

University of Pretoria



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Natural and Agricultural Sciences

Fakulteit Natuur- en Landbouwetenskappe
Lefapha la Disaense tša Tlhago le Temo

Department of Geology

Geology

Geological knowledge, education and training, study of minerals and rocks, flowing water, groundwater, volcanoes, earthquakes, plate tectonics, global climatic change and the evolution of life are covered during undergraduate studies.



Active research in the following fields
Mineralogy, Metamorphic Petrology, Igneous Petrology, Hydrogeology, Environmental and Engineering Geology, Economic Geology and Mineral deposits, Mining methods, Geological Carbon Storage, Geo- Hazards, Volcanology

Field Excursions

Students observe, record, analyse and interpret near-surface geophysical data
Taking measurements of geological features and phenomena
Promote field work in geo-sciences



LC De Villiers Geology Museum

Take a peek into our planet's deep history! Explanation and lectures on rocks, minerals, fossils, meteorites and many artefacts are offered by friendly personnel. A model of volcanisms and Stone Age life are displayed



Guided tours and Science shows available
Mineral and Rock identification, Geology of Mapungubwe
Planet Earth and beyond, Mining of mineral resources
We welcome schools, bus tours, and the community at large.
Entrance to the LC de Villiers Geology Museum is FREE.
Looking forward to your visit!

Stoneman Analytical Lab

World class analytical facilities which report on quality analysis.
Equipment include : XRF and XRD
Selfrag
Electron Microprobe



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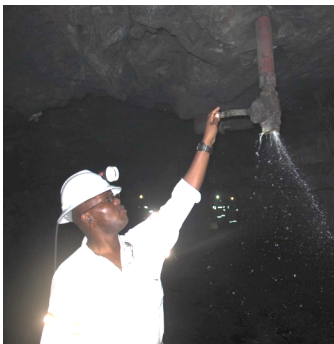
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Engineering Geology

Geological work relevant to engineering, environmental concerns, public health, safety and welfare, with respect to naturally occurring rock, soil, surface water, subsurface fluids and the interaction of introduced materials and processes with the geological environment (IAEG 2002)



Most engineering structures are built on and with geological materials. The strength, deformability, durability and permeability of these materials govern their suitability as foundations, their use as construction materials, and the stability of slopes and excavations.

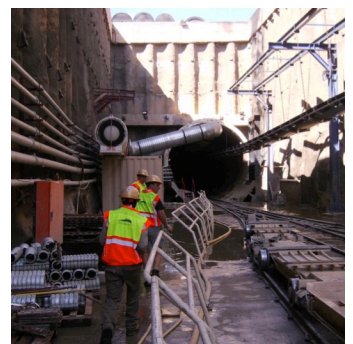


Hydrogeology

Geological knowledge applied to the distribution and movement, as well as the quality and treatment, of subsurface water occurring in geological media, incorporating also a strong understanding of fluid mechanics, geochemistry, policy and principles of sustainability and resource management



Groundwater is generally more abundant in terrestrial environments than surface water, notably in semi-arid to temperate climates such as South Africa. Given costs of dam construction, reticulation and treatment, groundwater is often a viable option for supply.



Why the University of Pretoria?

At the University of Pretoria, we pride ourselves in training excellent professionals for the geotechnical and hydrogeological fields. Our research focuses strongly on the interaction between these two disciplines, contributing to new developing fields of vadose zone hydrology, engineering hydrogeology and urban geology.



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X-ray Analytical Facility

At the University of Pretoria, we pride ourselves in training and supporting researchers across different departments with the latest analytical techniques available. The Stoneman Analytical Facility focuses strongly on chemical and mineralogical identification and quantification of rocks, soils, clays, ores, metals, chemicals, slags and various other materials.

The facility is equipped with fundamental, modern and ground breaking equipment allowing for “first of its kind” research possibilities right here on our doorstep. Student training and short courses are also presented.



XRD

Qualitative and quantitative analyses for both techniques include:

- All crystalline phases
- Amorphous content
- High temperature
25°C - 1500°C
- Residual stress and texture

Instrumentation available:

- ❑ Two PANalytical X'Pert PRO's



XRF

- Major and trace elements
- Elemental range from F- Uranium
- Powders and solids

Instrumentation available:

- ❑ One Thermo Fisher ARL Perform'X



SelFrag

THE NEW KID ON THE BLOCK
Selective fragmentation using high-voltage electrical discharge.

Liberation of intact mineral grains for geochronology; soft minerals from hard matrices.

Almost any solid material from its matrix –with minimal damage or size reduction.



Sectioning & polishing

Solid and powdered materials are cut and prepared as either:

- Thin-sections
- Polished mounts

General Sample Processing and Preparation



Solid and powdered samples from various campus departments, external research-institutions and –companies pass through the facility on a daily basis.

Solid samples can be crushed, milled, pressed, weighed, dried, roasted, fused, fragmented, cut, mounted and polished for in-house or alternative analyses.

We take pride in the quality and turn-around-time of the services our experienced staff provides.



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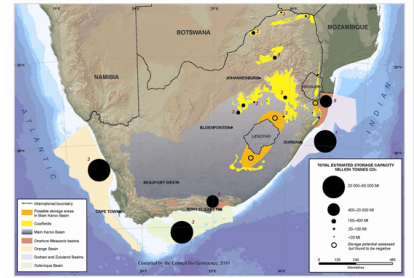


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Estimated CO₂ geological storage capacity of South Africa (Cloete, 2010)

UP CO₂ Sequestration Research Group - largest Carbon Storage working group in SA Universities

Three major themes are currently investigated by the UP CO₂-Sequestration Research Group:

- The suitability of the Cretaceous onshore Zululand Basin for CO₂ storage
- The possibility of CO₂ sequestration through carbonation of mafic minerals in tailings of the world's largest Cr and PGE mining district, the Bushveld Igneous Complex (BIC)
- The Karoo Basin as a possible sequestration site in sandstone and in shale gas reservoirs



Completed Student Projects

- 2012 – MSc “Improving Geological Saline Reservoir Integrity through Applied Mineral Carbonation Engineering”
- 2013 to 2015 – 4 BSc Hons. projects on cores of the Zululand Basin as possible CO₂ test injection site
- 2015 – PhD On borehole geophysics applied to hydrocarbon recovery, Rovuma Basin, Mozambique
- 2016 – MSc “Petrography, mineralogy and geochemistry of the rock formations of the Zululand Basin based on borehole NZA”
- 2013 – 3 experimental BSc Hons. projects on carbonation of Bushveld tailings
- 2016 – MSc “Extraction of major elements from PGE tailings in view of nanoparticle synthesis for environmental technological applications.”

CORSTORPHINE MEDAL of THE GEOLOGICAL SOCIETY OF SOUTH AFRICA

for an outstanding merit and best international standard MSc thesis: Recipient in 2015 UP Geology Student Sameera Mohamed



Ongoing Student Projects

- F. Ndongani: SACCCS Bursar, MSc project on cores of the Zululand basin, possible CO₂ test injection site.
- N. Hugo: SACCCS Bursar, MSc project on cores of the Zululand basin, possible CO₂ test injection site. International CCS Summer School bursary to Perth, Australia, November 2015.
- Z. Nkosi: CIMERA and NRF-DAAD bursary, MSc project on mineral carbonation in Bushveld tailings. DAAD grant to Germany in 2014/15 and International CCS Summer School bursary to Austin, Texas, July, 2014.
- V. Tibane, Lecturer in Geology: PhD project on cores of the Zululand Basin and experimental scCO₂ treatment of sandstones. Thuthuka-NRF and DAAD grants to Germany in 2014/15.
- S. Myendeki: MSc project; Council for Geosciences Intern and CIMERA – KARIN Bursar in project on Shale Gas and CO₂ in Karoo Supergroup rocks.
- N. Nxokwana, Council for Geosciences; SACCCS Bursar, MSc project on coal and shale related CS: Experiments on Karoo shales under CO₂ injection conditions performed at Illinois Geological Survey, USA, in 2015.

Some of our projects are presented at 35th IGC

Supporting Research Partners

South African Centre for Carbon Capture & Storage (**SACCCS**); Council for Geoscience (**CGS**); Geological Society of South Africa - **GSSA** (**REI Fund**); DST/NRF Centre of Excellence for Integrated Mineral and Energy Resource Analysis (**CIMERA**); Karoo Research Initiative (**KARIN**); University of Oslo (**UiO**), Norway; **Martin Luther University of Halle-Wittenberg**, Halle, Germany; **KUMBA IRON ORE**; **Exxaro**



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University of Pretoria Natural Hazard Centre

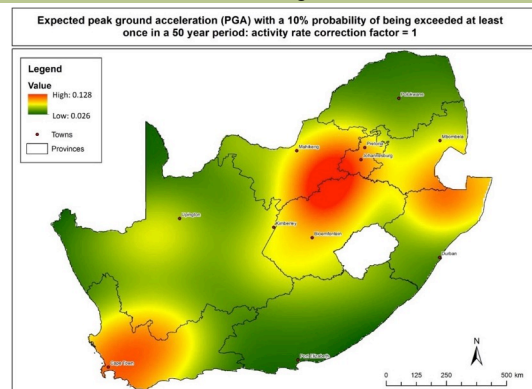
Hazard and Risk Modeling

Natural hazard and risk modeling, post-grad training...
... applied to problems natural event modeling for insurance,
disaster management and engineering works,
... statistical, actuarial and GIS modeling.



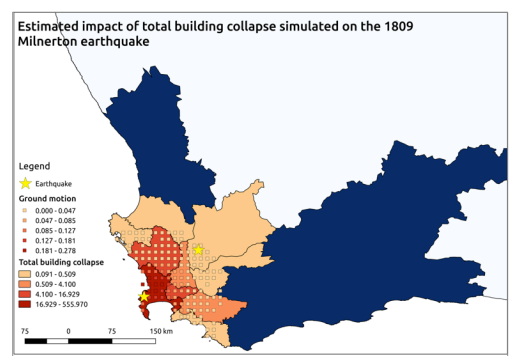
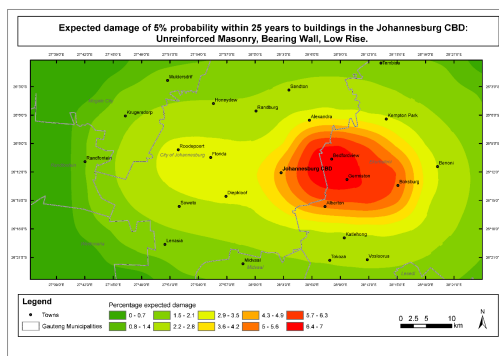
Consultation Work

Research and consultancy on natural perils...
... independent, expert opinion/advice on catastrophe modelling,
... presentations and short courses on catastrophe and financial modelling.



Established in 2008, the Centre is a multi-sponsorship collaboration between the University of Pretoria and partners from the industry. The Centre focus on research and education, and serves as a hub of information on disaster modelling by providing mathematical solutions for the African continent and the world.

The Centre unites various communities by serving as an information hub for various academic, governmental and commercial industries. The Centre's network of associates has extensive skills in hazard and risk modelling of earthquakes, mining catastrophes, hydrological and meteorological events.



Why University of Pretoria?

At the University of Pretoria, we pride ourselves in training excellent professionals and providing expert consultation services. Our research focuses strongly on the interaction between these two disciplines, contributing to new mathematical and statistical models for hazard, risk and catastrophe modeling.



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| www.up.ac.za/university-of-pretoria-natural-hazard-centre-africa

