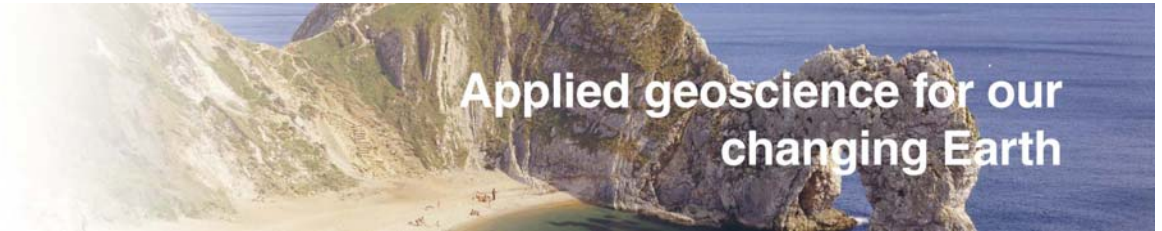




**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL



Challenges of CCS in developing economics

A comparison of CCS projects in China and South Africa

Ceri Vincent

Challenges in South Africa and China

- Approach to CCS in China and South Africa
- Projects and background
- Geological challenges
- Regulatory challenges
- Financial challenges



Approach to CCS - China

- Rapidly developing economy
- Reduction in carbon emissions is part of Chinese government's current 5 year plan for social and economic development – other options such as energy efficiency also important
- Emphasis on development of Chinese Technology and Intellectual Property
- International cooperation (eg China-EU MoU)
- Commonly an interest in EOR with CCS for economic reasons



Approach to CCS – South Africa

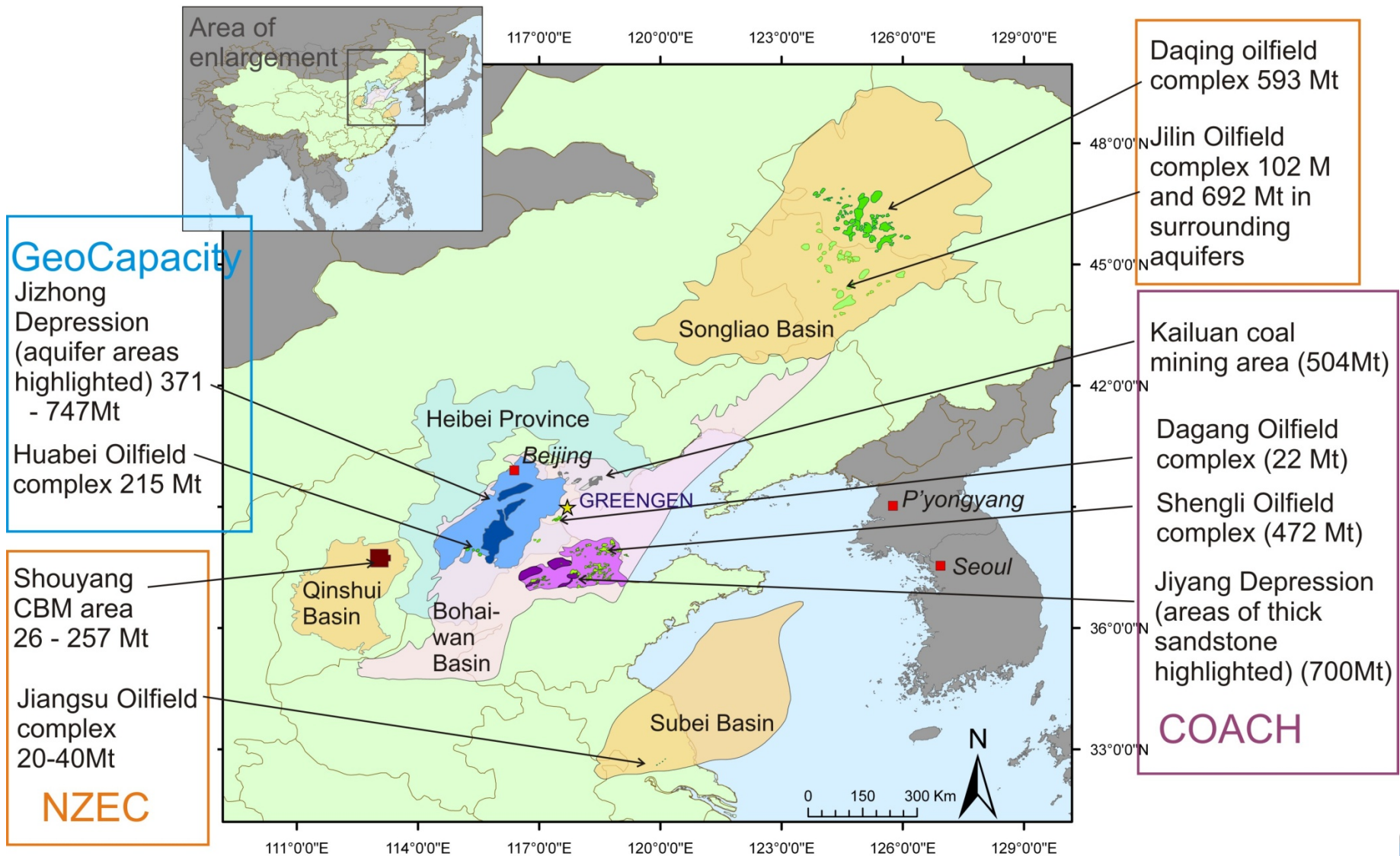
- Research on CCS and ‘green’ energy solutions (e.g. solar power)
- International cooperation
- South African National Development Institute (SANEDI)
 - set up the South African Centre for CCS (SACCCS) in 2009
 - and the Renewable Energy Centre of Research and Development (RECORD)
- Emphasis on job creation



Projects in China

- National projects – 973 and 863
- International cooperation projects





Basemap data taken from the Digital Chart of the World (1:1 million data), State province and basin outline (with the exception of Qinshui) reproduced with the kind permission of the USGS.

NZEC: <http://www.NZEC.info>, COACH: <http://www.co2-coach.com/>, GeoCapacity: <http://www.geology.cz/geocapacity>

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Projects in South Africa

- Projects fit into SACCCS roadmap to have test injection by 2016 and CCS demo by 2020 and deployment by 2025
- Geological Atlas considering all South Africa (CGS and PASA 2010)
- Detailed assessment of Zululand Basin for UK Department of Environment and Climate Change
- Scoping Study 2011 - 2012
- SAfECCS project 2011 - 2013

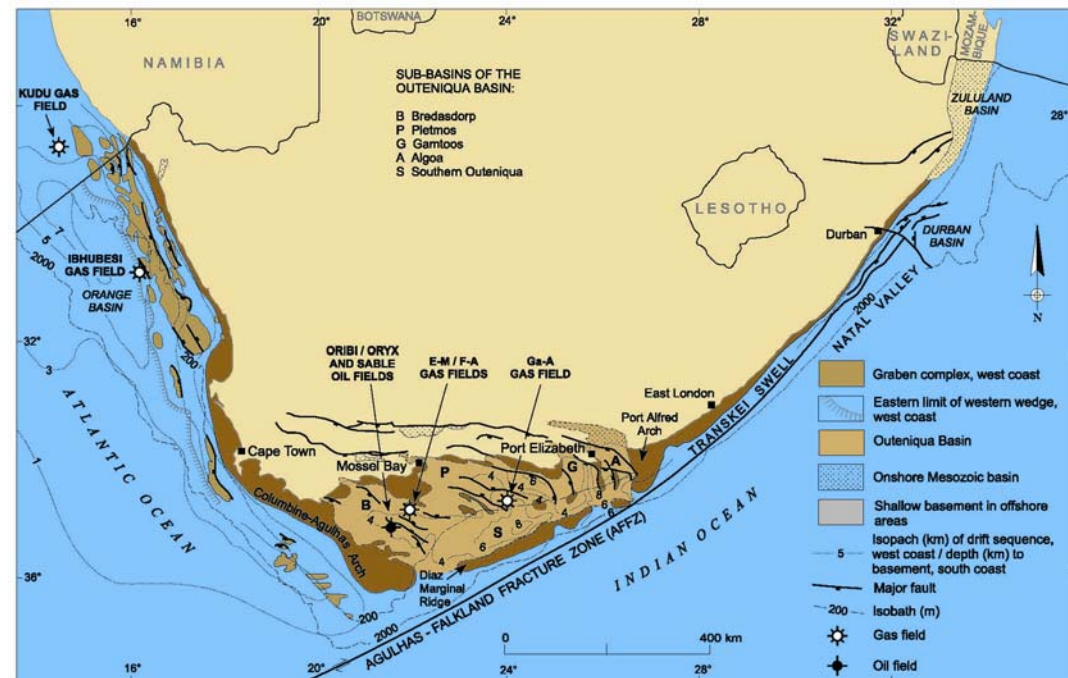
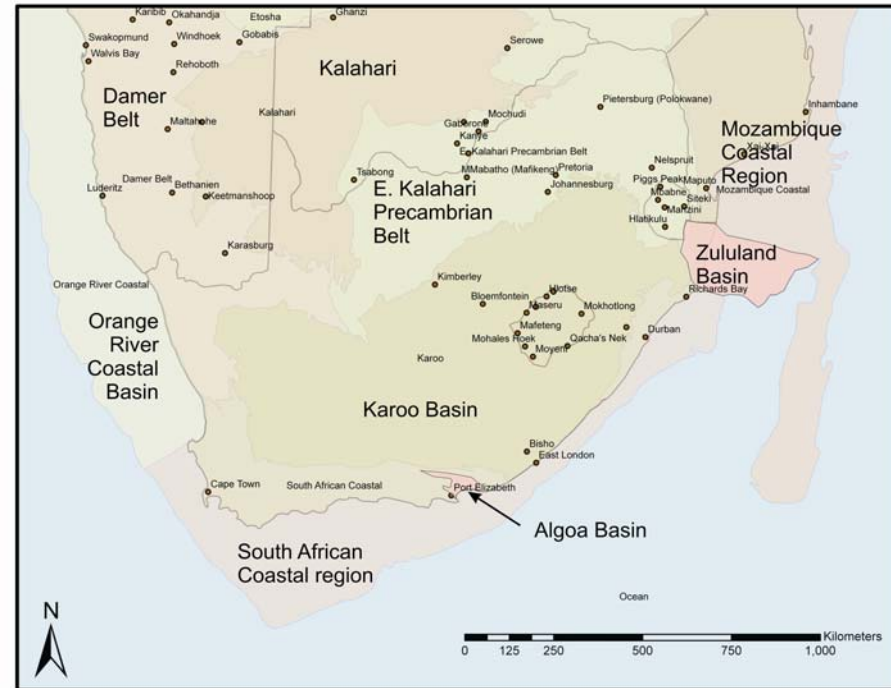


Image: Council for Geoscience

South Africa – Europe Cooperation on Carbon Capture and Storage (SAfECCS)

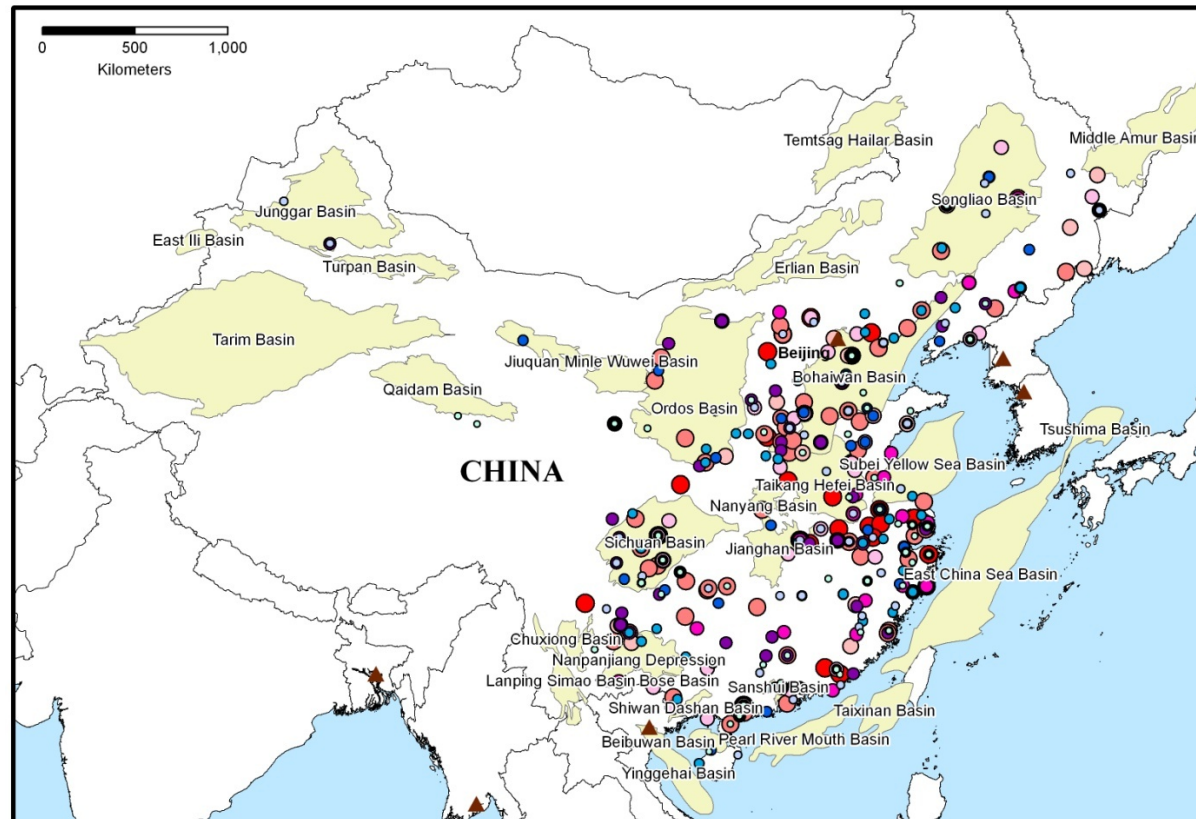
Main aims:

1. Capacity building
2. Prepare for test injection:
 - Geological assessment of ‘Test Injection’ site
 - Assess how test injection could take place under current regulations
 - Assessment of financial opportunities for CCS in South Africa.



Geological challenges - China

- non-marine basins, tight formations, compartmentalised by faulting and stratigraphy...

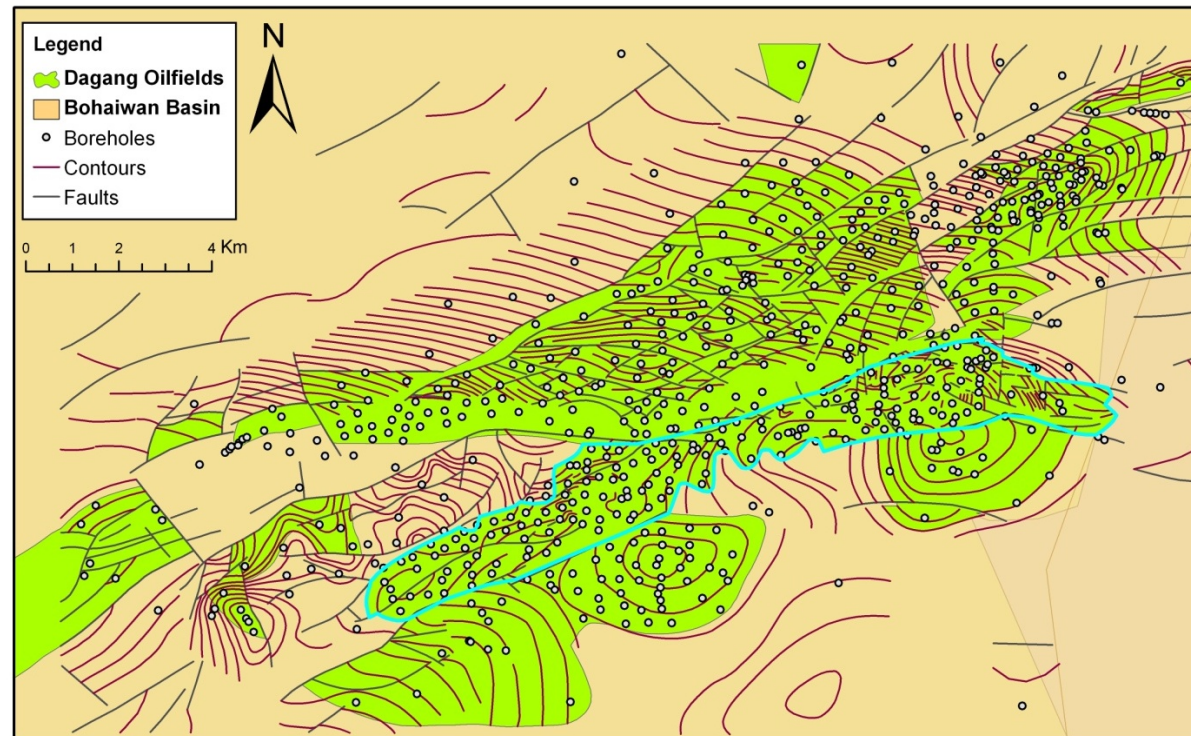


Example – Dagang Oilfield



Main issues:

- Boreholes
- Water flooding
- Compartmentalisation (by faults and lithology)



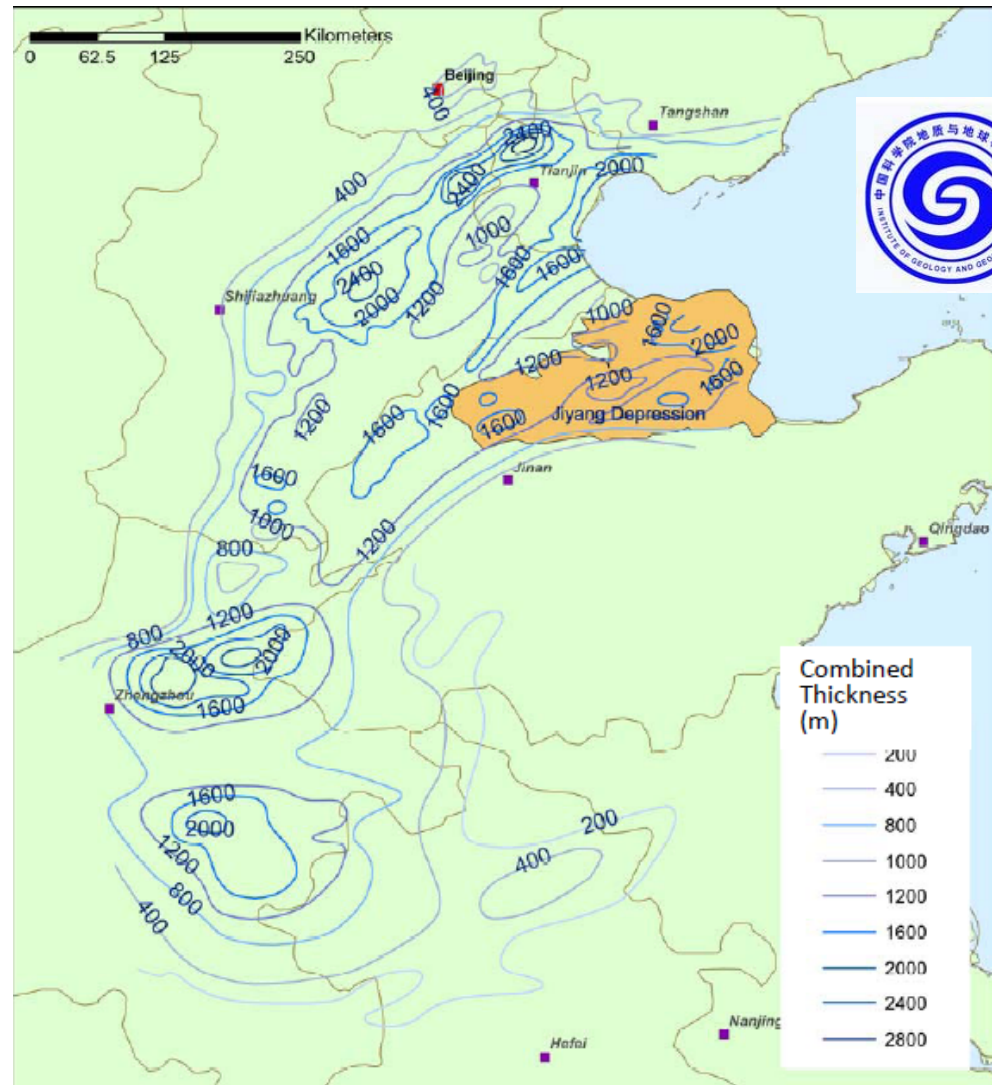
Proven oil-bearing area: 23.7km²
Gas-bearing area: 10.3km²

Example – aquifers

Main issue - sparse data

Using CSLF based-methodology, if 2% of the Guantao Formation pore space can be used in the Huimin sub-basin, storage capacity is 2700 MtCO₂

Isopach map of the combined thickness of the Guantao and Minghuazhen Formations (From L.J.Ye, 1983)



Geological challenges – South Africa

- shallow marine and some terrestrial sediments, uncertainty of integrity of caprocks, potential leakage pathways, igneous intrusions in some basins



Example – Algoa Basin aquifer sites

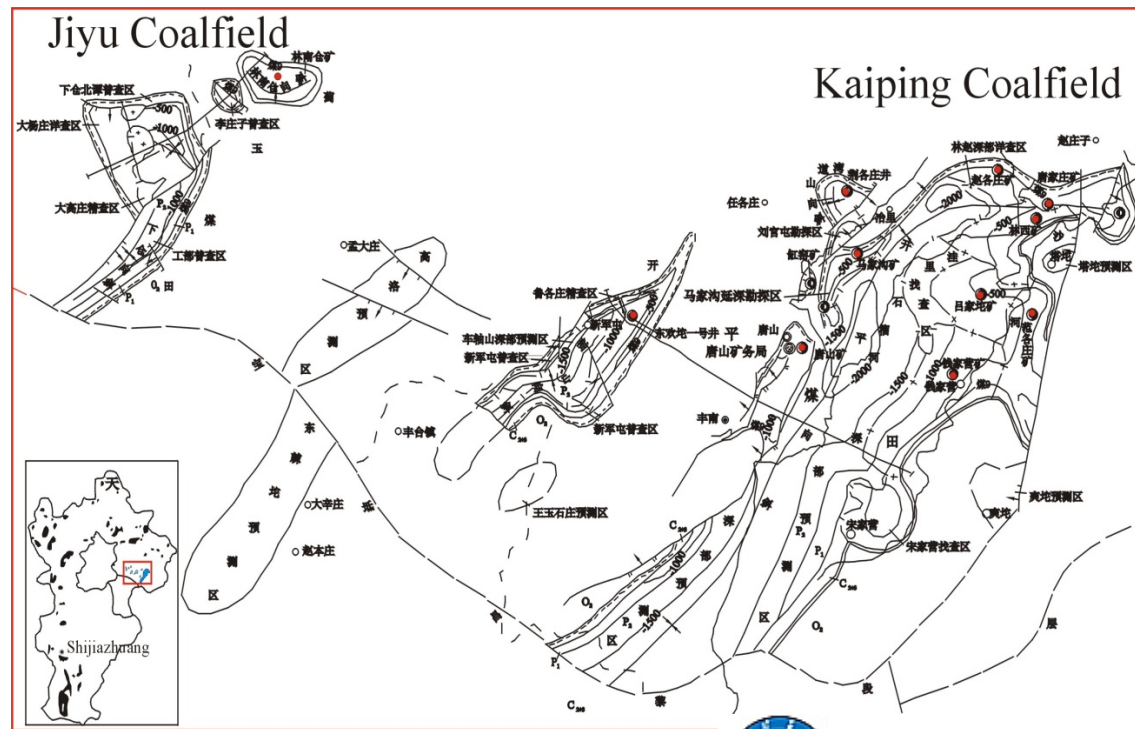
- Sandstones laterally bounded by faults or lensing into shales or siltstones
- Many sandstone layers that are a few metres thick with lower permeability layers in-between



Interbedded sandstone lenses (yellow-brown) with shale (purple-brown) of the Kirkwood Formation (photo courtesy CGS)

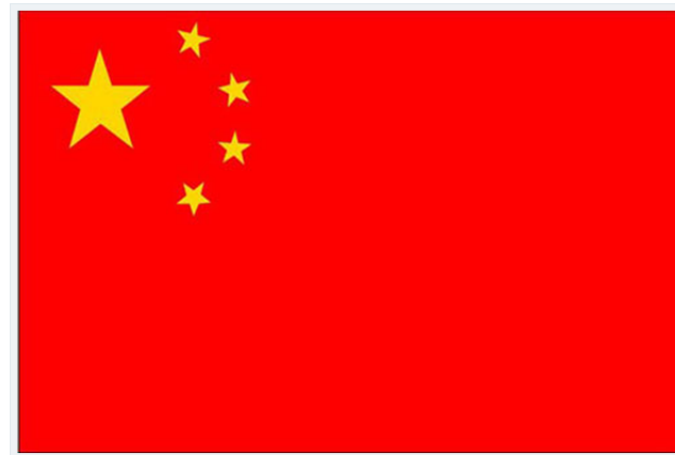
Use of pore space/energy reserves – China and SA

- Potential for contaminating future energy reserves of coal China and South Africa



Regulatory – China

- CO₂ storage carried out in tests and pilot projects (eg Shenhua DCL plant where captured CO₂ is stored in the Ordos Basin)
- CO₂-EOR tests carried out (eg Jilin oilfield complex)
- Policies considering CCS - possible Cap and trade being discussed



Regulatory – South Africa

- SAfECCS project investigating if CCS can be carried out under existing legislation
- As there is no specific CCS legislation, then a number of laws governing disposal of waste and land ownership are likely to be relevant
- Current discussions on policy...could change soon!



Financing

- Financing - cost of CCS and how to pay for or subsidise it
- International financing mechanisms – grants, loans, research funding....
- National funding mechanisms
 - eg National Basic Research Programme (also known as Project 973) in China and
 - SACCCS funding in South Africa (funding is provided by government and private companies and distributed by SACCCS)



Other challenges

- Data access/availability
- Transporting the CO₂ – both distances involved and regulatory issues
- Access to the site at surface – protected areas (eg one of the sites highlighted by the SAfECCS project is near a protected nature conservation area)



Summary

- Both China and South Africa are moving forward rapidly in investigating the potential for CCS
- Many challenges for all countries working on CCS – geological, political, financial – we need to work together



Thank you

