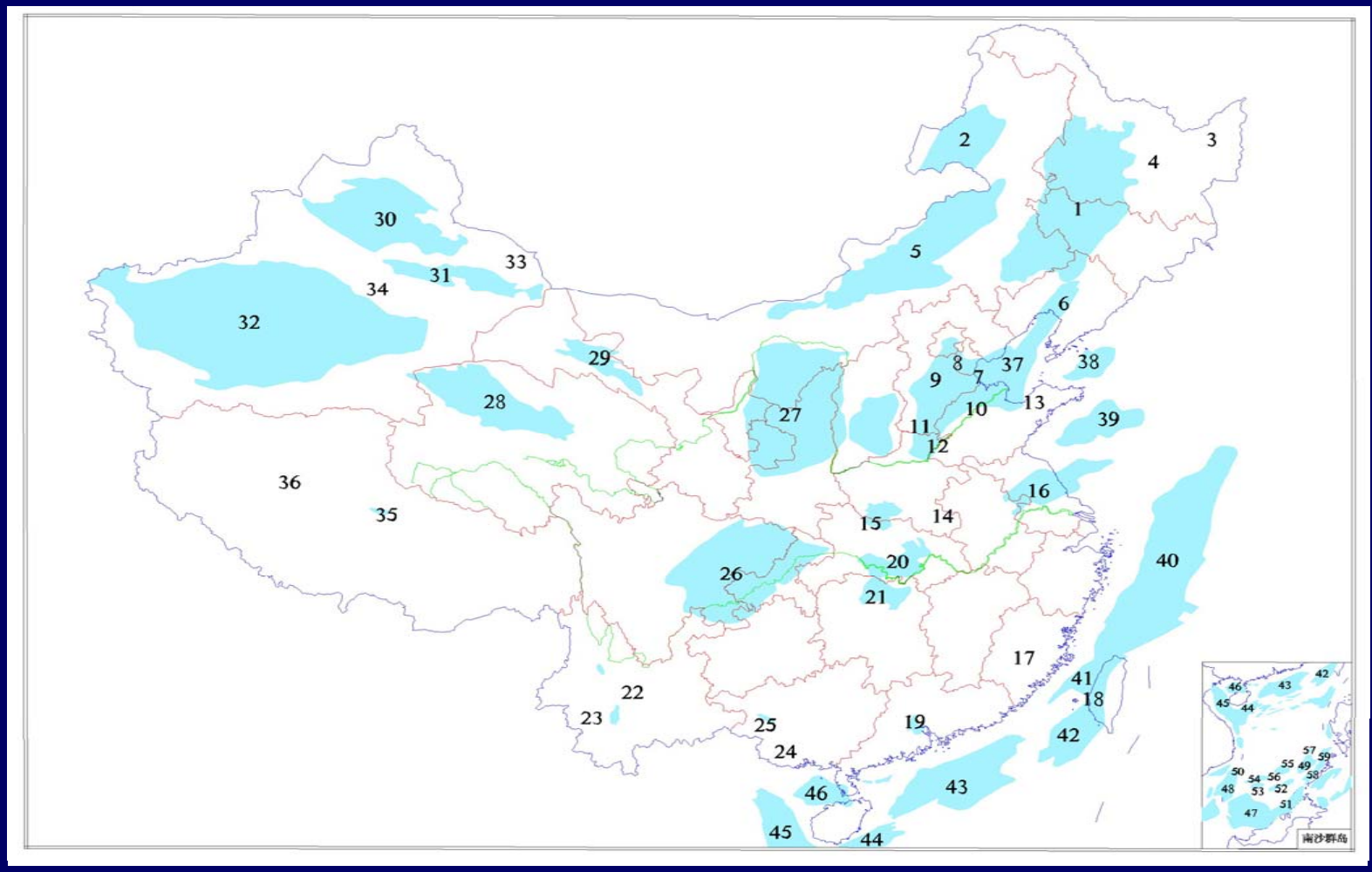
●局部小型断陷盆地（华南地区陆域具有CO_2埋存潜力的油气藏或煤层）

●含盐盆地（华中–西南地区，如以四川盆地、江汉盆地、江汉油田、潜江盐田、贵州地区的煤层等）

Oil-gas field using for CO_2 geological sequestration

- Chinese large sedimentary basins are also the main production of oil field. They are ideal points for CO_2 sequestration, especially the old oil-gas field and abandoned exploited well, mainly include Daqing, Shengli, Liaohe, Kelamayi, Sichuan, North China, Dagang, Zhongyuan, Jilin, Henan, Changqing and Jianghan, totally about 46 oil fields.
- The land of South China mainly consists by some small fault basin. The level of our abstract understanding about this area is comparatively low.
- Middle China and Southwest China area ought to take the Sichuan basin as a basis. Sichuan basis is not only a large size of petroliferous basin, but also a salt-lake basin.

CO_2 地质埋存技术



中国主要油田、含油盆地及其CO_2储存量分布图

Fig.12 Main oil fields, petroliferous basins and CO_2 in China

- CO2容量估算3：油田CO2-EOR处置容量

Fig.13: Estimated capacity of CO_2 :oil field

$$SCO_2 = EXTRA \times OOIP \times C \times R_{CO_2}$$

$$^{\circ}API = \frac{141.5}{S_g} - 131.5$$

SCO_2为CO_2隔离潜力[M]

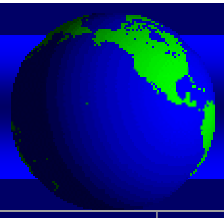
$EXTRA$为注入CO_2可增采的原油量占总地质储量的比例[-]，API重度用右式计算

$OOIP$为原油储量[M]

C为CO_2与原油之间的接触比例，取0.75；

R_{CO2}为开采单位体积原油而残留于油田中的CO_2量[M/V]（0.1-0.8，取0.45）

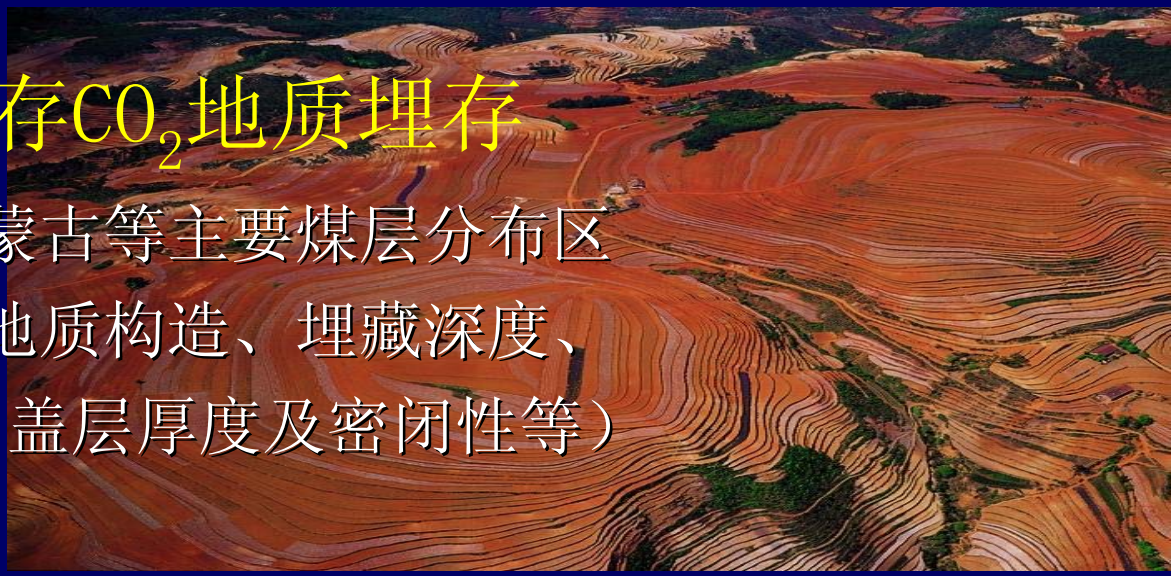
S_g为原油的相对密度[-]。



CO_2 地质埋存技术

Fig.14

沉积盆地	石油地质储量/10^8t	探明石油储量/10^8t	EXTRA	RCO_2/(t/t)	CO_2处置容量/10^8t	证实CO_2处置容量/10^8t
松辽盆地	174.0000	65.2400	0.08	3.29	19.3687	12.7406
海拉尔盆地	5.3400	0.0332	0.10	3.33	0.7884	
三江盆地	3.4360		0.10	3.33	0.5073	
依兰伊通	5.1600	0.3324	0.10	3.33	0.7618	0.0861
二连盆地	8.1800	2.0263	0.05	3.21	0.5773	0.2509
辽河坳陷	45.7000	21.1100	0.05	3.14	3.1642	2.5643
黄骅坳陷大港油区	25.6000	9.0700	0.05	3.10	1.7481	1.0866
黄骅坳陷冀东油区	6.3000	1.0291	0.05	3.10	0.4302	0.1233
冀中坳陷	9.1726	9.1726	0.05	3.18	0.6422	1.1267
济阳坳陷	73.0000	42.0000	0.05	3.11	4.9989	5.0458
临清坳陷	15.4000		0.05	3.11	1.0546	
胶莱盆地	30.8000		0.05	3.11	2.1091	
东濮凹陷	4.9342	4.9342	0.13	3.37	0.9224	1.6182
华北南部盆地	14.0000		0.05	3.01	0.9281	
南襄盆地	3.9000	2.2014	0.12	3.35	0.6515	0.6452
苏北盆地	12.0800	1.8107	0.15	3.40	2.6289	0.6913
福建地区	0.0500		0.10	3.33		
台西盆地	10.5500		0.10	3.33	0.4372	
三水盆地	0.2160	0.0060	0.16	3.41	0.0139	
江汉盆地	3.7500	1.1682	0.05	3.11	0.2565	0.1402
洞庭湖盆地	0.3500		0.05	3.14	0.0242	
楚雄盆地	6.3600		0.05	3.14	0.3013	
兰坪-思茅盆地	7.8300		0.05	3.14	0.3709	
十万大山盆地	17.9900		0.05	3.14	0.8523	
百色盆地	0.9227	0.1845	0.05	3.14	0.0437	0.0224
四川盆地	11.3500	0.6967	0.09	3.31	1.0283	0.1619
鄂尔多斯盆地	59.0000	11.5934	0.12	3.36	7.2232	3.6393
柴达木盆地	31.2000	2.5377	0.10	3.33	2.8174	0.6547
酒西、酒东、花海盆地	3.0100	0.9660	0.07	3.28	0.1800	0.1650
准噶尔盆地	85.8700	17.6210	0.05	3.18	3.6918	2.1645
吐哈盆地	15.7500	2.4035	0.18	3.46	2.6211	1.1428
塔里木盆地	107.6000	4.6605	0.05	3.01	4.3800	0.5420
三塘湖盆地	4.9400	0.1127	0.05	3.18	0.2124	0.0138
焉耆盆地	4.5300	0.4172	0.05	3.18	0.1948	0.0512
伦坡拉盆地	0.4500		0.05	3.18	0.0166	
羌塘盆地	21.0000		0.05	3.18	0.7739	
渤海湾盆地	40.2900	8.6183	0.05	2.99	1.4911	0.9968
北黄海盆地	1.4146		0.05	3.18	0.0556	
南黄海盆地	5.4870		0.05	3.18	0.2157	
东海盆地	53.7900	0.2214	0.05	3.18	2.1144	0.0272
台西盆地	7.2910		0.05	3.18	0.2866	
台西南盆地	3.2650		0.05	3.18	0.1283	
珠江口盆地	68.0000	4.6664	0.05	3.16	2.6565	0.5697
琼东南盆地	21.2300	0.0377	0.05	3.16	0.8294	
莺歌海盆地	59.4000		0.05	3.16	2.3205	
北部湾盆地	16.6700	0.8737	0.11	3.34	1.4539	0.2381



3．不可开采煤存CO_2地质埋存

- 山西、陕西、内蒙古等主要煤层分布区
  （具备适宜的煤层地质构造、埋藏深度、孔隙度、渗透性、盖层厚度及密闭性等）

Incapable exploited coal for CO_2 sequestration

The coal beds distribute widely in our mainland. Some of them are incapable exploited coal bed and they have considerable proportion. They are good for CO_2 sequestration and the potential is huge. Around the main coal bed distribution of Shanxi, Shaanxi and Mongolia, we should do some investigations about the zone of CO_2 sequestration in deep coal bed. The primary contents are geological structure, depth of burial, porosity, penetrability, depth of cover and tightness.

CO_2 地质埋存技术

中国主要含煤区及其CO_2储存量分布图

Fig.15 Main coaliferous areas and CO_2 in China

● CO2容量估算3:中国CO_2煤层处置容量

Fig.16: Estimated capacity of CO2 : coaliferous areas

$$S_{CO_2} = a\rho_{CO_2}\sum_{i=1}^{68}\sum_{j=1}^{10} G_i \frac{C_{ij}}{C_i} RF_{ij} ER_{ij}$$

S_{CO_2} 为CO_2的可处置量(kg)

a 为表征可可采煤层气区面积占煤层总分布面积的比例，取值10%

S_{CO_2} 为标准压力和温度条件下的CO_2密度，取值1.977 kg/m^3

ρ_{CO_2} 为第i评价区内的煤层气资源量(m^3)

ρ_{CO_2} C_j为第i评价区的煤炭资源量(t)

G_i C_{ij}为第i评价区第j种煤阶的煤炭资源量(t)

RF_{ij} 为第i评价区第j种煤阶煤中利用CO_2-ECBM技术煤层气的可采系数

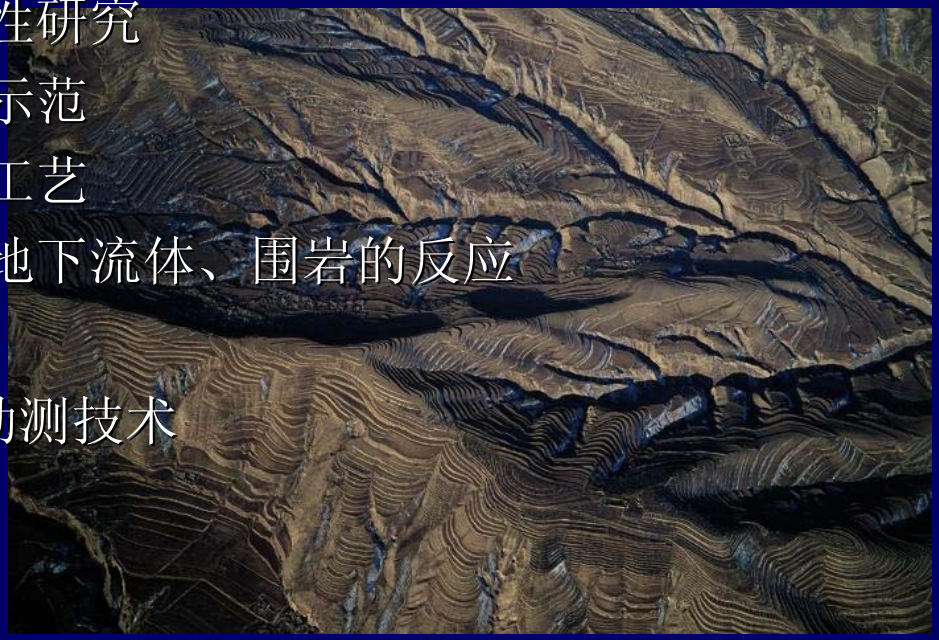
ER_{ij} 为第i评价区第j阶煤的CO_2/CH_4置换比例。RF和ER均为煤阶的函数，据Reeves

Fig. 17. 中国各煤田煤层气可采系数和CO_2/CH_4置换比

煤阶	*j*	*RF*	*ER*
褐煤	1	1.00	10.0
不粘煤	2	0.67	10.0
弱粘煤	3	1.00	10.0
长焰煤	4	1.00	6.0
气煤	5	0.61	3.0
肥煤	6	0.55	1.5
焦煤	7	0.50	1.0
瘦煤	8	0.50	1.0
贫煤	9	0.50	1.0
无烟煤	10	0.50	1.0

4. 重要科学技术问题

- CO_2地质埋存的机理研究
- 不同地质条件的建模试验
- 多相体系CO_2-水-岩石相互作用模拟
- CO_2在地下空间的运动规律研究
- CO_2地质埋存的安全性和可靠性研究
- CO_2地质埋存工程技术研究及示范
- 低成本捕集高纯度CO_2气体的工艺
- CO_2储存状态、稳定性及其与地下流体、围岩的反应
- CO_2储存对地下环境的影响
- 地球物理、地球化学、遥感勘测技术
- 监测技术



IMPORTANT TECHNOLOGIC PROBLEMS

- There are many scientific problems related to CO_2 geological sequestration. We must concentrate on several of them which are in dire need of solve and immediately effective, like the research of mechanism CO_2 sequestration, modeling test in different geological conditions, modeling the interaction among CO_2 , water and rock of heterogeneous system, the movement law research of CO_2 underground zone, the research of security and reliability for CO_2 sequestration, demonstration of geological sequestration technology
- Besides the selection of the sequestration points, we also should consider those technological problems as follow, like the seeking the low cost tech of catching high purity CO_2 , researching the deposited state and security of CO_2 , the influence of the reaction between subsurface fluid and wall rock and exploiting the technology of physical geography, geochemistry, telemetry and monitoring, etc

小 结 summary

- 中国CO_2地下贮存总容量为14,548亿吨

（其中：24个主要沉积盆地深部咸水层可埋存CO_2约为14,350亿吨，46个含油气盆地可埋存CO_2约78亿吨，68个主要煤层区可埋存CO_2约120亿吨）

- 中国地下空间容量可供中国CO_2埋存1000年以上

（按2002年CO_2总排放量为33-40亿吨的1/3的估算）

- Preliminary estimating, the total capacity of CO_2 sequestration is about 1454.8 billion tons in China., where, the deep saline aquifer of twenty-four main sedimentary basins' total capacity is 1435 billion tons, the total capacity of 46 petroliferous basins is 7.8billion tons, and the capacity of 68 main coal beds is about 12 billion tons
- Considering the one third of Chinese gross discharge of CO_2 in 2002 is 3 to 4 billion tons, the underground zone can be used over 1000 years for CO_2 geological sequestration