The Walloon-Birkhead Transition – Changes in coal and interburden character

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1. Project description

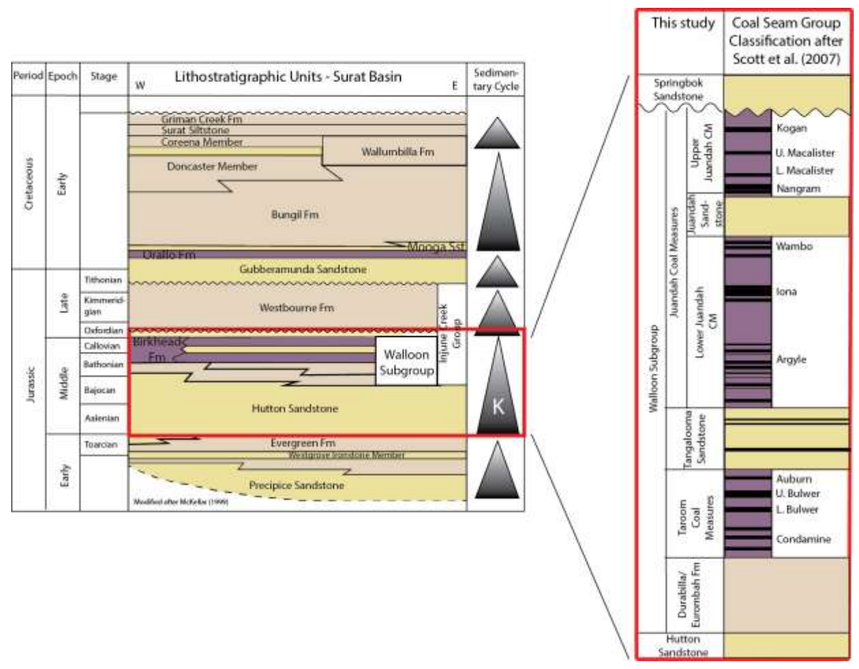
The aim of this project is to evaluate the variability in coal and interburden character of the Surat Basin's Walloon Subgroup across the Surat Basin and the Nebine Ridge to the west, where the Walloon Subgroup passes laterally into the Eromanga Basin's Birkhead Formation.

This will be achieved through an integrated study of the sedimentology, sediment dispersal patterns and provenance, and coal composition and geochemistry across the Walloon-Birkhead transition. To assist with a more confident correlation of sub units and to test existing basin-wide correlations, chemostratigraphic and biostratigraphic markers are required.

The results of this study will help to overcome uncertainties associated with the Surat Basin stratigraphy and inter-well correlation for highly variable coal measures such as the Walloon Coal Measures, and it will provide valuable insight into their depositional environment and palaeomire conditions.

2. Background

Figure 1 (right): Surat Basin stratigraphy (modified after McKellar (1998), Hamilton (2012), Hoffmann et al. (2009) and Scott et al. (2007)). The triangles are meant to represent base level sequences. Note: A recent study by Wainman et al. (2015) suggests that the Walloon Coal Measures are Oxfordian in age.



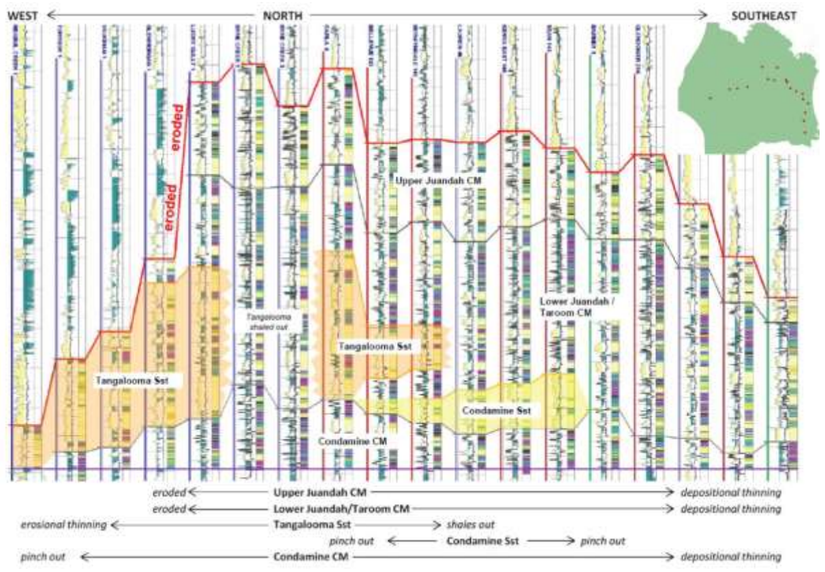


Figure 2 (left): Cross-section from west to north to the southeast of the Surat Basin (Sliwa et al., 2014; OGIA). Note: The Juandah Coal Measures are eroded by the Springbok Sandstone in the western Surat Basin, the Taroom Coal Measures pinch out towards the Nebine Ridge in the west. The Tangalooma Sandstone shales out in the north. The correlations shown here will be tested in this study.

3. Methodology

Characterisation of coals	Characterisation of interburden
Petrography*	Hyperspectral scanning (Hylogger™)
Organic isotope analysis*	Sedimentary logging
Lithotype logging	X-ray diffraction (XRD)
Phyteral analysis	Conventional sandstone petrography
Trace element analysis	Provenance (detrital zircon U-Pb chronology)

Table 1: Analyses to be conducted to fulfil overarching aim of this study ; *preliminary results presented in this poster.

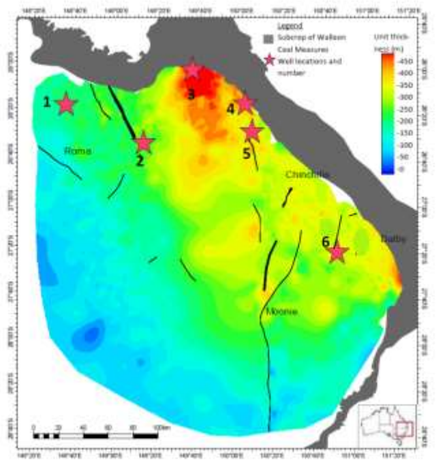


Figure 3: Thickness map of the Surat Basin's Walloon Coal Measures showing well locations of study well 1-6. Note: the Walloon Subgroup thins to the west of the Basin.

4. Preliminary results

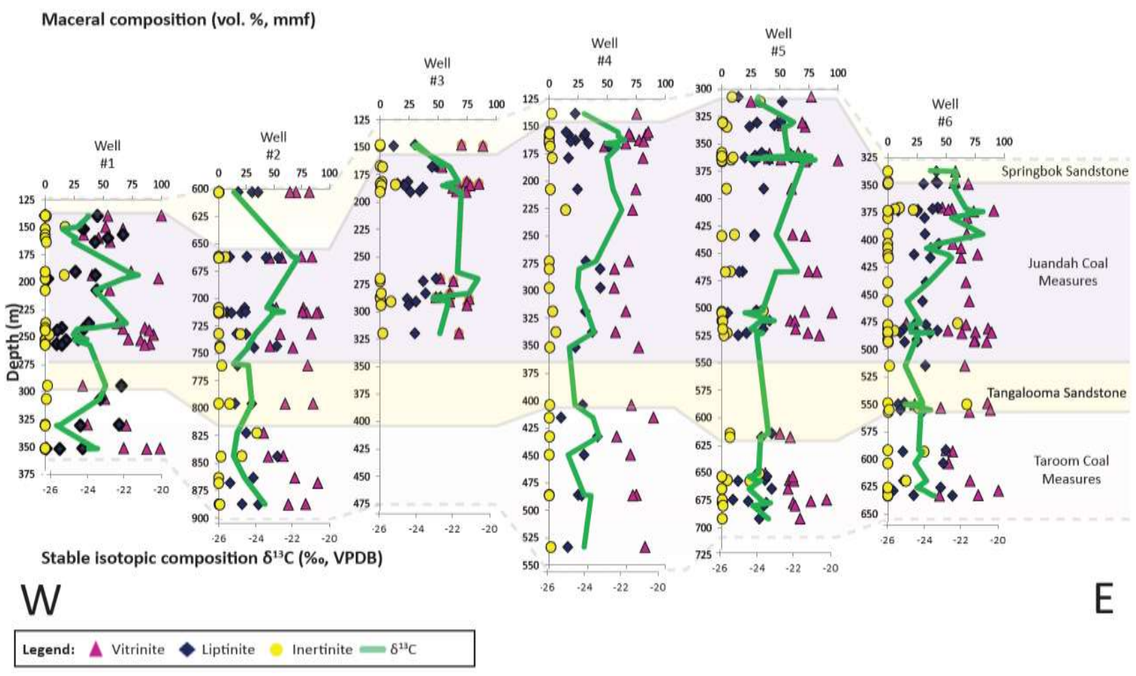


Figure 4: Maceral composition (vol. %, mmf) and stable isotopic composition $\delta^{13}C$ VPDB (‰); section from W to N to E. Grey lines indicate formation boundaries as correlated by companies.

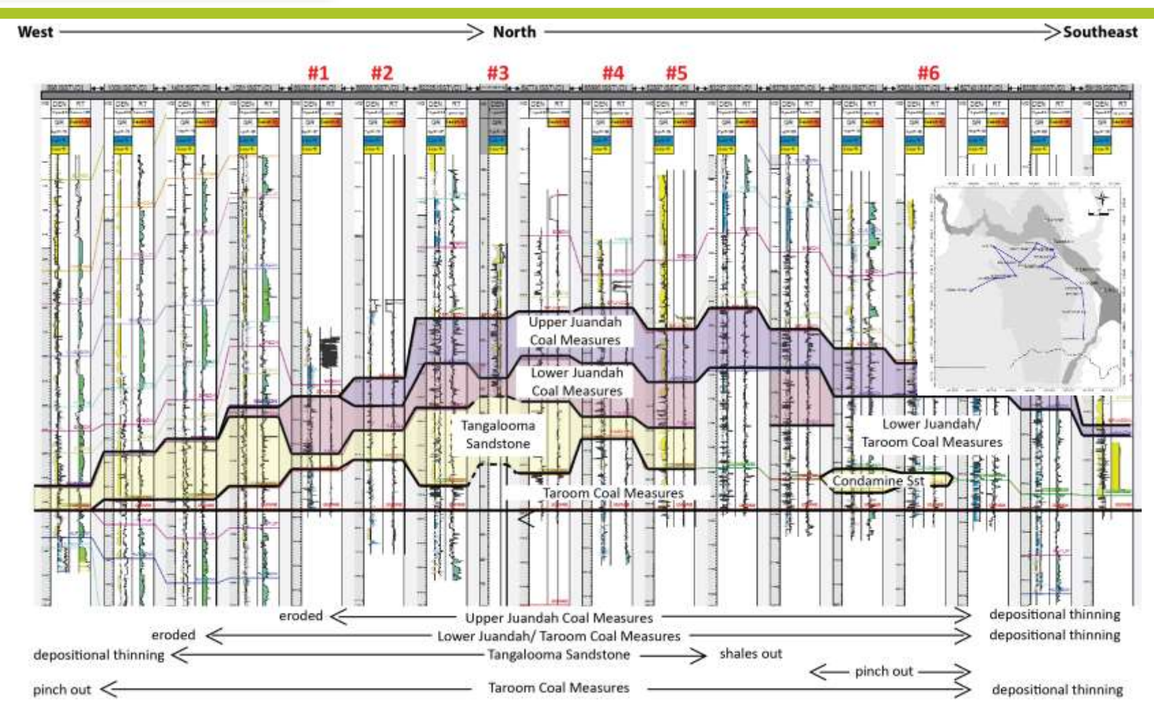


Figure 5: W-N-SE trending section (Sliwa et al., 2014) including study wells 1-6. Correlation of sub units based on isotope trends.

Note: Consistently increased inertinite content in Upper Juandah Coal Measures and Springbok coals (Figure 4); for all wells gradual enrichment in ^{13}C starting in Lower Juandah Coal Measures with least negative $\delta^{13}C$ values in Upper Juandah Coal Measures, followed by shift back to more negative $\delta^{13}C$ values in Springbok coals (Figure 4); enrichment in ^{13}C sets in well before shift to increased inertinite contents; isotopic signature responds to allogenic, climatic shift; well 1 shows unusually negative values for samples from "Upper Juandah Coal Measures" (as per company correlations)"; isotopic composition suggests that particular depth interval was miscorrelated and is part of the Springbok Sandstone; the Upper Juandah Coal Measures seem to be eroded in well 1, which partially confirms correlations by Sliwa et al. (2014).

5. Conclusion

- Organic stable isotope trends have the potential to serve as chemostratigraphic markers, if excursions are not just influenced by local, environmental factors, but represent larger factors, like changes in climate
- It could be confirmed that the Upper Juandah were eroded on the western limb of the Surat Basin (well 1)
- Trace element analysis and age dating could be helpful to better constrain the Surat Basin stratigraphic model.

6. Acknowledgements

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