Groundwater – reservoir (dis)connectivity with strontium isotopes

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Groundwater tracers such as strontium isotopes ($^{87}Sr/^{86}Sr$) are increasingly used by governments and regulators to identify reservoir-aquifer leakage or connectivity. For example, using $^{87}Sr/^{86}Sr$ as a tool to identify potential connectivity between the Surat Basin Walloon Coal Measures (WCM) CSG reservoir and the overlying Springbok Sandstone aquifer if values are overlapping (Fig.1). New small study on $^{87}Sr/^{86}Sr$ sources in rocks: Springbok Ss, shallow WCM interburden.

Fig 1: $^{87}Sr/^{86}Sr$ of groundwaters in our recent groundwater study. Note overlapping Springbok Ss and CSG production waters. (Orange box is CSG range from Baublys et al., 2019)

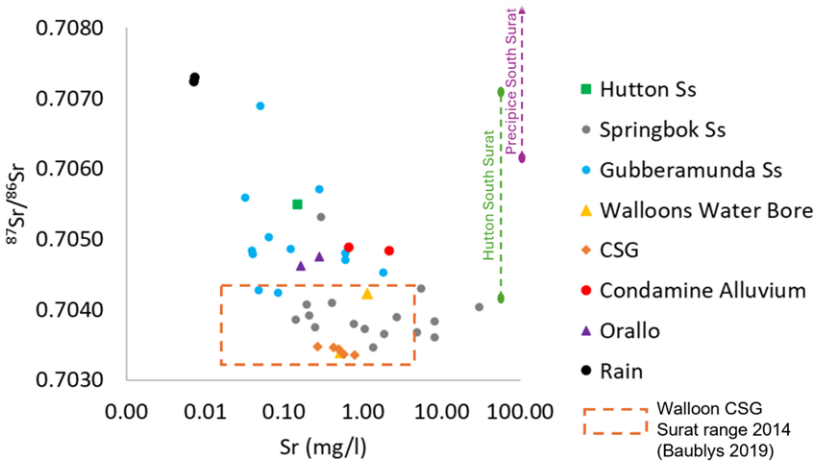
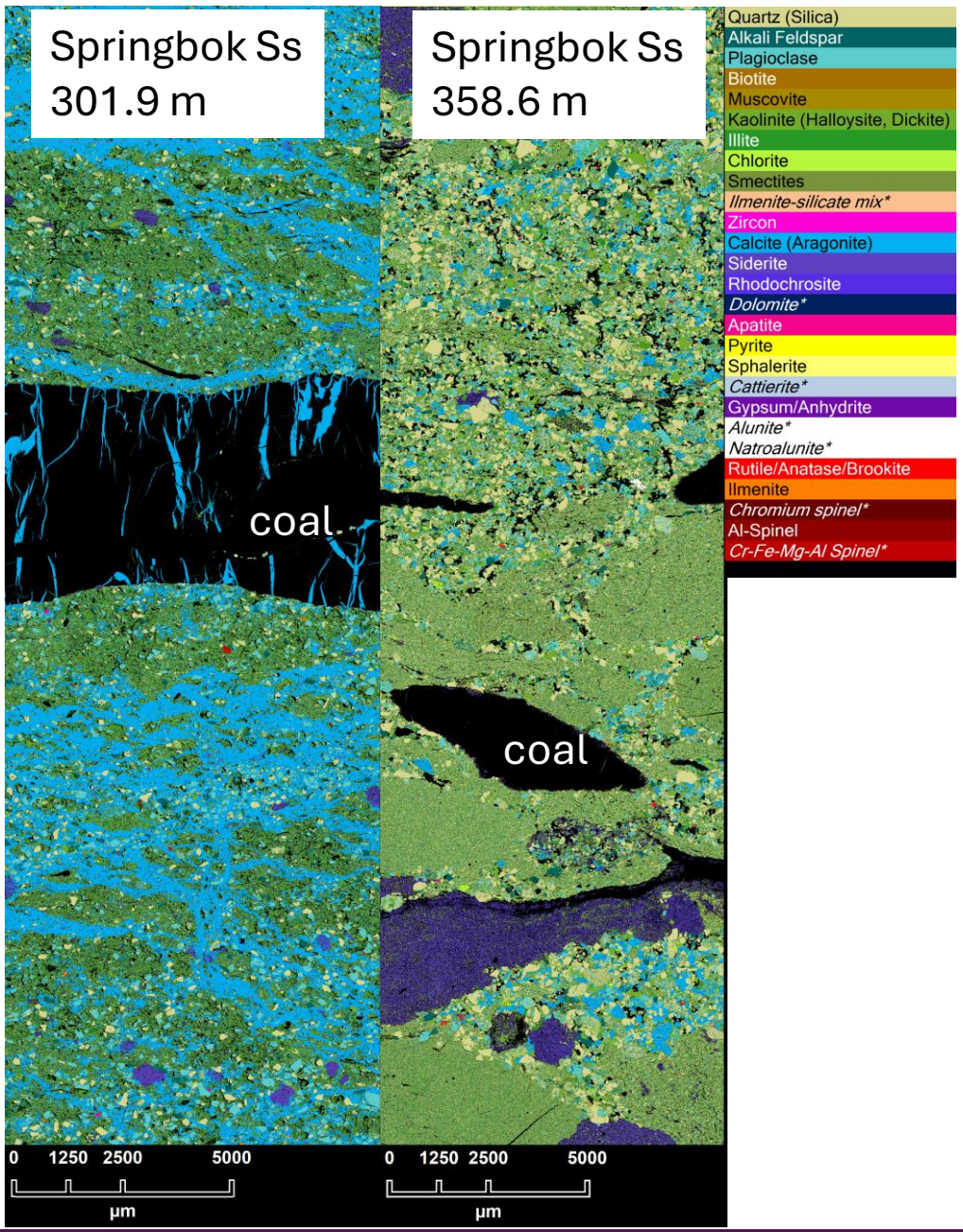


Fig 2: QEMSCAN mineral components, examples in Springbok Ss cores. Potential strontium hosts include calcite, plagioclase. Note coal layers.



- $^{87}Sr/^{86}Sr$ signatures of groundwater can be a combination of water recharge and the host rock (e.g. Pearce et al., 2024; Raiber et al.,2024; Baublys et al., 2019)
- Overlapping $^{87}Sr/^{86}Sr$ signatures *may not* be an indicator of connectivity/leakage, rather similar rock formation minerals/coal ?
- There are *no rock core* $^{87}Sr/^{86}Sr$ signature data for the Springbok Sandstone to inform the argument on groundwater connectivity
- Methods applicable to other formations (e.g. Hutton, Condamine, or the Bowen Basin, or other basins e.g. in NT.

Groundwater – reservoir (dis)connectivity with strontium isotopes (cont.)

- Initial results – similar minerals in Springbok and WCM interburden that could host strontium sources (Fig. 2,3)
- Some overlapping $^{87}Sr/^{86}Sr$ signatures of the "whole rock" in Springbok Ss and WCM interburden (Fig. 4)
- Next steps:
- *Sequential acid extractions of rock cores for different mineral sources of* $^{87}Sr/^{86}Sr$ signatures.

Fig 2: QEMSCAN mineral components, examples in shallow Walloon Coal Measures (WCM) interburden. Potential strontium hosts include calcite, plagioclase etc.

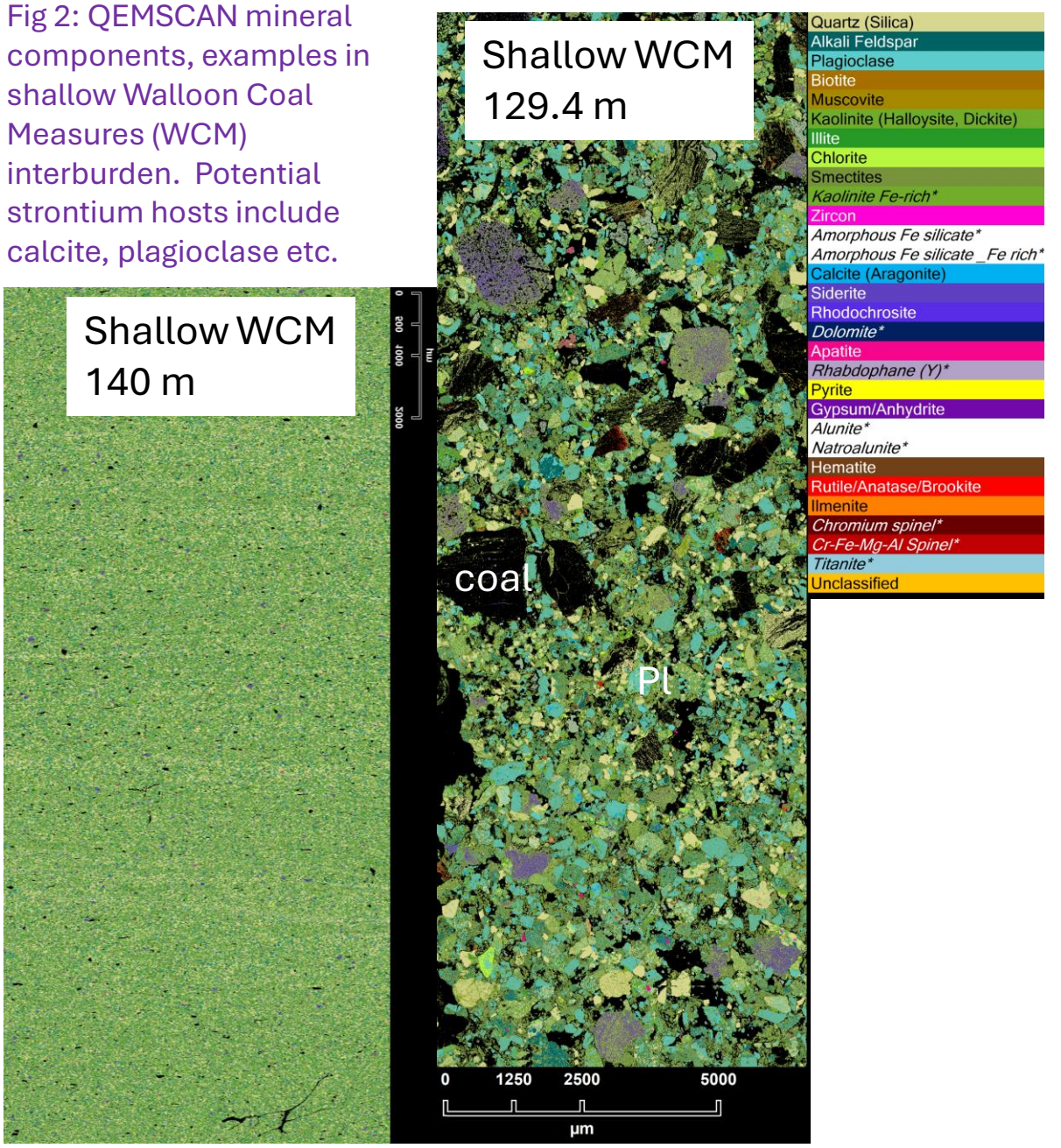
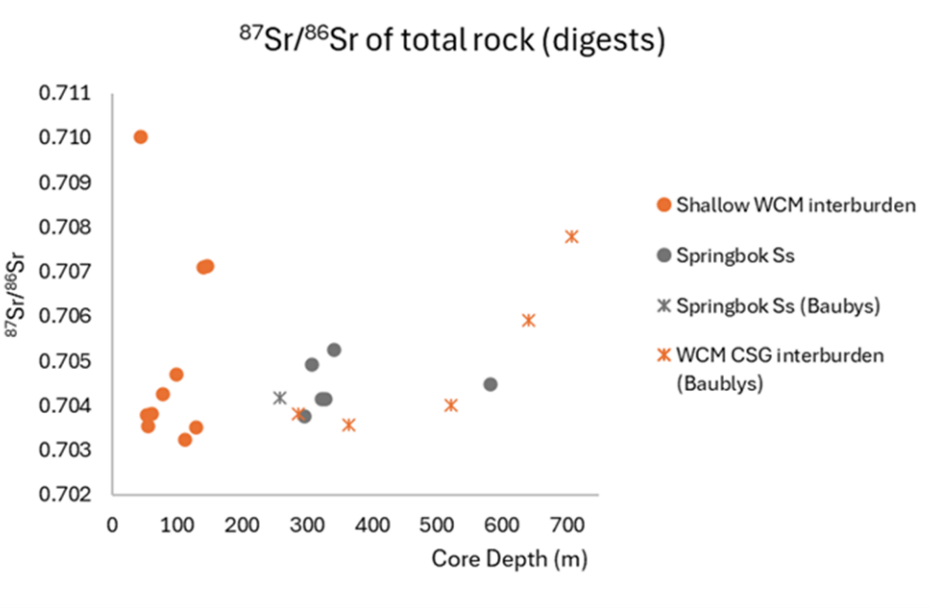


Fig 4: $^{87}Sr/^{86}Sr$ signatures of Springbok and Walloon interburden rock cores, note some overlapping signatures.



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