

An Indian-Australian research partnership

Project Title:	Geomechanical modelling of flow and deformation in coal measure rocks	
Project Number	IMURA0652	
Monash Main Supervisor (Name, Email Id, Phone)	Dr. Jayantha Kodikara jayantha.kodikara@monash.edu	<i>Full name, Email</i>
Monash Co-supervisor(s) (Name, Email Id, Phone)	Dr Ha Bui	
Monash Department:	Civil Engineering	
IITB Main Supervisor (Name, Email Id, Phone)	Dr. V. Vishal v.vishal@iitb.ac.in	<i>Full name, Email</i>
IITB Co-supervisor(s) (Name, Email Id, Phone)	Dr. T. N. Singh tnsingh@iitb.ac.in	
IITB Department:	Earth Sciences	

Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure Engineering

The research problem

The unconventional sources of hydrocarbons such as coal and shale have gained significant attention in the recent years. Fast track research and development have taken place in over the past two decades to understand the process of identification of suitable source rocks and that of enhancing the extraction of the oil and gas from those. It is estimated that enormous volumes of hydrocarbon are stored in coal and shale around the globe; however, the challenges are more to extract them. Unlike the conventional sources which have been studied in extensive details for more than a century, coal and shale are relatively less understood. The long term stable extraction process will depend on the know-how about the geomechanical response of these rocks during gas flow, deformation related to extraction and the overall stability of the system.

This study will focus on numerical and analytical modelling of the various geomechanical processes during fluid flow in the unconventional reservoirs.

Project aims

The project aims are as follows:

1. Develop numerical models on hydro-mechanical changes of coal and shale during methane extraction
2. Develop analytical models based on the governing equations on deformation of rocks coupled with fluid flow
3. Generation and propagation of fractures during induced fracturing at variable pressure regimes will be modelled
4. Identify the missing components in the existing models and couple with various geomechanical phenomenon for the new models.
5. To investigate the possible CO₂ storage for enhanced methane extraction.

Expected outcomes

The project will provide solutions to predict the gas flow behaviour and the deformation in the reservoir during extraction and upon depletion. The models will be useful for the oil and gas community in designing methods for enhanced extraction of hydrocarbon

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

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

Capabilities and Degrees Required

Capability in numerical/analytical modelling and background in engineering geology, civil or mining engineering is desired.

Potential Collaborators

Please provide a few key words relating to this project to make it easier for the students to apply.

Numerical modelling, Analytical modelling, Geomechanics, Coal measure rocks