

TRACING HYDROCARBONS IN THE BIGHT

At a glance

Project title

Fluid inclusion study

Project summary

To reveal hidden oil systems in the Bight Basin as potential sources for coastal bitumen strandings.

Project investigators

CSIRO

Program partners

CSIRO, BP, SARDI, the University of Adelaide and Flinders University are working on a \$20 million research program to better understand the environmental, economic and social value of the Great Australian Bight.

Project contacts

Dr Richard Kempton
CSIRO

E: Richard.Kempton@csiro.au

Overview

Oil and gas are critical to Australia's energy needs and major contributors to the Australian economy.

The Great Australian Bight may contain valuable hydrocarbon resources, however a better understanding of the petroleum systems is desirable before commercial activities begin in these deep and remote waters.

This project will use techniques developed by CSIRO to investigate oil 'hidden' within microscopic fluid-filled cavities (fluid inclusions). These have previously shown evidence for the movement of oil and gas in the area.

The researchers will examine key petroleum exploration wells from archived rock material to gain a basin wide understanding of the movement of hydrocarbons, their composition and when this occurred.

The findings will be of importance to associated studies seeking potential sources for natural seeps and coastal bitumen strandings (asphaltites and tar balls) and examining baseline hydrocarbon loading in the Bight.

The Challenge

The Bight Basin is an under explored frontier basin with limited evidence for oil and gas. Many existing wells were drilled prior to this century and often missed their intended targets. Despite this, historic evidence for coastal bitumen strandings around the Great Australian Bight have been linked to potential undiscovered oil deposits.

Large-scale investments will be required by explorers to locate hydrocarbon deposits in this remote area. Decisions on where to look are guided largely by remotely sensed data and models. The challenge is to find tangible evidence for oil and gas in the rocks of the Bight as a way to calibrate these petroleum system models.

Fluid inclusions offer a unique way to track the movement of hydrocarbons in the rocks beneath the oceans, even when there is no other physical evidence. Because hydrocarbon fluid inclusions are 'untainted' specimens – trapped in minerals and preserved in time – they record the historic origins and movement of oil and gas in basins. They can provide information about migration, type and composition of hydrocarbons present, their conditions of entrapment (such as pressure and temperature) and when in time they were trapped.



Above : GOI™ (Grains with oil inclusion) workstation for identifying oil inclusions.

The Research

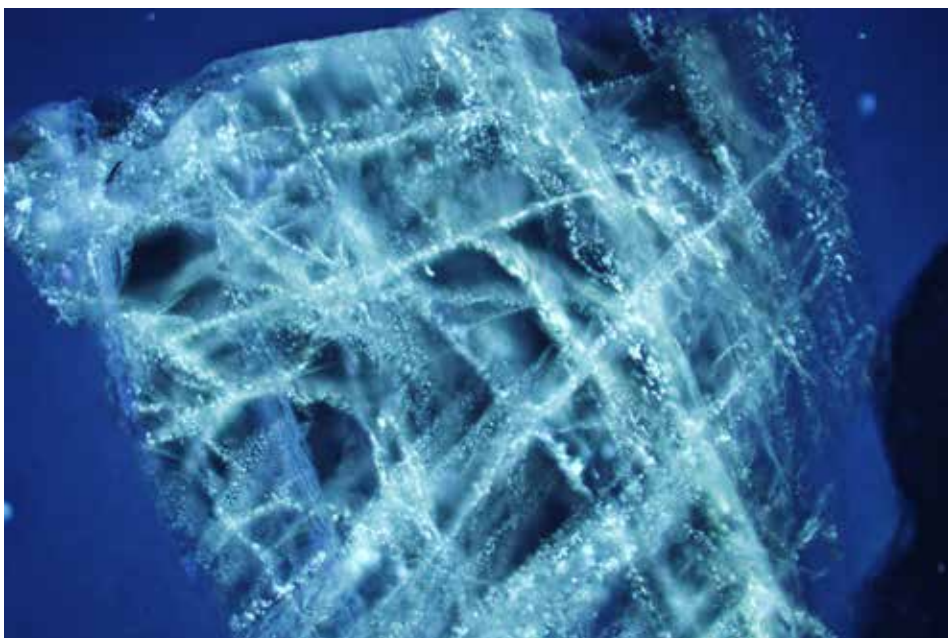
CSIRO has developed world-leading capability in fluid inclusion research for petroleum applications. This includes the patented GOI™ (Grains with Oil Inclusions) technology. The project will use this to detect hidden oil shows in rocks retrieved from archived samples collected from previous drilling in the Bight. The work will augment previous studies carried out by CSIRO, with a particular focus on the untested Gnarlyknots-1A well.

The tiny amounts of liquid hydrocarbon contained within these inclusions will be extracted for molecular fingerprinting using the Molecular Composition of Inclusions (MCI) technique. The molecular typing of any hydrocarbons will contribute valuable geochemical information on potential source rocks in the Bight and for linkage with studies addressing the origin of coastal bitumen strandings.

Novel petroleum inclusion thermodynamic models will extract as much possible information on the pressure and temperature conditions at which oil and gas was trapped. From this their age can be constrained.

Above right: Identifying traces of oil in sediments, such as sand grains from beneath the ocean floor (above right), increase our understanding of the movement of hydrocarbons in the Great Australian Bight.

Below: Predicting oil quality and type is important for exploration.



The Impact

Understanding the petroleum systems in the Great Australian Bight, by direct measurement from fluid inclusions, will help build a picture of how oil and gas evolved and moved through the rocks of this largely unexplored region. Unlocking this information allows petroleum system models to be calibrated from the rocks, which has implications for prospectivity in the region.

The ability to fingerprint the molecular composition of liquid hydrocarbons will contribute to the understanding of baseline hydrocarbon loading in the Great Australian Bight and potential sources for some of the coastal bitumen strandings.

The People

Dr Richard Kempton of CSIRO is a geologist who investigates fluid flow in sedimentary basins using fluid inclusions. His interests focus on understanding the step-wise fill history of petroleum reservoirs in previously unseen detail, which have positioned CSIRO as a leader in the application of fluid-inclusion based methods for reducing exploration risk.

Dr Julien Bourdet of CSIRO is a geologist and specialist in oil and gas fluid inclusions. His interests focus on better understanding the physical conditions of oil migration and accumulation processes and how fluids evolve at the microscopic level. He is currently investigating new Raman-derived techniques for pore-water salinity and deriving pressure from gas inclusions.

Dr Se Gong of CSIRO is an organic geochemist. Her interests focus on understanding the molecular composition of oil trapped within fluid inclusions and their origin. She is working to develop new technologies to analyse the molecular and isotopic composition of gases from fluid inclusions.



For more information

Dr Steven Lapidge
Great Australian Bight Research Director
steven.lapidge@sa.gov.au

www.misa.net.au/GAB

