

An Indian-Australian research partnership

Project Title: **Investigation of induced seismicity in CO₂ enhanced oil recovery**

Project Number **IMURA0758**

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Earth Sciences

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST <u>one</u>. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Earth Sciences and Civil Engineering (Geo, Water, Climate)	1	Advanced computational engineering, simulation and manufacture
		2	Clean Energy

The research problem

CO₂ injection into oil reservoirs to enhance oil recovery (EOR) is a mature technology in use for over 40 years. With the recent increase in interest in carbon sequestration to reduce concentration of carbon dioxide in the atmosphere and combat climate change, CO₂-EOR can also act as a viable option for permanently sequestering CO₂, since a large portion of the injected CO₂ remains in place in depleted reservoirs. However, fluid injection also increases risk of induced seismicity, which has been observed during seismic monitoring of CO₂-EOR projects. Apart from the obvious seismic hazard, induced seismicity also presents a possible leakage risk from fracturing of caprock. These risks need to be investigated further with a focus on optimizing CO₂ storage rather than maximizing oil recovery, for CO₂-

EOR to become successful as emissions mitigation tool.

Project aims

The project aims are as follows:

1. In-depth understanding of coupling between fluid flow and mechanical deformations in porous media.
2. Investigation of the geo-mechanical response of injecting CO₂ in depleted reservoirs.
3. Mechanical modelling of induced seismicity and fracture propagation.
4. Investigation of the effect of induced seismicity on caprock integrity.
5. Coupled thermo-hydro-mechanical simulation of storage formation and caprock in association with CO₂ sequestration

Expected outcomes

The present study would help in understanding the physical processes responsible for induced seismicity associated with CO₂ sequestration in enhanced oil recovery. This would assist in assessing the potential risks involved and ways to mitigate them during CO₂ injection. It would also help in discerning the effects of mechanical deformations on caprock integrity and potential leakages due to them. Consequently, the study would help in evaluating the potential of the technology as a carbon sequestration tool in the future.

How will the project address the Goals of the above Themes?

This project addresses the themes like clean energy, and advanced computational engineering, simulation and manufacture.

Capabilities and Degrees Required

A BTech/M.Tech degree in Geology, Geophysics, Mechanical, Petroleum Engineering. Background in numerical modelling will be preferred.

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Geo Science,geotechnical,geomechanics (7)
Modelling and Simulation (37)