

Final report in Geoscience Australia

Six months' study and communication in Geoscience Australia is a very important experience for me. I have achieved much knowledge under the guide and help of Dr. Wang Liuqi, Rick, Jessica and other workmates in Geoscience Australia. It is a good chance to summarize my work and gained achievements in Geoscience Australia.

1. Relationship between reactive surface area and grain diameter

I mainly carried out the literature review work of numerical modeling for the CO₂ storage in the first month. I have read about 30 papers in this period and fitted the relationship between the reactive surface area and grain diameter of calcite, anorthite and kaolinite by using the experimental data of the literatures above. In the meantime, Dr. Wang has given me some speeches about the numerical and experimental investigations on CO₂ storage. The specific surface area of anorthite was displayed below:

$$\log S = -1.19542 \log D + 8.44891 \quad (1)$$

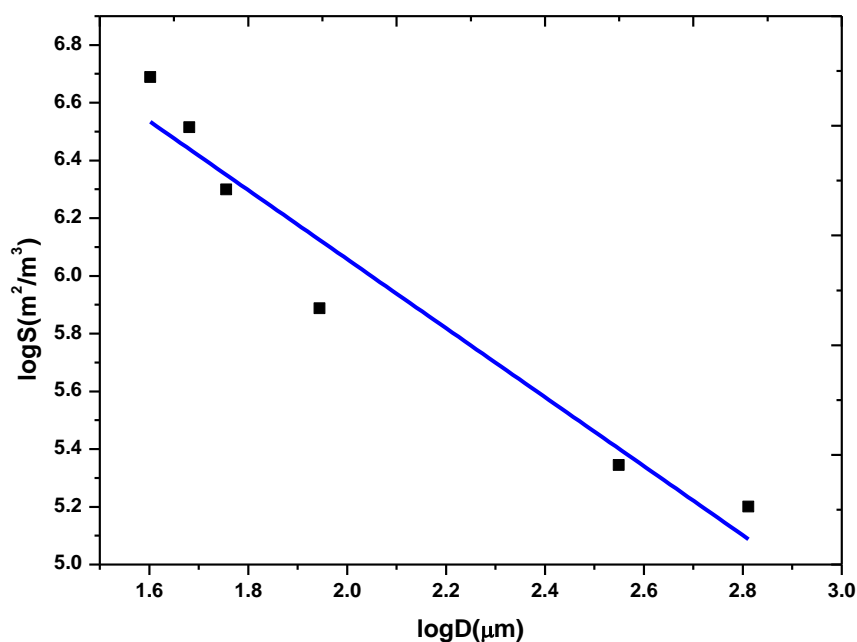


Fig. 1 Specific surface area of Anorthite

2. Experimental work

In the following month, I mainly investigated the experimental result which is carried out in Tsinghua University. I dealt with the experimental results and judged whether the data is right or not. And I tried to research the displacement characteristic when the supercritical CO₂ was injected into the water-saturated sandstones with various injection rate and injection ratio of CO₂ and water. MRI was used to measure the water saturation and visualize the displacement process. Dr. Wang has given me much advice.

3. Numerical work on solution trapping of CO₂

I began to do the numerical investigations using the GEM-CMG software in the third month. I have spent 2 weeks to study the basic apply of the software. And then I started to investigate the effect of relative permeability model on the solution trapping of CO₂. Corey model and Parker model were used to investigate the solution trapping of CO₂ with different parameters. According to the numerical result, I have written a Chinese paper. Some results were displayed as below:

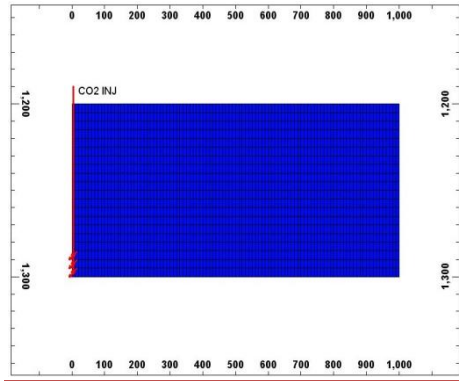


Fig.2 Numerical model

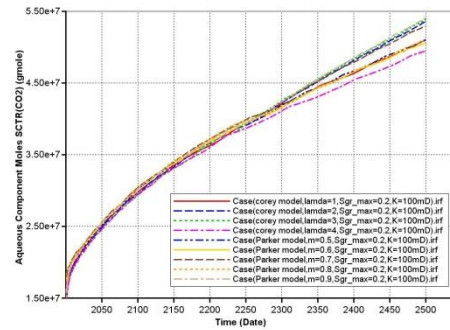


Fig.3 Aqueous CO₂ for different models

4. Numerical work of reactive surface area effect on mineralization trapping of CO₂

I have investigated the effect of reactive surface area on mineralization trapping of CO₂. According to the equation (1), I have calculated six different reactive surface areas and then put into the CMG software. According to the results, I have written a paper. Some results were displayed as below:

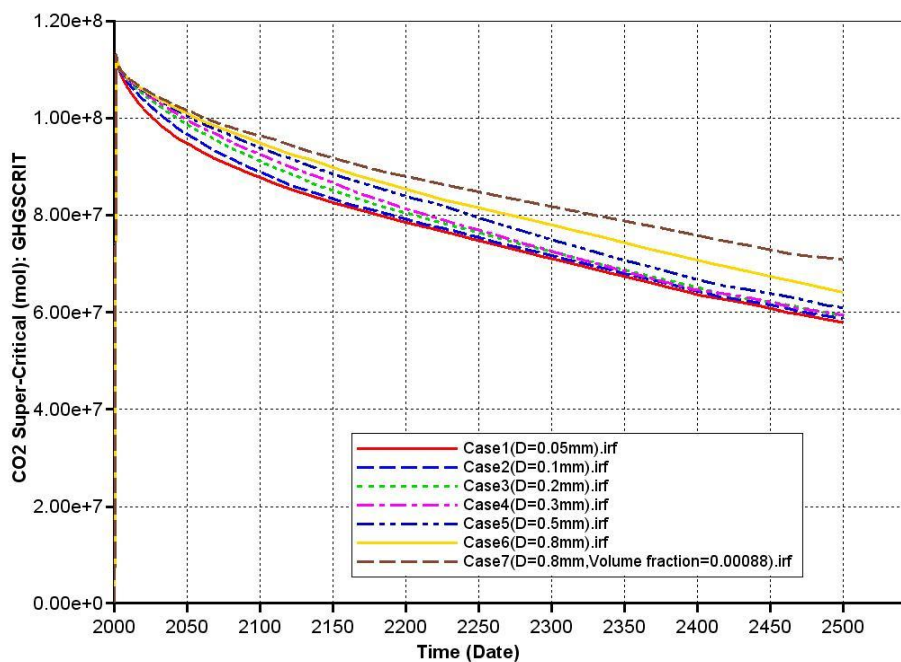


Fig. 4 Quantity of Supercritical CO₂

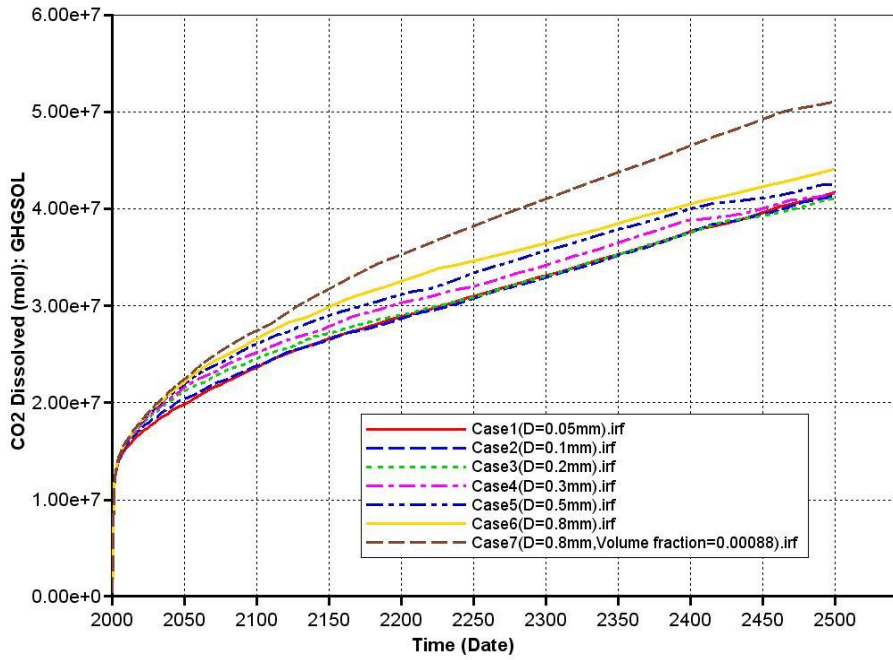


Fig. 5 Quantity of Aqueous CO₂

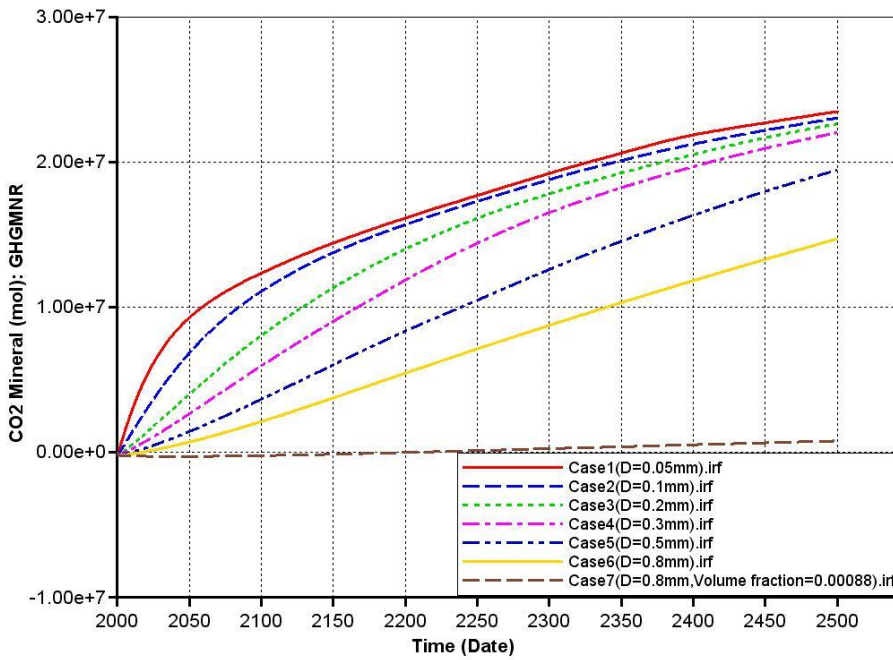


Fig. 6 Quantity of Mineralized CO₂

5. Visit on Otway project and Australian National University

During these six months, I have visited the Otway project which is a demonstration project in Victoria State. I have gained the knowledge on practical project of CO₂ storage in saline aquifers. And I have also visited the digitalcore lab of Australian National University. From the visit, I have studied the role of advanced micro-CT on CO₂ storage and petroleum industry.

6. Achievements

I have written two papers in this period, including a Chinese paper and an English paper.

Acknowledgement

I carried out this study in Geoscience Australia sponsored by CAGS (China-Australia Geological Storage of CO₂ Project). Thanks for the sponsorship of CAGS project. Thanks for the guide and help of Dr. Wang, Rick, Jessica and other workmates in Geoscience Australia. I have achieved so much and felt very happy in Australia.