Rapid geological modelling for the Surat Basin based on well logs

Visiting Academic

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Research purposes

Resources estimation and numerical simulation of coal seam gas reservoirs depends on precise 3D geological models. The 3D modeling uses coal seam gas reservoir exploration and development data.

This research looked at:

- How to collect, collate and extract useful data faster from scattered drilling, logging and laboratory reports.

- How to improve the quality and accuracy of 3D geological modelling to increase reliability and reduce uncertainty.

3D geological models

Automatic ↑ Intelligent

- Computer programming
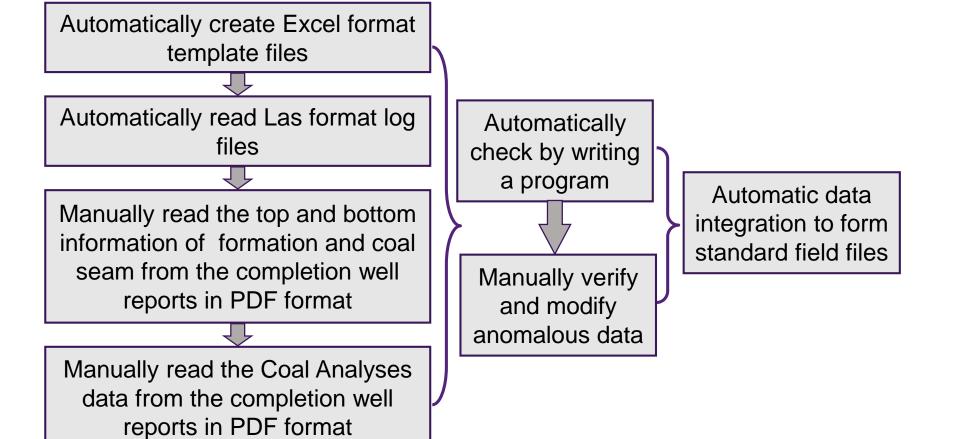- Mathematics & geometry
- Artificial intelligence

Multi-source data

Location of experimental gas fields

The research was focused on the Surat Basin. 147 wells in the Lauren area and 348 wells in the Condabri area (Figure 1) were used in the 3D rapid geological modelling.
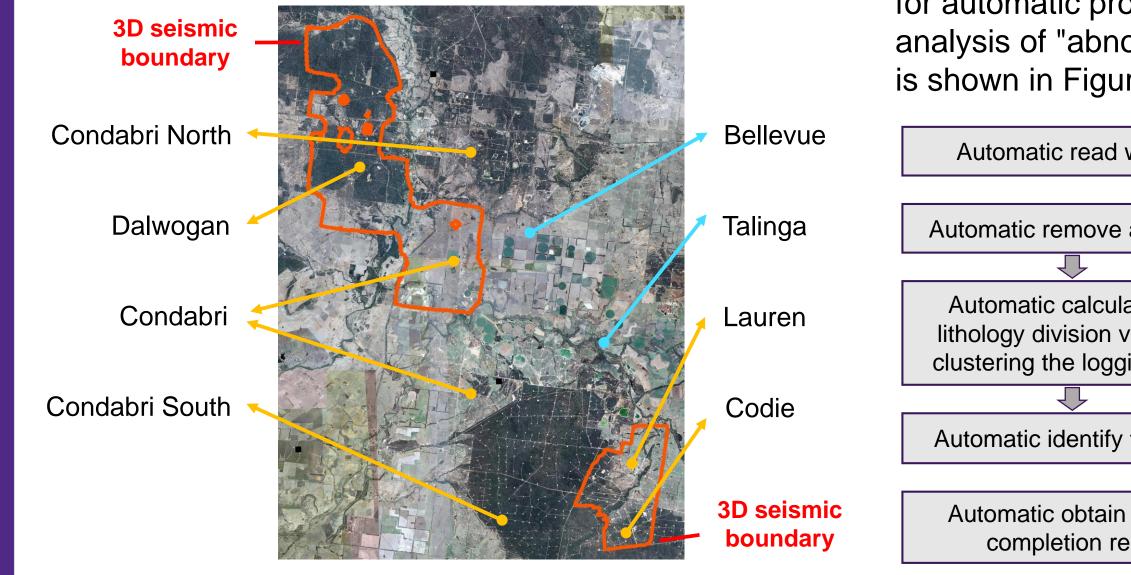

Figure 1: Location of Condabri and Lauren in the Surat Basin

Methodology for drilling and logging data rapid processing

Big data processing requires the use of computers where possible. The workflow of drilling and logging data rapid extracting is shown in Figure 2.

Figure 2: Framework and workflow of drilling and logging data rapid extracting

The re-analysis of logging data and optimisation of stratigraphic boundaries are essential for improving the accuracy of 3D geological models. The workflow for automatic processing is shown in Figure 2. The analysis of "abnormal" data and the removal process is shown in Figure 4.
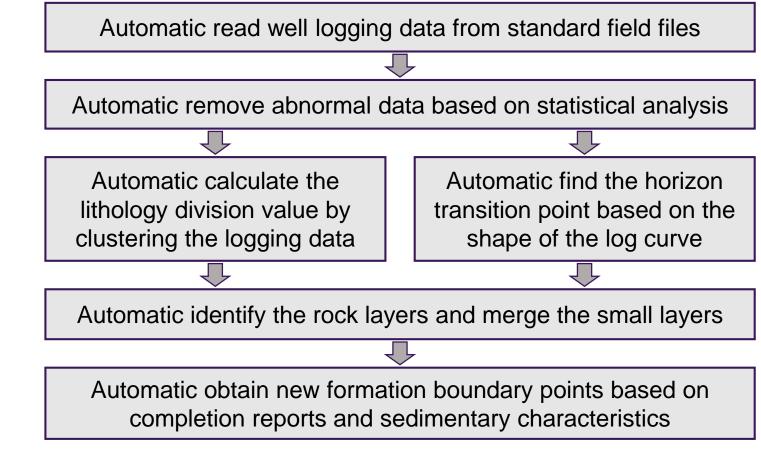

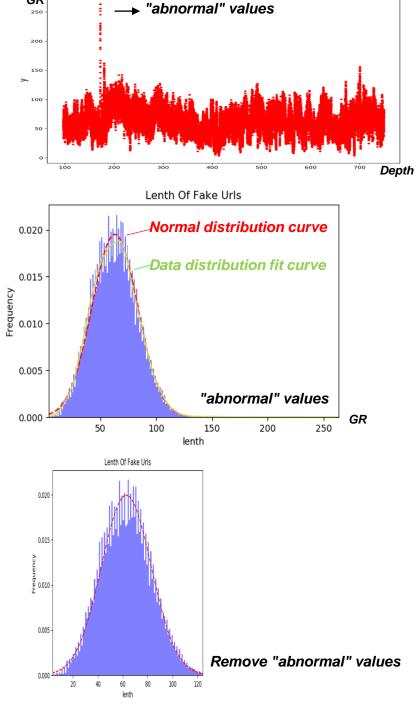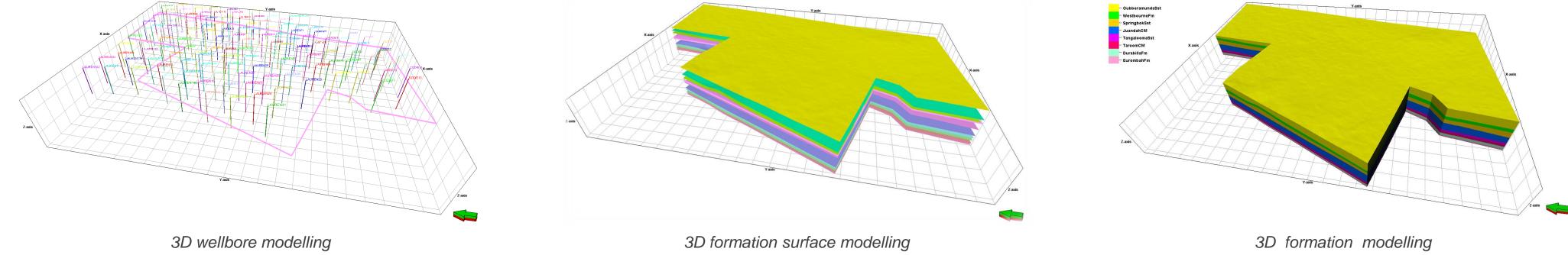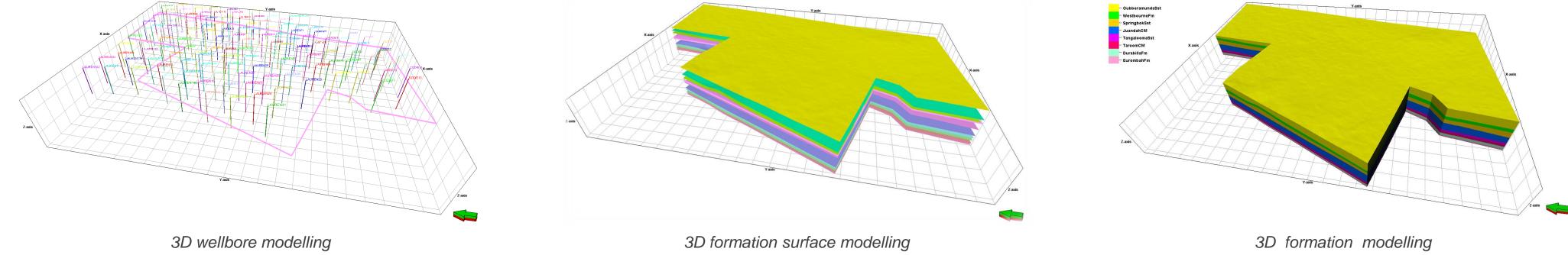*Figure 3: Workflow for automatic re-analysis of logging data*

Figure 4: The process of automatic analysis and removal of "abnormal" data

Results of 3D geological modelling

The processed drilling and logging data can be automatically exported to a Petrel format file to support rapid geological modelling (Figure 5).
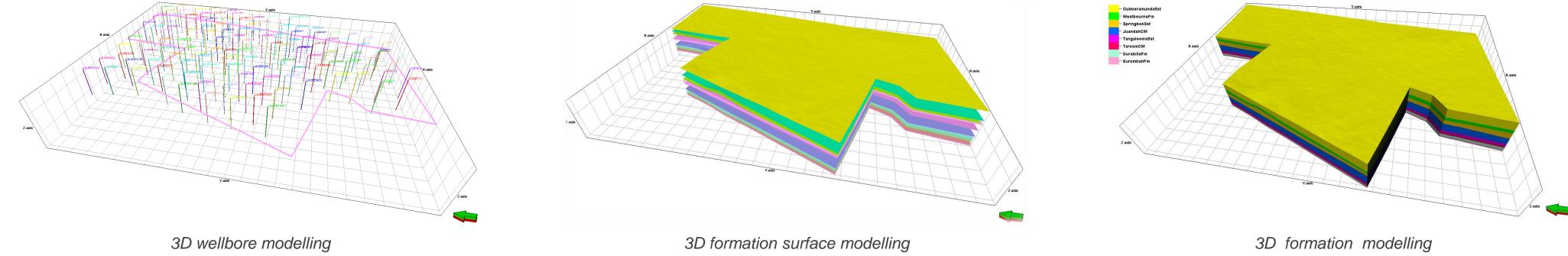

3D wellbore modelling   3D formation surface modelling   3D formation modelling

Figure 5: Experimental results of rapid 3D geological modelling of the Lauren gas field in the Surat Basin

Future goals

- Create a high-resolution 3D geometric and properties model of the Walloon Measures.

- Combining 3D seismic data to improve the accuracy of 3D geological geometry models.

Research with real world impact

REDUCE COST   INCREASE SUPPLY   ENVIRONMENTAL PERFORMANCE   SOCIO-ECONOMIC & TRANSPARENCY