



Review article

South Africa's coalfields – A 2014 perspective

P. John Hancox ^{a,*}, Annette E. Götz ^{b,c}^a University of the Witwatersrand, School of Geosciences and Evolutionary Studies Institute, Private Bag 3, 2050 Wits, South Africa^b University of Pretoria, Department of Geology, Private Bag X20, Hatfield, 0028 Pretoria, South Africa^c Kazan Federal University, 18 Kremlyovskaya St., Kazan 420008, Republic of Tatarstan, Russian Federation

ARTICLE INFO

Article history:

Received 7 April 2014

Received in revised form 22 June 2014

Accepted 22 June 2014

Available online 28 June 2014

Keywords:

Gondwana coal

Permian

Triassic

Coalfield

South Africa

ABSTRACT

For well over a century and a half coal has played a vital role in South Africa's economy and currently bituminous coal is the primary energy source for domestic electricity generation, as well as being the feedstock for the production of a substantial percentage of the country's liquid fuels. It furthermore provides a considerable source of foreign revenue from exports.

Based on geographic considerations, and variations in the sedimentation, origin, formation, distribution and quality of the coals, 19 coalfields are generally recognised in South Africa. This paper provides an updated review of their exploration and exploitation histories, general geology, coal seam nomenclature and coal qualities. Within the various coalfields autocyclic variability is the norm rather than the exception, whereas allocyclic variability is much less so, and allows for the correlation of genetically related sequences. During the mid-Jurassic break up of Gondwana most of the coal-bearing successions were intruded by dolerite. These intrusions are important as they may cause devolatilisation and burning of the coal, create structural disturbances and related seam correlation problems, and difficulties in mining operations.

Whilst many of the coalfields have been extensively explored and exploited, those in the north of the country have until recently received much less attention. Four coalfields occur partly or wholly within the Limpopo Province of South Africa and these may contain as much as 70% of South Africa's remaining coal resources. These coalfields in particular have been the focus of recent exploration due to the presence of large coking and thermal coal resources, as well as for their coal bed methane potential, and these resources need to be unlocked with regards to creating maximum benefit and minimal environmental degradation.

South Africa's coals have also been recently addressed as palaeoclimate archives recording Gondwana's postglacial climate amelioration by major changes in land plant communities, and proving high-resolution palynostratigraphy as a crucial tool to decipher climate change during the Permo-Carboniferous. This aspect of the coals of South Africa is also reviewed.

© 2014 Published by Elsevier B.V.

Contents

1.	Introduction	172
1.1.	The main coal producers in South Africa	172
1.1.1.	Anglo American Thermal Coal (AATC)	172
1.1.2.	Sasol	172
1.1.3.	Exxaro	173
1.1.4.	BHP Billiton Energy Coal South Africa (BECSA)	173
1.1.5.	Glencore Xstrata	173
1.2.	Academic research and previous reviews	173
2.	Karoo Basin overview	173
2.1.	Regional tectonic framework	173
2.2.	General geology and stratigraphy of the Karoo Supergroup	174
2.2.1.	Dwyka Group	176
2.2.2.	Ecca Group	176
2.2.3.	Beaufort Group	179
2.2.4.	Stormberg Group	179

* Corresponding author. Tel.: +27 83 488 1066; fax: +27 11 447 4814.

E-mail addresses: jhancox@cciconline.com (P.J. Hancox), annette.goetz@up.ac.za (A.E. Götz).

	2.2.5. Drakensberg Group and associated intrusives	180
3.	Previous research on the coals of South Africa	180
3.1.	Trace element chemistry	180
3.1.1.	Sulphur in South African coals	180
3.1.2.	Nitrogen in South African coals	181
3.1.3.	Phosphorus in South African coals	181
3.2.	Petrological studies	181
3.3.	Palynological studies	181
3.4.	Age of the coals	181
4.	The coalfields of South Africa	182
4.1.	Witbank Coalfield	182
4.1.1.	Introduction	182
4.1.2.	Location	182
4.1.3.	Exploration and exploitation history	183
4.1.4.	Research history	183
4.1.5.	Geology	185
4.1.6.	Seam sequences	185
4.1.7.	Structure and intrusions	190
4.2.	Highveld Coalfield	190
4.2.1.	Introduction	190
4.2.2.	Location	190
4.2.3.	Exploration and exploitation history	190
4.2.4.	Research history	191
4.2.5.	Geology	192
4.2.6.	Coal seams	193
4.2.7.	Structure and intrusions	194
4.3.	Ermelo Coalfield	195
4.3.1.	Introduction	195
4.3.2.	Location	195
4.3.3.	Exploration and exploitation history	195
4.3.4.	Research history	196
4.3.5.	Geology	197
4.3.6.	Coal seams	197
4.3.7.	Structure and intrusions	198
4.4.	Coalfields in the Free State	199
4.4.1.	Free State Coalfield	199
4.4.2.	Vereeniging–Sasolburg Coalfield	203
4.4.3.	South Rand Coalfield	208
4.5.	Coalfields of KwaZulu-Natal	210
4.5.1.	Klip River Coalfield	210
4.5.2.	Utrecht Coalfield	215
4.5.3.	Vryheid Coalfield	217
4.5.4.	Nongoma Coalfield	219
4.5.5.	Somkhele Coalfield	221
4.6.	Kangwane Coalfield	223
4.6.1.	Introduction	223
4.6.2.	Location	224
4.6.3.	Exploration and exploitation history	224
4.6.4.	Research history	224
4.6.5.	Geology	224
4.6.6.	Coal seams	224
4.6.7.	Structure and intrusions	225
4.7.	Springbok Flats Coalfield	225
4.7.1.	Introduction	225
4.7.2.	Location	226
4.7.3.	Exploration and exploitation history	226
4.7.4.	Research history	226
4.7.5.	Geology	227
4.7.6.	Coal seams	227
4.7.7.	Structure and intrusions	228
4.8.	Waterberg Coalfield	228
4.8.1.	Introduction	228
4.8.2.	Location	229
4.8.3.	Exploration and exploitation history	229
4.8.4.	Research history	230
4.8.5.	Geology	231
4.8.6.	Coal seams	232
4.8.7.	Structure and intrusions	233
4.9.	Soutpansberg Coalfield (Mopane, Tshipise and Pafuri sub-basins)	233
4.9.1.	Introduction	233
4.9.2.	Location	234
4.9.3.	Exploration and exploitation history	234

Download English Version:

<https://daneshyari.com/en/article/1753220>

Download Persian Version:

<https://daneshyari.com/article/1753220>

[Daneshyari.com](https://daneshyari.com)