Fluid History—Oil charge analysis

CSIRO develops and applies innovative techniques to investigate the movement of hydrocarbons in petroleum reservoirs and sedimentary basins at geological and production time scales, by analysing rocks and associated fluids at the micro-scale

Expertise

The team has multi-disciplinary skills in:

- petroleum geosciences.
- specialists in fluid inclusion studies.
- petrography/diagenesis.
- micro-thermometry.

Oil-filled fluid inclusion

The research team works closely with both CSIRO's organic geochemistry team, that analyses the molecular composition of oil inclusions (MCI), and structural team, that investigates trap integrity, to provide a complete fluid history analysis capability.

Facilities

We have access to unique facilities to conduct research and provide analytical services. CSIRO owns and operates:

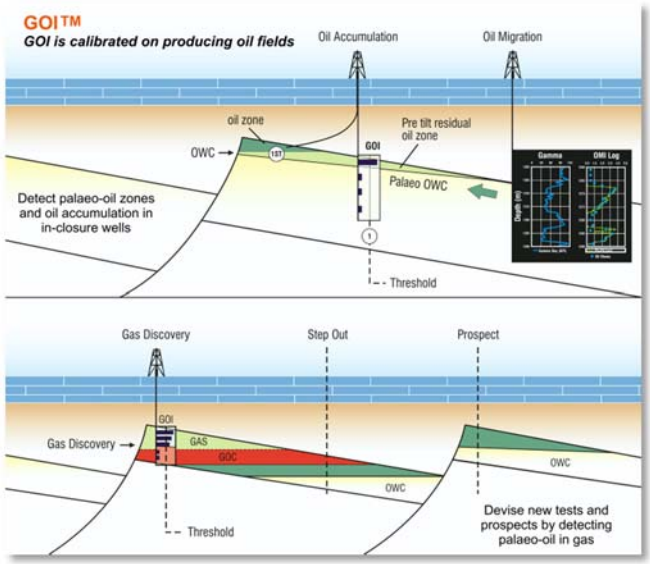
- patented and exclusive technologies with data acquisition and interpretation work flows:
  - GOI™ (Grains with Oil Inclusions).
  - ROI™ (Resistivity from Oil–water Inclusions).
- an extensive database of GOI™ data in Australia.
- a fully equipped fluid inclusion laboratory with:
  - CSIRO GOI™ microscopy work stations.
  - Linkam Scientific micro-thermometric heating/freezing stage.
  - Horiba LabRam HR Evolution Raman spectrometer.

GOI™ workstation for petroleum inclusion analysis

Applications

These technologies have direct application to the petroleum industry in the fields of:

- detection of palaeo-oil zones and potential for nearby oil prospects.
- delineating palaeo-oil water contacts (P-OWC).
- detection of oil migration in out-of-closure wells.
- regional oil charge prediction.
- oil reserve estimation (irreducible water salinity).



GOI™ applications

Our collaborators

Our team has established extensive partnerships with other research groups within CSIRO to deliver a multi-disciplinary approach to our work. We also collaborate with other Australian and international research organisations.

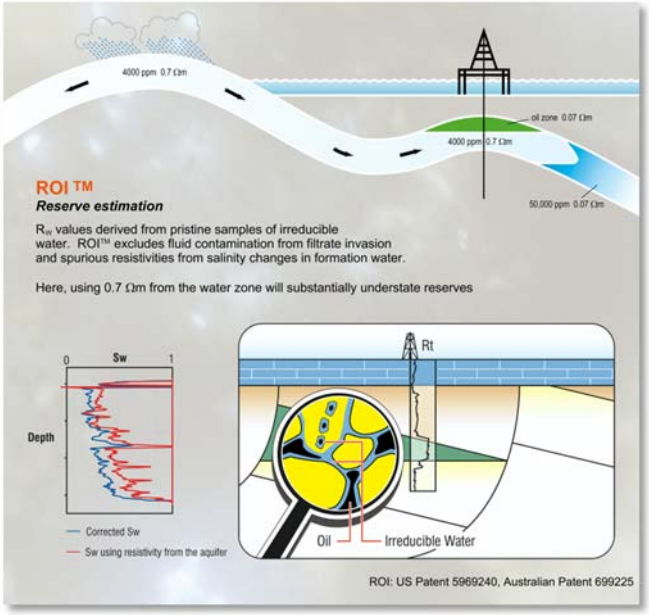
- Geoscience Australia, Petrobras (CENPES)

We deliver commercial services to the petroleum industry with over 140 partnerships worldwide.

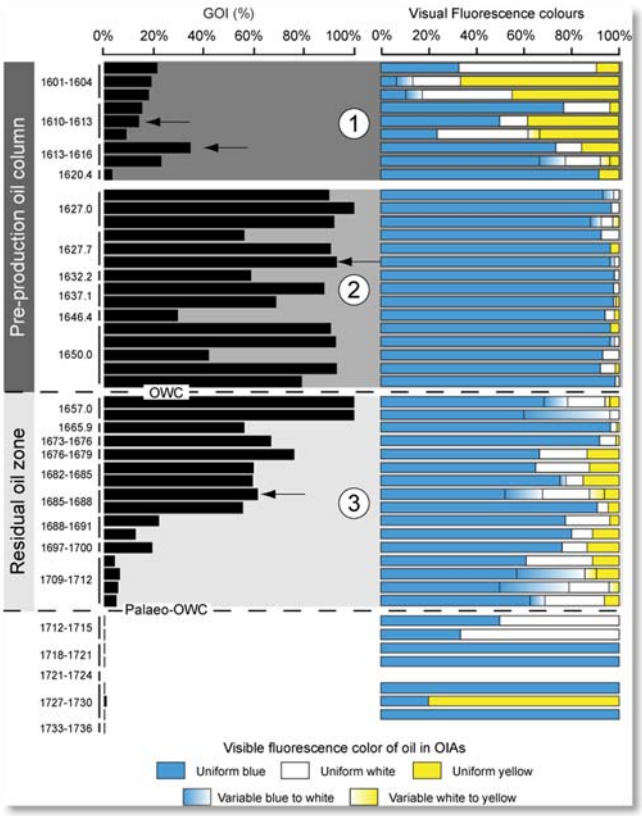
- Eni, BP, Chevron, Santos, Inpex, plus many others.

Case study—Jabiru-1A oilfield

A fluid inclusion (GOI™) study of the Jabiru oilfield, Timor Sea (Australia), shows that the oil column was filled to greater depths in the past. The variability in the attributes of oil inclusion assemblages (OIAs) in the palaeo-oil zone can be mapped to identify internal structures that result from fluid interactions in the reservoir. Variability in the OIAs is greatest within an inferred palaeo-gas cap (Zone 1) and current residual zone (Zone 3) and less within the current oil zone (Zone 2). These are explained by in-reservoir processes like drainage of oil and interaction with gas. These processes, which are often hidden, are important for an understanding of the charge component of the accumulation and retention history and for reducing exploration risk—"Bourdet et al. (2012) Marine and Petroleum Geology, 36(1), 118-139".



Reserves estimation using ROI™



Fluid inclusion abundance (GOI) profile, Jabiru-1A, Timor Sea

Getting involved

The expertise and technologies of the Geofluids team can be accessed through:

- routine commercial consulting services.
- collaborative research.
- technical support.
- technology and laboratory system licensing and training.

Key contacts

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