

R&D in coal processing – SA and abroad

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Outline

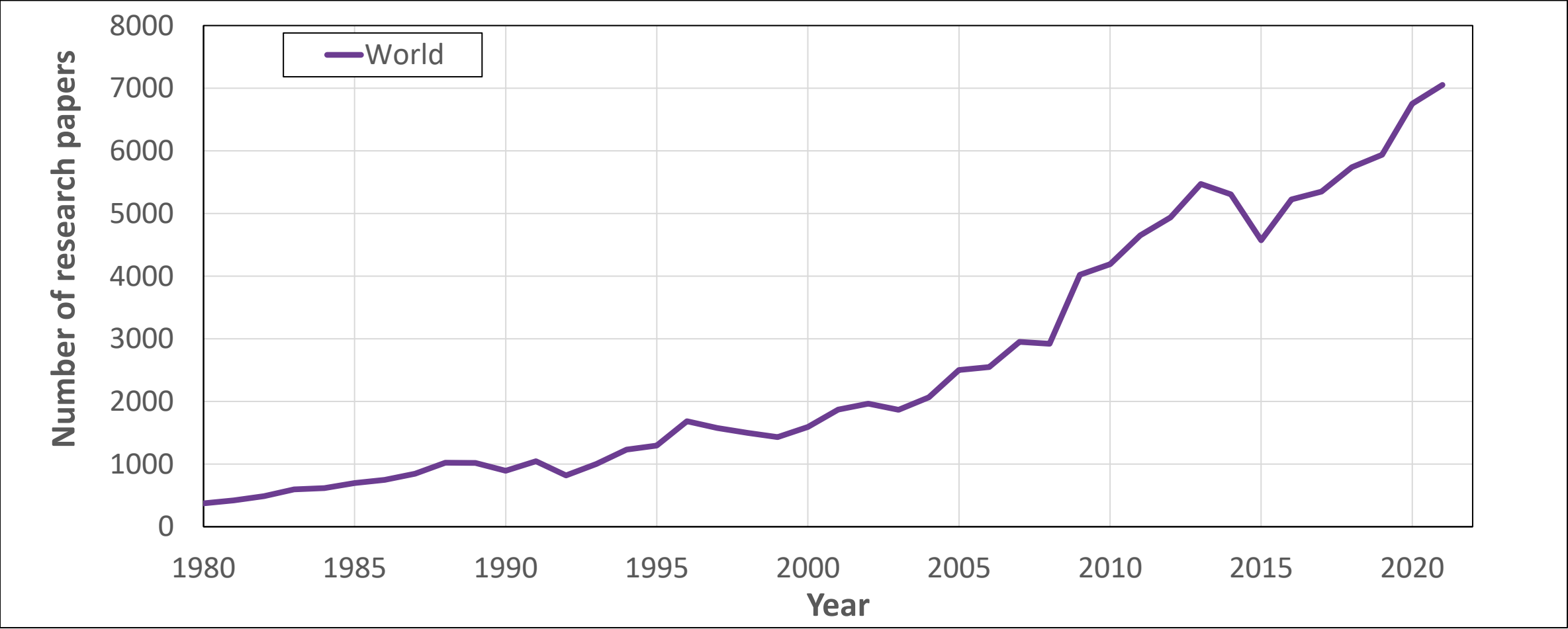
- Worldwide research outputs
 - Where does SA fit in?
- Who contributes to coal research?
- Current research topics
- What is happening in South Africa?

Disclaimer

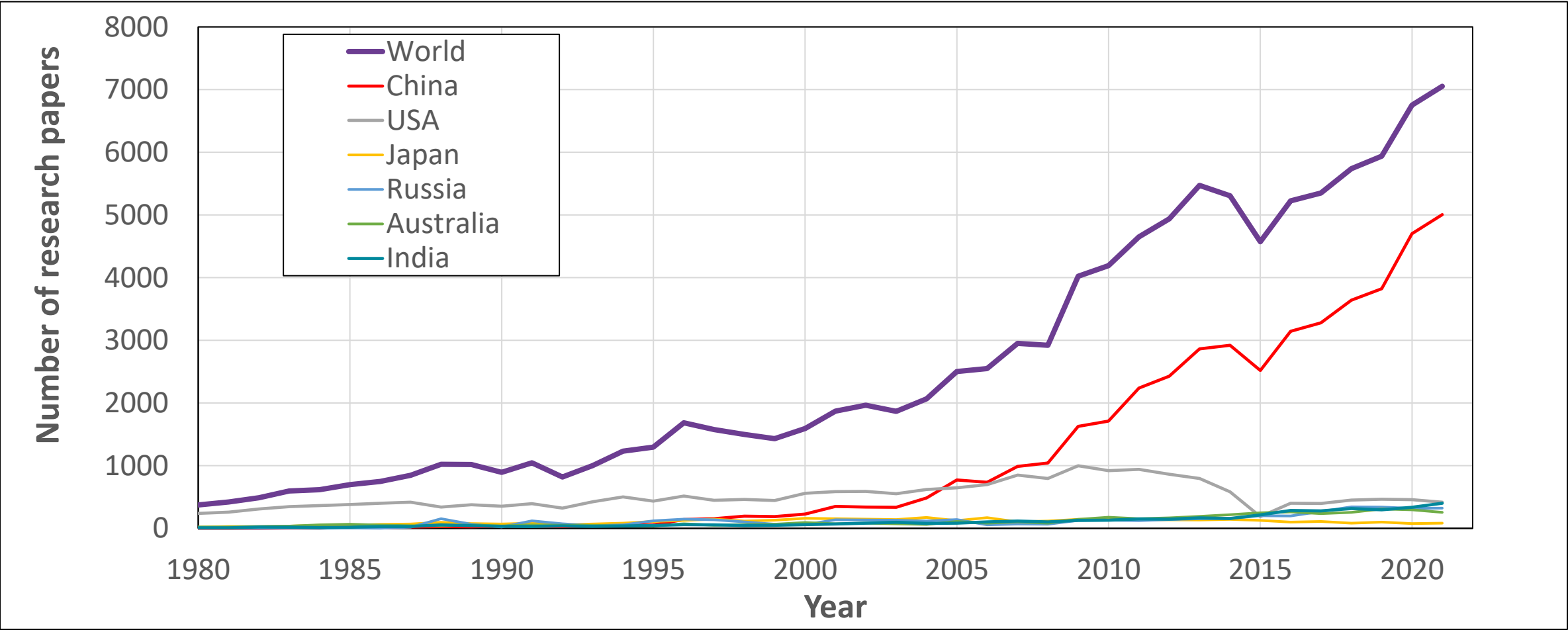
- Output numbers as per Scopus
 - Dependent on search boundaries
 - Dependent on supported publications
- Data will not be exact but will show trends

What is happening in the world?

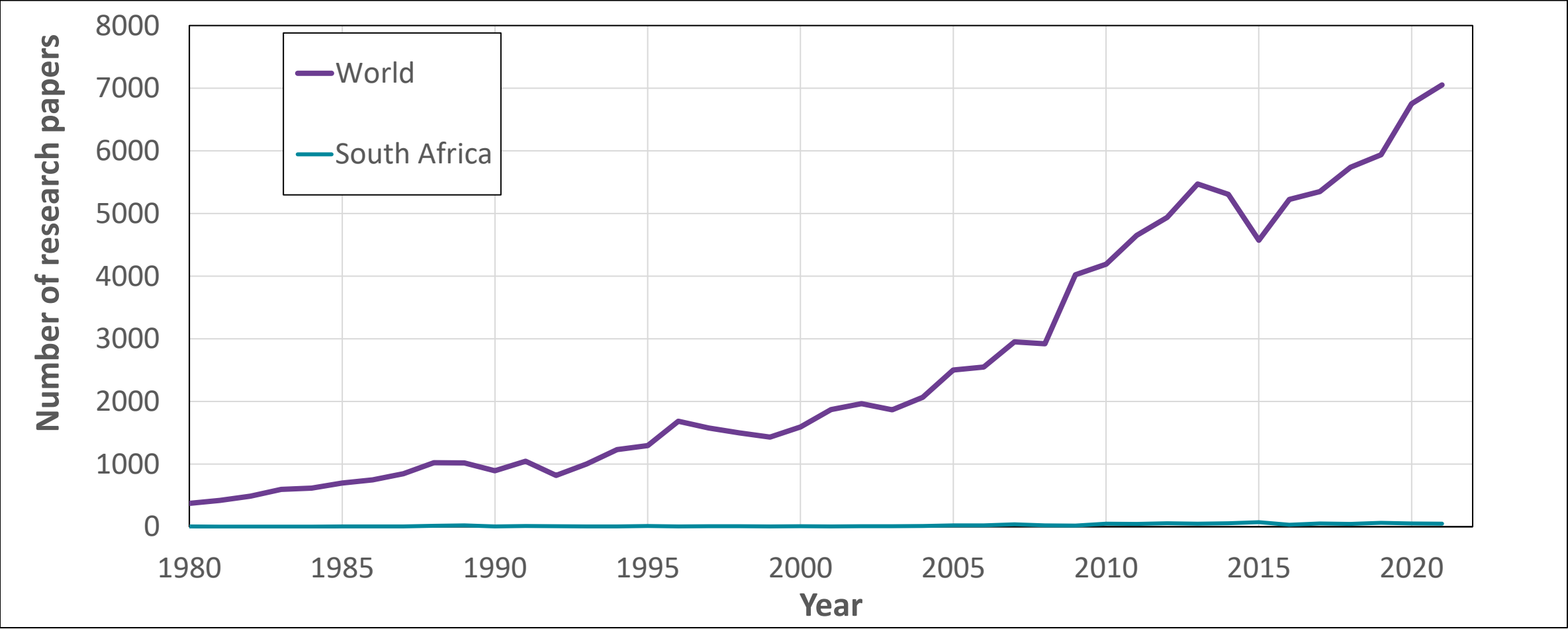
World wide coal papers - Scopus



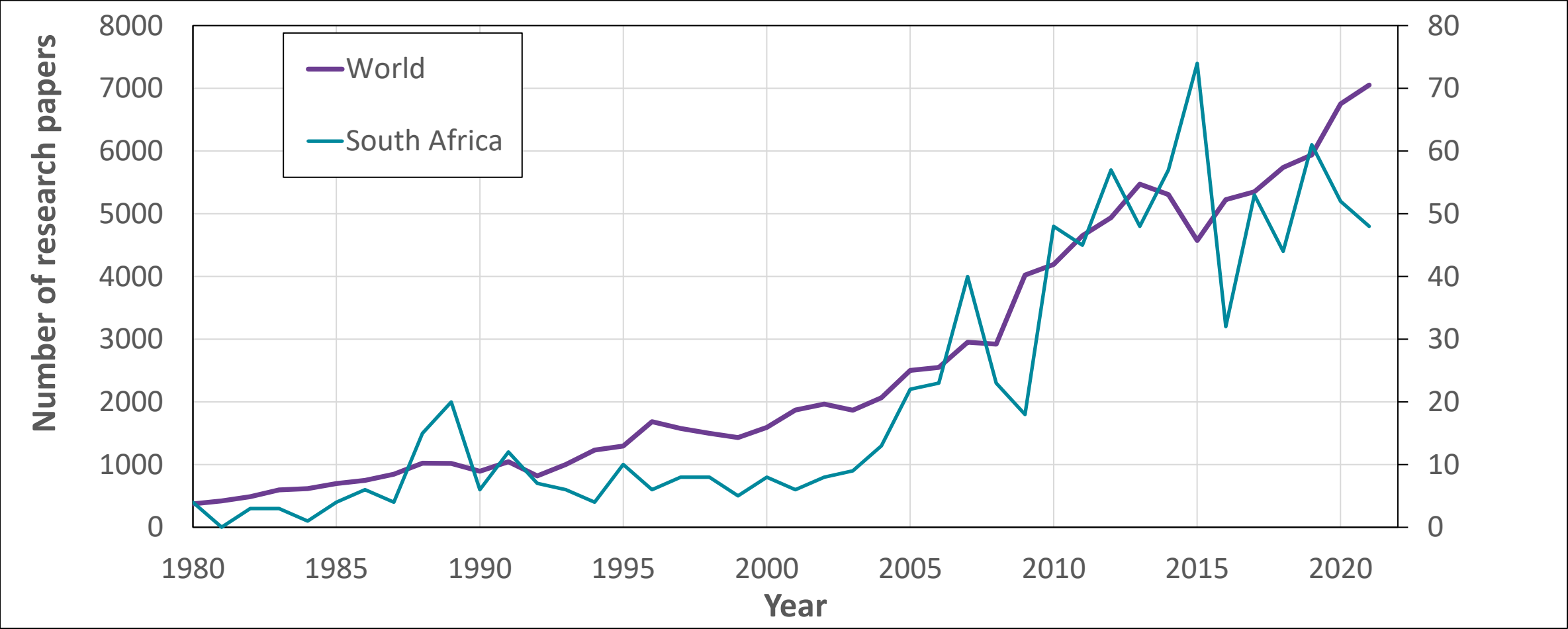
Coal publications?



Where does SA feature?



Where does SA feature?



Who contributes – pre 2000



Who contributes – 2000 to 2010



Who contributes – 2010 to 2021



Who contributes – Total



ICPC – Topics 2016

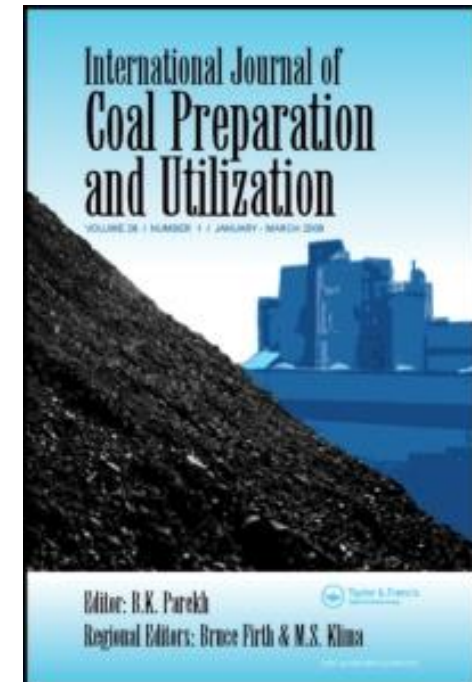


ICPC – Topics 2019



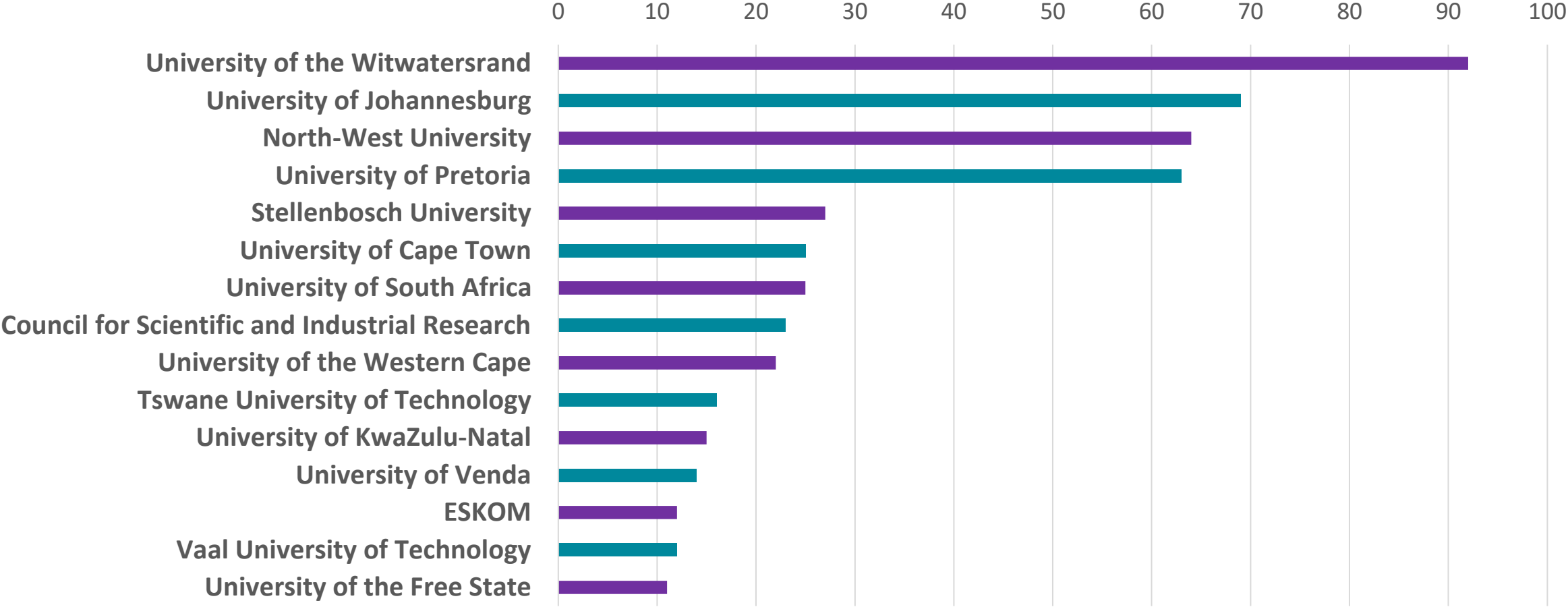
Most cited articles – last 3 years

- **Prediction of gross calorific value** of solid fuels from their proximate analysis using soft computing and regression analysis
- Recovery of **rare-earth elements** from coal fly ash via enhanced leaching
- Application of metaheuristic based artificial neural network and multilinear regression for the **prediction of higher heating values of fuels**
- Computational intelligence-based models for **predicting the spontaneous combustion liability of coal**
- Experimentation and statistical **prediction of screening performance** of coal with different moisture content in the vibrating screen
- **Dry coal beneficiation** technique in the gas–solid **fluidized bed**: a review
- **Image positioning and identification** method and system for coal and gangue sorting robot
- A texture fused superpixel **algorithm** for coal mine waste rock image segmentation
- **Discrimination analysis** of coal and gangue using multifractal properties of optical texture
- A mini-review on **coal fly ash properties, utilization and synthesis of zeolites**

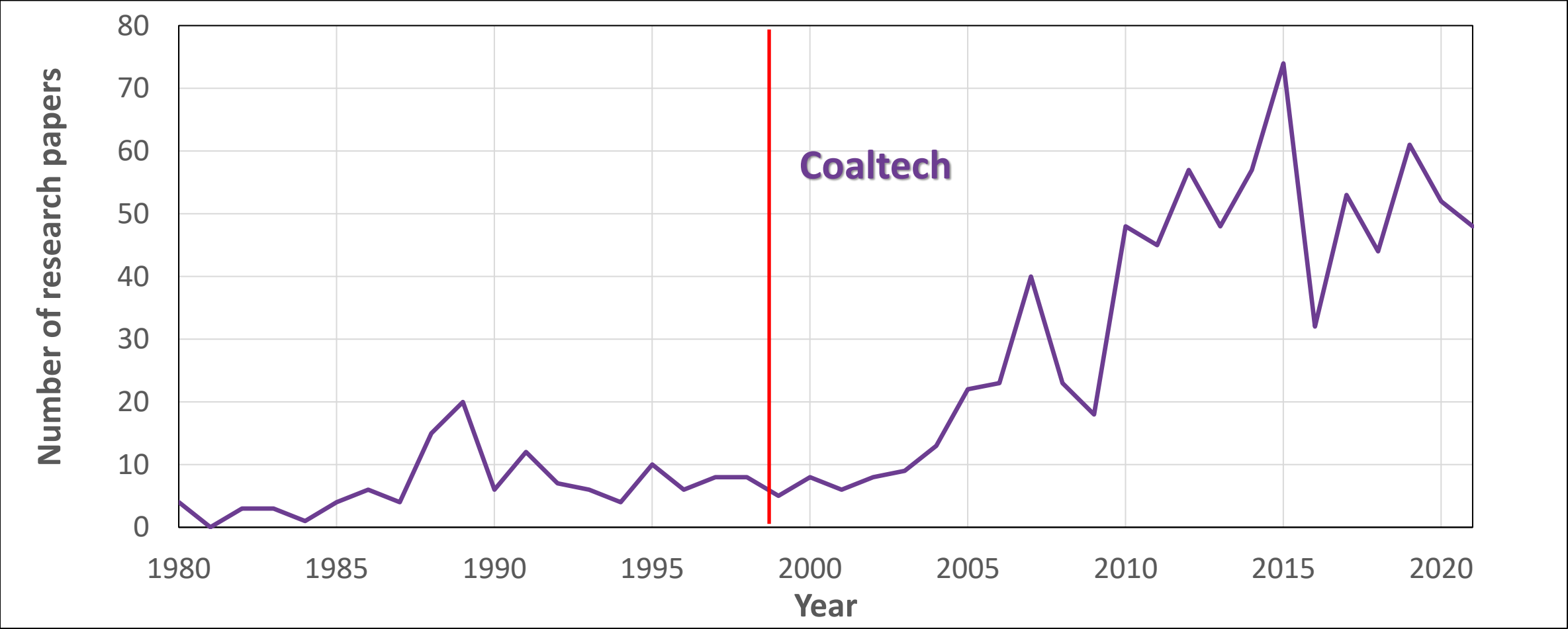


What is happening in the South Africa?

Who does coal research (last 5 years)



South African trend



Coaltech successes

- 25 tph fines dense medium cyclone plant
- Binderless briquetting of fine coal
- Water treatment processes
- Dry processing and screening of low-grade raw coals
- FGX Compound Dry Separator
- Fine coal dewatering
- Three product cyclone
- SepAir pilot plant



Coaltech successes

- Dust and gas suppression on underground continuous miners
- Spontaneous combustion and hot hole blasting
- Wetland and passive water treatment research
- Many geological and geophysical projects

Financed 134
completed Master's
and PhD studies



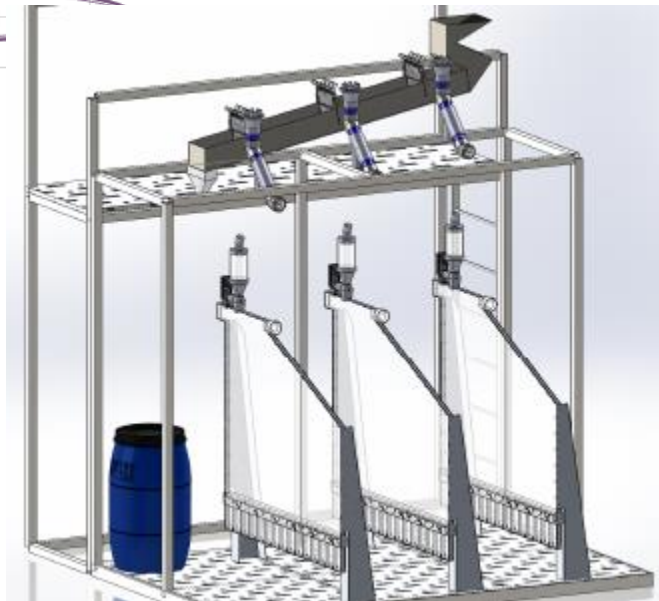
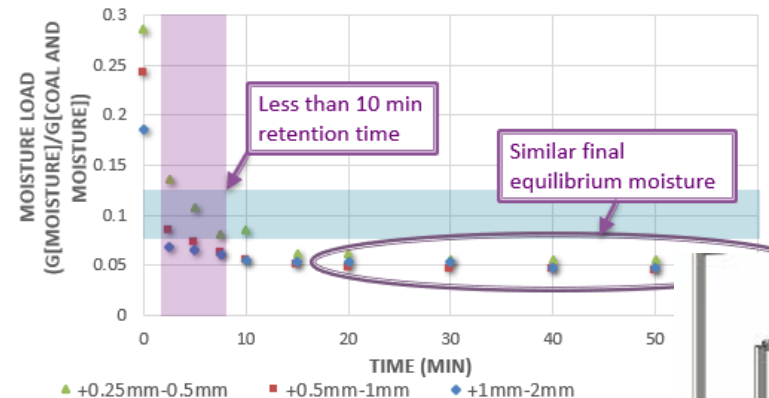
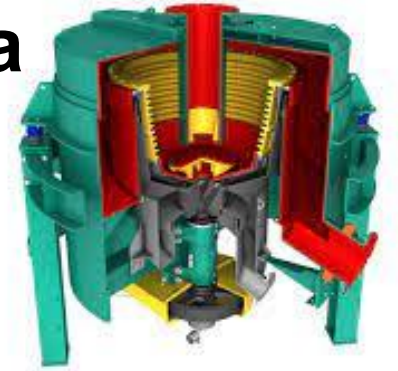
Current work at Universities

- **North-West University**

- Dry coal processing
 - SepAir
 - Wining
- Fine coal drying
 - Ceramic drying
- Coal conversion and combustior
- Emissions control
- Water pollution and rehabilitation
- Smoke-less coal stoves

- **University of Pretoria**

- Knelson concentrator



Current work at Universities

• University of Johannesburg

- Data base of Rare Earth Elements in SA coals
- Interpretations of petrology and geochemistry on the origin and depositional environment
- Advanced non-destructive analytical techniques for SA coal industry



• University of the Witwatersrand

- Hydrothermal carbonization (HTC) of coal fines
- Optimization of mineral grading wind sifter
- Recovery of Rare Earth Elements (REE) for coal discards
- Flammability, corrosion resistant and environmentally friendliness of coal composites

Why don't we do more?

- Not glamorous for younger generations
 - IR4
 - Availability of students for Post-grad work

- Funding

- Focus



What is the solution?

- Allow bursary students to do Post-grad studies
 - Or at least allow to write up industrial projects
- Funding
 - Repackage research to access European funds
- Industry come together
- Access to plants and pilot plants
 - Technical advice



Acknowledgements

- Coaltech – Henk Lodewijks
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- Technical advice and TONS of coal samples from various coal operations

Thank you!