

Research Unit Mining

Modern Satellite Data Provide New Insights into Surface Movements above Coal Longwall Mining

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Venue: Sun City, Rustenburg, South Africa
21-23 JULY 2025 – Conference

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PIONEERING PROGRESS : THE FUTURE OF ROCK ENGINEERING

One aspect is to **look back with a critical eye.**

Different from criticising.
Rather, progressive insight.

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PIONEERING PROGRESS : THE FUTURE OF ROCK ENGINEERING

One aspect is to **look back with a critical eye.**

MAIN MESSAGE OF MY PRESENTATION

Be **open minded** when looking at data or interpreting observations.

General accepted knowledge,
State of the art and handbooks,
What you learned at school or university.

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WHEN REFERRING TO SURFACE MOVEMENTS ABOVE COAL LONGWALLS

Simple trough shape

Surface movements = Subsidence

How long do surface movements carry on after mining?

Two to three years.

Limited number of surveys after mining.
Additional movements between two surveys equal to accuracy interpreted as end of movements.

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Surface movements = Subsidence

How long do surface movements carry on after mining?

A number of years after the mine closure, the additional surface movements are reversed, i.e., uplift, due to the flooding of the underground infrastructure and rock mass.

Decades after mining, the strata has not reached an equilibrium.

Based on freely available satellite data:
Large number of data points above and around mined area,
Frequent measurements,
On-going measurements,
Limited cost.

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Research looks at European (Belgian) coal mines.

LONGWALL:
Typically: 200 on 800 m
Single head- and tailgate
No barrier pillars

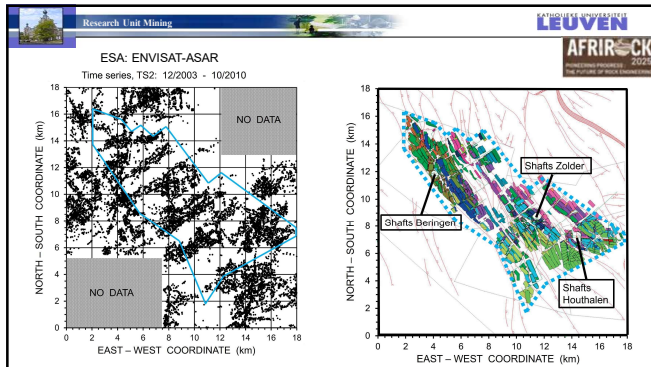
DEPTH INTERVAL: 400 to 900 m

MULTI-SEAM MINING:
Mostly 5 to 10 panels for a XY-location

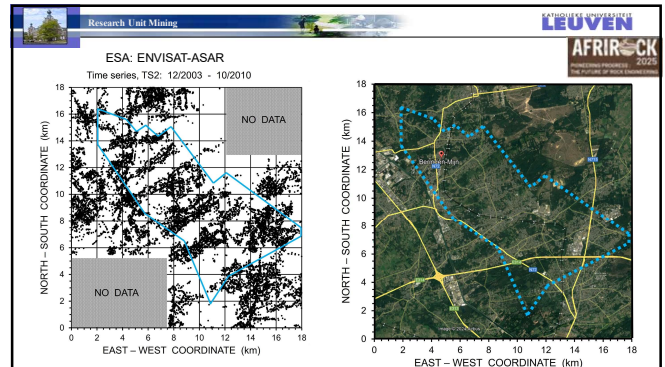
MINING HEIGHT:
Single longwall: 1.0 to 1.5 m
Total: up to 13 m

NUMEROUS SUB-VERTICAL FAULTS

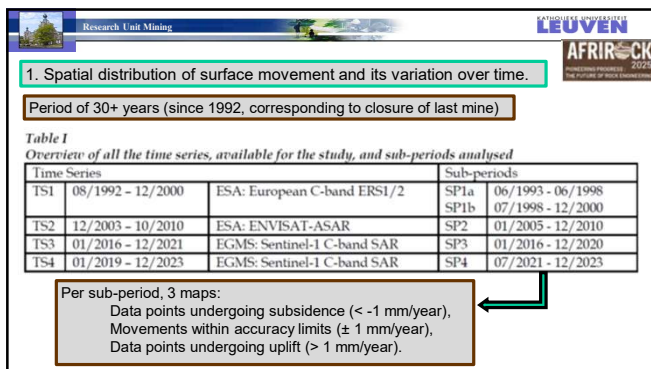
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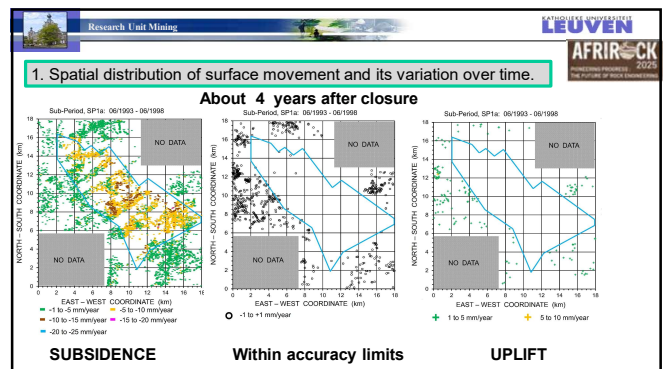
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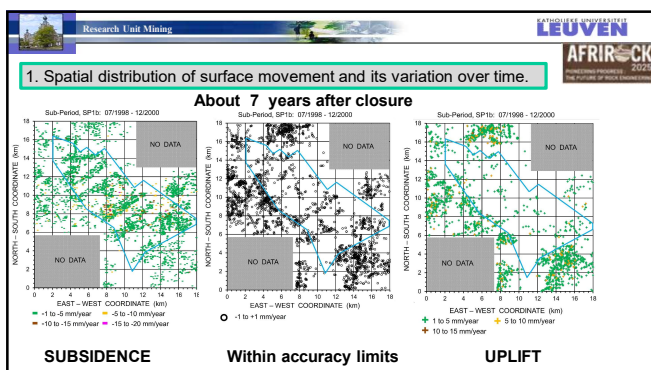
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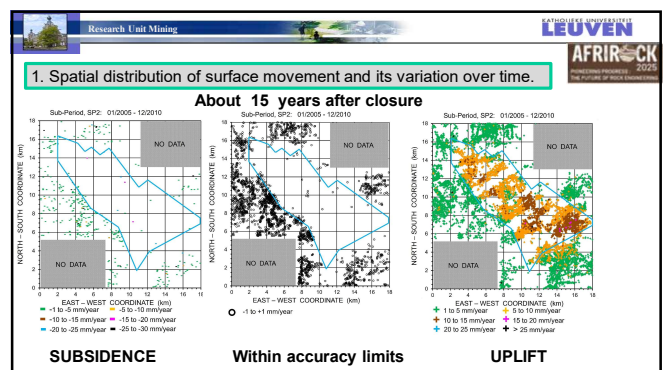
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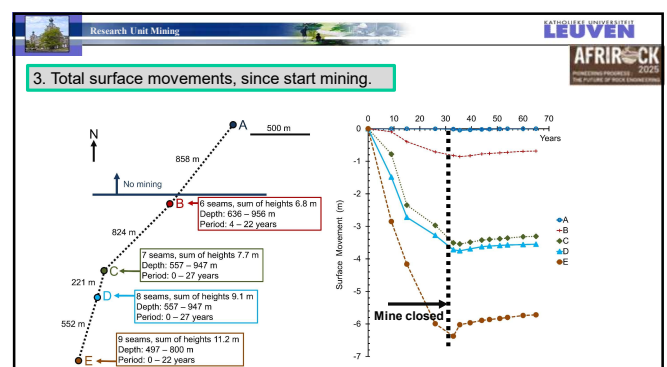
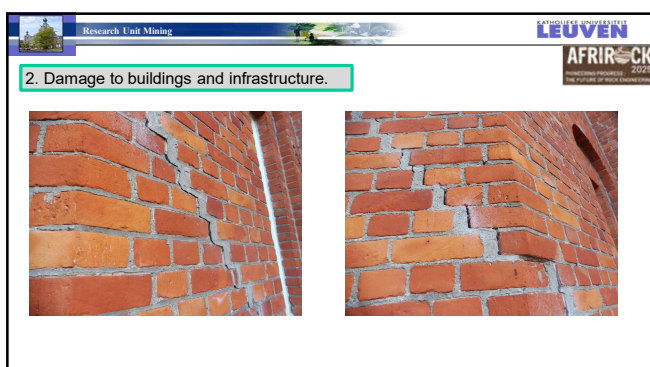
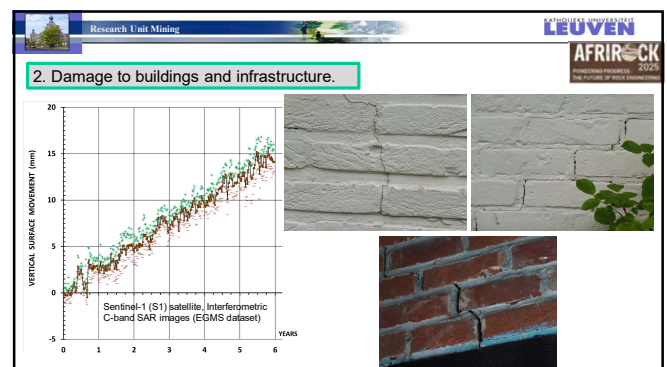
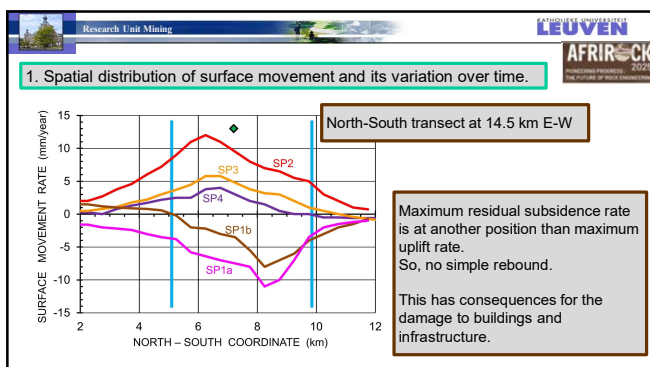
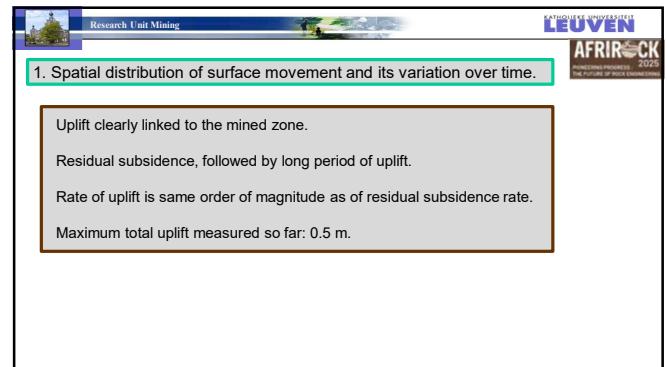
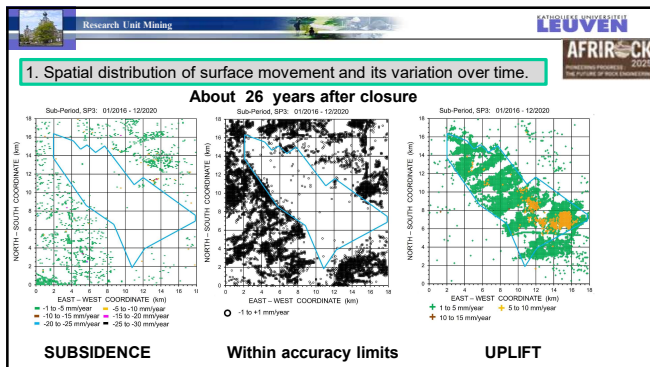
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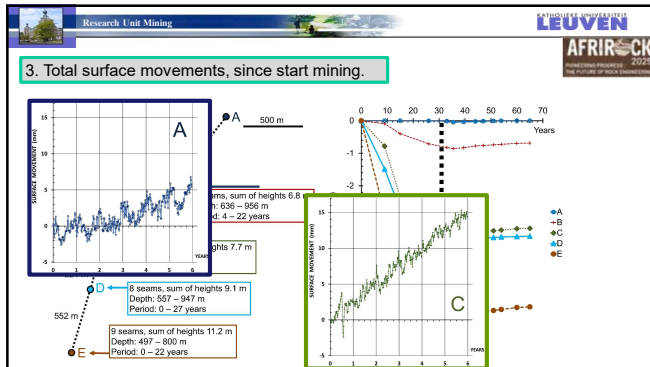


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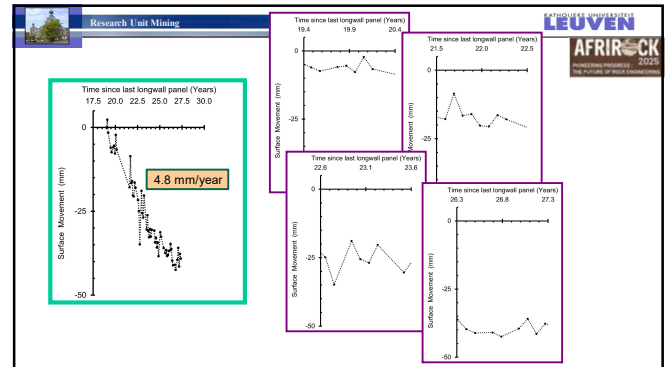


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Pertinent question:

Why was this long-term impact not really an issue ?

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Why were we able to quantify the long-term impact ?

Access to satellite data:

- Monthly measurements (or more frequent) during a **long-time period**
- Only time consuming for calculation over entire data period
- In built-up areas, dense network of datapoints
- Data available over period of interest (to be decided after event)
- Independent of mine (e.g., data available after closure)

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Final remarks

New observation techniques leads to new insights.

There is a need to look with an open mind to the new observations.

It is the accumulation of all previous loading that is responsible for possible damage to buildings and infrastructure.

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THANKS

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