GEOclips

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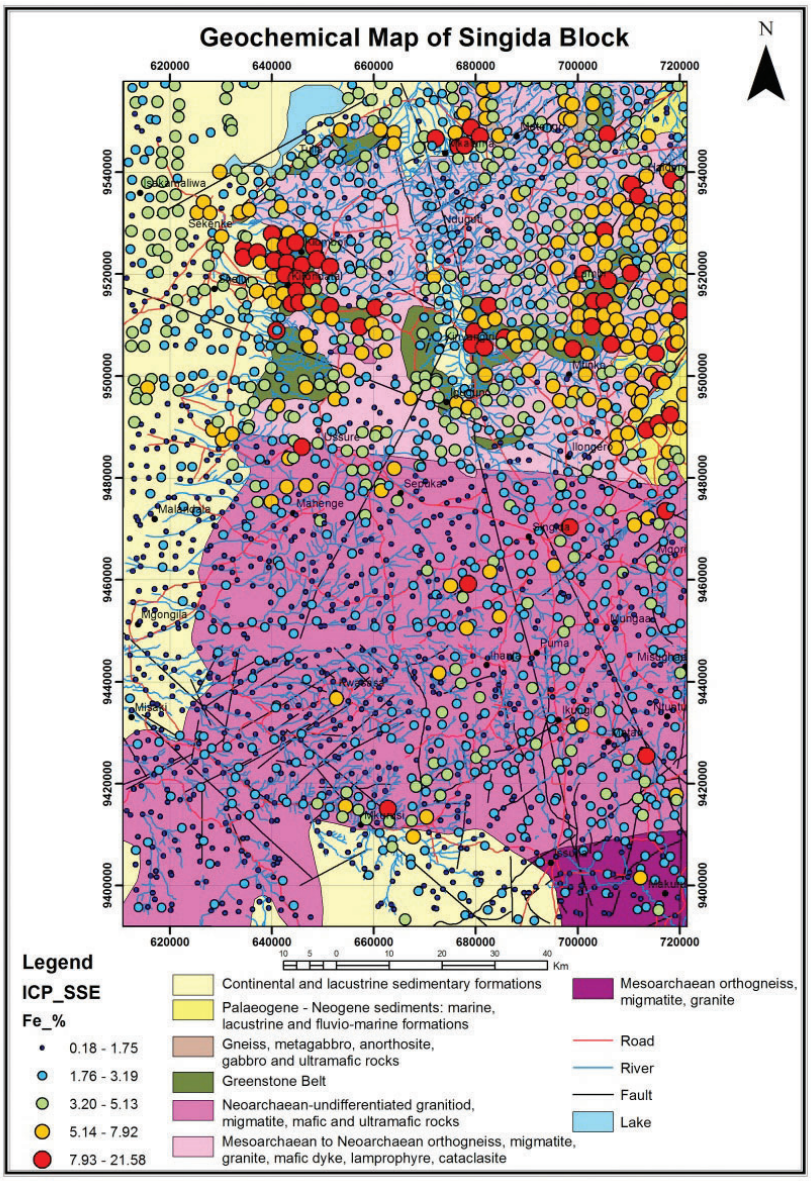
Council for Geoscience

Geochemical mapping in Tanzania

1. Map preparation for fieldwork. **2.** Samples for orientation studies taken at the gold mine near Nzuguni. **3.** Sieving of stream sediment samples. **4.** Stream sediment sampling. **5.** Soil sampling. **6.** Sampling of termite hills. **7.** The local cooks at base camp. **8.** Preparations for breakfast. **9.** Lunch in the field. **10.** Hot water supply was a necessity. **11.** Samples were checked at the base camp. **12.** Training was conducted at the CGS head office in Pretoria.



A geochemical map as one of the products of the project.

The Council for Geoscience has successfully completed its eighth international geochemistry contract since 1998. In this time, two projects have been conducted in Morocco and one each in Ghana, Rwanda, Uganda, Lesotho and Mozambique. The Tanzanian geochemistry mapping project was part of the contractual obligation of the geothematic mapping programme of the Sustainable Management of Mineral Resources Project (SMMRP) with the Geological Survey of Tanzania (GST) during the period 2013 to 2014. The multidisciplinary SMMRP specifically included geological mapping, geochemical surveys, ground geophysical surveys and capacity building within the laboratories at the GST.

The Council for Geoscience partnered with the British Geological Survey International (BGSi) to provide technical guidance to the Geological Survey of Tanzania through training and knowledge exchange. GST staff were supported and empowered through mentoring and were aided in improving the quality of all products and deliverables through institutional strengthening and capacity building by working in close partnership with the CGS/BGSi staff during the course of the project. The Council for Geoscience took the lead role in the geochemistry mapping while BGSi led the geological mapping and geophysical surveys.

Training and map preparation for field work were first concluded and thereafter the geochemistry project kicked off with an orientation study on 10 June 2013. This orientation study included a field visit to a gold mine situated near the village of Nzuguni in the topographic sheet 162/2 (Dodoma East) area. All the GST geochemical team members and consultants were present at the site. On the job training on how to sample streams and soils continued for the duration of the field season. Three different sampling techniques were tested on stream sediments, soil and termite hills as part of the orientation study.

The regional geochemical mapping survey consisted of two components; one Quarter Degree Sheet (QDS) was sampled in the Dodoma area and six QDS were sampled in the Singida District. Stream sediments (with stream orders 1 to 2) on a sampling density of one sample per nine square kilometres (1/9 km^2) were adopted as the sampling medium for the geochemical survey.

Two field camps were set up in the Singida District during the sampling campaign. The first field camp was situated at Puma, south of Singida. Three local cooks were employed to feed the geochemistry team. Tasks such as the preparation of chapatis were very laborious and the cooks had to get up very early in the morning to provide breakfast and lunch for the team. The cooks also had to keep the fire burning in an ingenious field stove to provide hot water for tea and showers in the evening.

After the four sheets had been sampled from the camp at Puma during July to October 2013, the field camp was moved to Kiomboi from where the last two QD sheets were sampled during November 2013.

A total of 3 200 stream sediment samples (including 10 % duplicate samples) were

collected. The stream sediment material was sieved in the field to the <2 mm size fraction. Samples were checked in the camp on a grid as part of the sample quality control process before they were transported to the GST sample preparation laboratories where they were sieved to the <75 micron size fraction.

The samples were analysed by three international laboratories, namely the Canadian Acme Laboratory, the CGS Laboratory in South Africa and the Geoanalysis Laboratory of Henan in the People's Republic of China. The data were compiled and training was conducted on ARC-GIS at the Council for Geoscience in Silverton, Pretoria. The GIS training was led by Doreen van der Walt, supported by Dirk Grobbelaar and Mehdi Bensid. Four geologists from the GST participated in the ARC-GIS training workshop. During the training, geochemical maps and statistical graphs were compiled for the orientation and main surveys. Geochemical maps were compiled using data analysed by ICP-MS and XRF for comparison and quality control purposes. Geochemical synthesis maps were compiled for gold, base metal, platinum group element, radiometric element (K, Th, U) and rare earth element anomalies.

Tanzania is a very pleasant and colourful country. The climate and the hospitality of the country are warm, with the people of Tanzania having welcomed us with Karibu! Tanzania has a diverse landscape with beautiful baobab trees in the Dodoma District and lakes in the Singida District. Impressive rock outcrops and an interesting diversity of birdlife contributed to an enjoyable work experience.

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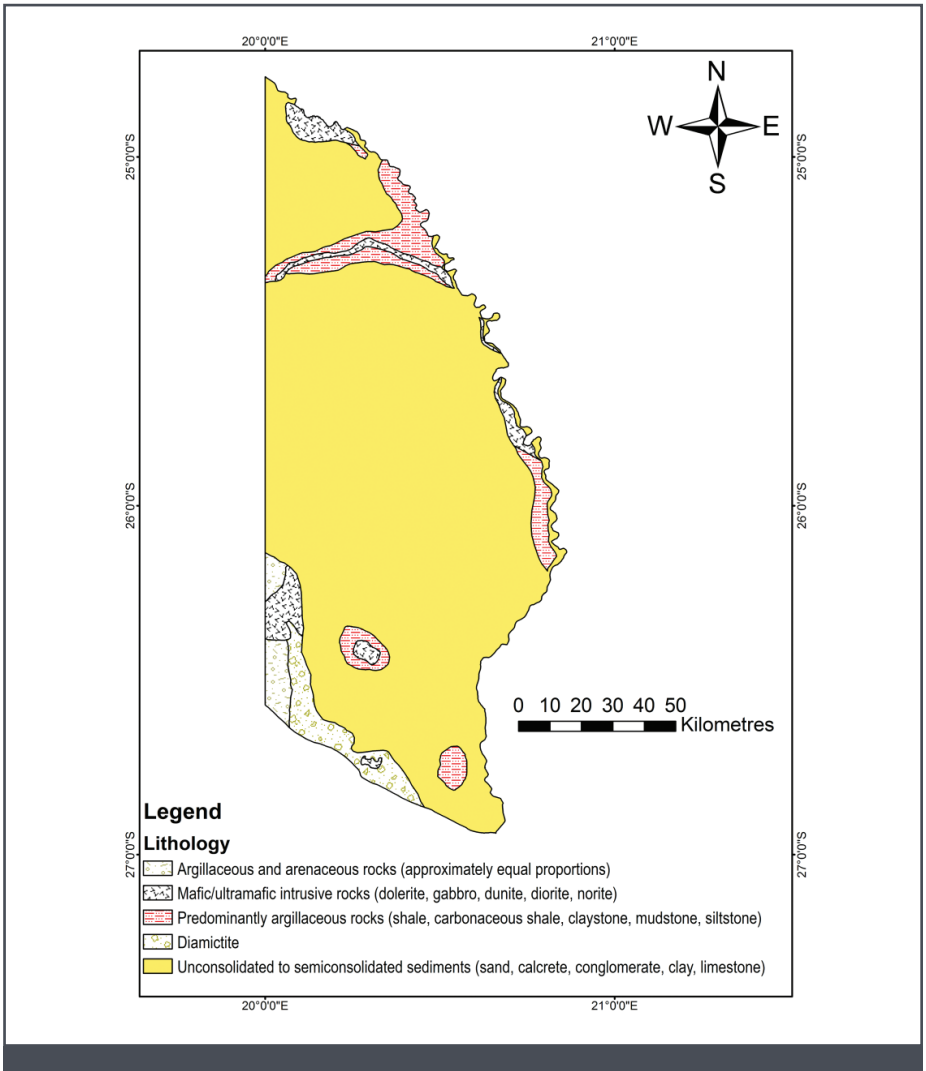
Kalahari–Karoo Transboundary Aquifer project



Delineation of the area and geology of the South African part of the Stampriet Aquifer project.

The Swiss Agency for Development and Cooperation (SDC) has entrusted UNESCO, through its International Hydrological Programme, together with the International Groundwater Resources Assessment Centre (IGRAC), with the execution of the global project Groundwater Resources Governance in Transboundary Aquifers. The project aims to conduct a detailed assessment of the characteristics, current state and management of transboundary aquifers in three case study areas and to lay the foundations for a multicountry consultative body. The three aquifer case studies selected for this project are the:

- Kalahari–Karoo (Stampriet) Aquifer in Botswana, Namibia and South Africa,
- Pre-Tashkent Aquifer in Kazakhstan and Uzbekistan,
- Esquipulas–Ocotepeque–Citalá (Trifinio) Aquifer in Honduras, El Salvador and Guatemala.

The proposal to choose the Kalahari–Karoo (Stampriet) Aquifer as one of the case studies in this project goes back to an initiative of the aquifer sharing countries. In the framework of the Internationally Shared Aquifer Resources Management (ISARM)

The Minister of Agriculture, Water and Forestry of Namibia, John Mutorwa, formally launched the project at the first regional meeting in Windhoek in October 2013.

Prof. Jurgen Kirchner (Regional Coordinator), Geert-Jan Nijsten (IGRAC), Stefano Burchi (Senior Legal Specialist), Andrew Ross (UNESCO, Paris), Tales Carvalho Resende (UNESCO, Paris), Fortress Netili, Joyce Leshomo (Technical Specialist — Hydrogeology, CGS) and Bantu Hanise (Technical Specialist — Socio-economic and environmental issues, CGS) attended a regional meeting in Namibia in May 2014.

programme of SADC, representatives of Botswana, Namibia and South Africa proposed to initiate activities aimed at improving knowledge about the Stampriet transboundary aquifer and at facilitating its joint management.

The Council for Geoscience was selected by the Department of Water and Sanitation (DWS) of South Africa as the National Expert to conduct research to address hydrogeological, socio-economic and environmental and legal and institutional issues related to the South African part of the Stampriet Aquifer.

The main goal of the Groundwater Resources Governance in Transboundary Aquifers project is to enhance cooperation on water security, reduce transboundary and water use conflicts, and improve overall environmental sustainability. The project aims to reinforce the capacity of Member States in managing groundwater resources, to strengthen cooperation amongst countries sharing the aquifer, and to develop a long-term strategy for the monitoring and governance of the transboundary aquifer. One of the expected outcomes is that the countries sharing the aquifers will cooperate for the sustainable management of the resource. They should also agree to take steps to deal with transboundary implications through a political commitment to define and implement national and regional priority actions for the protection and equitable utilisation of the aquifers.

The project implementation strategy is based on the ISARM guidelines and their multidisciplinary approach to the governance and management of transboundary aquifers in addressing scientific, socio-economic, legal, institutional and environmental aspects. The Stampriet project comprises two components:

- *Component 1:* Building recognition of the shared nature of the resource, and mutual trust through an indicator-based assessment based on joint fact finding and science-based diagnostics. This component will focus on the assessment of the hydrogeological, environmental and socio-economic conditions and governance, legal and institutional frameworks, including the identification of issues of transboundary concern. The outputs of this component will be an indicator-based assessment, a diagnostic analysis and an Information Management System (IMS).

- *Component 2:* Reaching consensus on transboundary governance mechanisms for groundwater management. The focus of this component will be on improved groundwater governance aimed at establishing cooperation mechanisms for transboundary groundwater management at the aquifer level and on reaching an agreement on priorities for actions to be taken by the affected countries to address the identified issues of transboundary concern.

Stakeholder consultation was carried out throughout the project implementation phase. Within the implementation of Component 1, a consultation process among the countries was conducted

to enable them to reach agreement on the priority issues. The implementation of Component 2 has given local and national stakeholders the opportunity to acquaint themselves with the full array of issues at stake and to take ownership of the objectives of the project which will ultimately lead to improved groundwater governance of the Kalahari–Karoo (Stampriet) Aquifer.

Three national experts are responsible for the hydrogeological, socio-economic, environmental and legal and institutional aspects of the project. The hydrogeologist, Joyce Leshomo, and socio-economist, Bantu Hanise, are from the Council for Geoscience and the legal and institutional expert is from the Department of Water and Sanitation. Currently, the project is nearing completion.

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Workshop on the application of UNFC-2009 for uranium resources

The UNFC-2009 workshop delegates.

The Council for Geoscience was requested by the Department of Energy (DoE) to organise a regional workshop on the Application of United Nations Framework Classification (UNFC) — 2009 for Uranium Resources within the framework of the Technical Cooperation Project RAF2011 — Supporting the Sustainable Development of Uranium Resources. The workshop was sponsored by the International Atomic Energy Agency (IAEA) and the United Nations Economic Commission for Europe (UNECE). The workshop took place in Johannesburg from 10 to 14 November 2014.

UNFC-2009 is a universally acceptable and internationally applicable scheme for the classification and reporting of fossil energy and mineral reserves and resources and is currently the only system in the world to do this kind of classification and reporting. The UNFC was established in 1992 and, since then, various reviews and additions have been undertaken. In 2009, a simplified version of the UNFC was approved (UNFC-2009) which ensured maximum potential for alignment with other widely used energy and mineral resource classification systems to facilitate mapping using these systems. UNFC-2009 is a generic principle-based system in which quantities are classified on the basis of three fundamental criteria; economic and social viability, field project status and feasibility, and geological knowledge using a numerical coding system. UNFC-2009 reflects conditions in the economic and social domain, including markets and government framework conditions, technological and industrial maturity and the ever-present uncertainties. It provides a single framework on which to build international energy and mineral studies, analyse government resource management policies, plan industrial processes and allocate capital efficiently.

The purpose of the workshop was to discuss and share experiences in applying UNFC-2009 for the evaluation of uranium projects in Africa and to illustrate how sustainable development could be leveraged by the use of transparent communication standards. The workshop was attended by delegates from the Council for Geoscience, the Department of Mineral Resources (DMR), DoE, IAEA, UNECE, the Committee for Mineral Reserves International Reporting Standards (CRIRSCO), the South African Code for the Reporting of Mineral Resources (SAMREC Code), Mintek, the University of the Witwatersrand and other delegates, representing 14 African and 3 European countries.

The CEO of the Council for Geoscience, Mr Mxolisi Kota, gave an opening address and welcomed the international experts to South Africa. The delegates from the Council for Geoscience gave three presentations: Uranium resources in South Africa, classified based on the SAMREC Code, OECD/IAEA uranium classification and UNFC-

Abdul Kenan presenting to the workshop delegates.

2009, by Abdul Kenan; Uranium in the Springbok Flats Basin, by Valerie Nxumalo and Application of UNFC-2009 for the reporting of uranium resources, case studies — South Africa, Namibia and Malawi, by Abdul Kenan and Livhuwani Ramalata. The workshop included a one day visit to the Council for Geoscience and Mintek.

South Africa, represented by the Council for Geoscience, is one of only three countries in Africa that regularly contributes to the publication of the IAEA/OECD Red Book (Uranium resources). The Council for Geoscience is taking the lead in this regard and will be the advisory organ of the application of UNFC-2009 in Africa.

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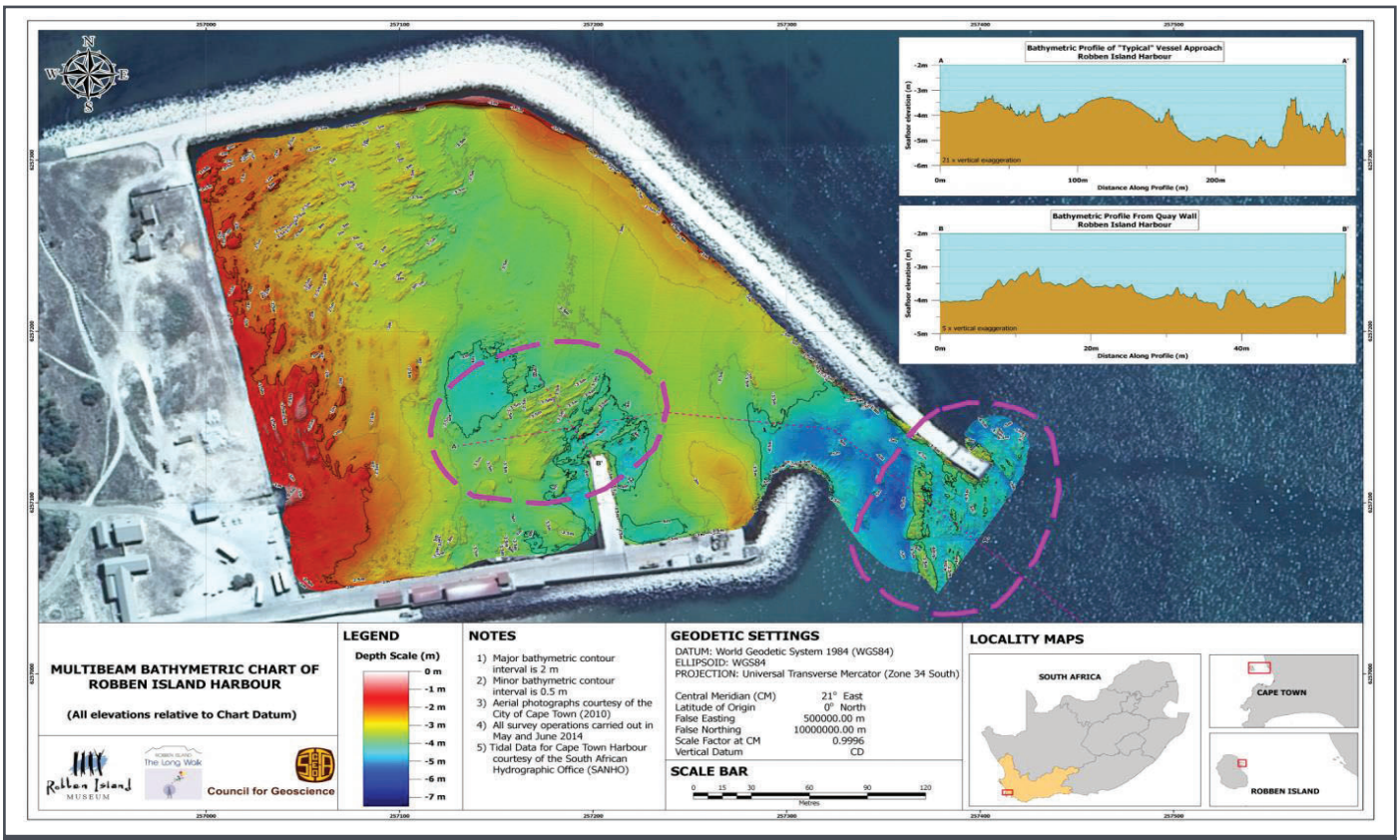
Marine survey reveals secret of Robben Island



Multibeam bathymetric chart of Robben Island Harbour, showing rock outcrops identified as potential hazards to vessel navigation.

The Robben Island Museum (RIM) currently has a fleet of four ferries to transport tourists to and from Robben Island; the Sikhululekile, the Susan Kruger, the Dias and the cargo ferry Blouberg. Sikhululekile, the newest ferry, was purchased in 2008. Unfortunately, this R26 million flagship ferry has been out of service for almost a year because of repeated damage to the ferry's hull during low tides.

The museum management had been worried about the possibility of rocks in the harbour for some time and asked the South African Navy and police divers to survey the harbour in February and May last year. These surveys showed submerged obstacles, but no more detail could be provided.

In June 2014, the Council for Geoscience approached Robben Island Museum for permission to survey the seafloor from the harbour at Murray Bay to Blouberg. The acquired data would be used as part of an endeavour to walk on the seafloor

Robben Island, with the harbour to the left.

between these two localities to raise funds for the Nelson Mandela Children's Hospital. Information on the area within the 1 nautical mile (exclusive zone) around the island and the harbour floor would then be provided to RIM should they grant said permission. Marine geoscientists, under the leadership of Michael MacHutchon, determined the presence of two rocky outcrops, one in the middle of the harbour at 2.5 m and another near the entrance to the harbour. There is no gap in the outcrop at the entrance and all vessels need to pass over this outcrop. The rock outcrops cannot be removed because they are in the sensitive environment of a World Heritage Site. In addition, the survey identified an old pipeline and a 7.8 km underwater land bridge between the harbour and Blouberg, at an average depth of 15 m.

The rocks posed no problems to the other two ferries used by the museum as these have shallower draughts. However, the draught of the Sikhululekile is too deep, particularly during low tide. At the time of the survey, a tender had been issued to replace the ferry with a new one of similar draught. Owing to the findings of the CGS investigations, the tender specifications were amended for a shallower draught vessel with a shallower water capacity. The study raised questions as to why a detailed survey had not been conducted prior to spending money on a new ferry which ultimately proved to be too big to safely navigate the harbour.

A detailed account of this survey will follow in the next issue of GEOclips. An adventurer is planning to "walk" this route to raise funds for charity.

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Special stamp issue for the 35th IGC

In 2014, the Local Organising Committee (LOC) of the 35th IGC submitted an application to the Philatelic Bureau of the South African Post Office to consider a special stamp issue to commemorate the 35th IGC. The Bureau confirmed that the application was successful and the 35th IGC stamp issue is now on their official programme for 2016!

A meeting held with officials of the Philatelic Bureau was attended by members of the 35th IGC LOC and Pieter Bosch, a former employee of the Council for Geoscience, who is an avid philatelist. Pieter has been trying for years to interest the Philatelic Bureau in a postage stamp series of the South African geoheritage sites.

The idea is to produce a series of five or ten stamps depicting the most famous South African geological superlatives, simultaneously promoting and commemorating the hosting of the 35th IGC in South Africa in 2016. The IGC, held under the auspices of the International Union of Geological Sciences (IUGS), was last held in Africa in Algiers, Algeria in 1952 and, before that, the 15th IGC took place in Pretoria, South Africa in 1929.

The LOC of the 35th IGC is very excited about this special series of the Philatelic Bureau and is looking forward to the 35th IGC, which will be held between 27 August and 4 September 2016 at the CTICC in Cape Town. Please visit the website at http://www.35igc.org for more information. A link on the website will enable you to express your interest in the Congress and also to propose a symposium, workshop or short course. Abstract submissions will open on 1 July 2015 — keep your eyes open for the advertisement calling for abstracts to submit your contribution! The second circular of the 35th IGC will be released shortly and will be available for download from the website.

The 35th IGC will be a once-in-a-lifetime opportunity to showcase South Africa's fabulous geological heritage to the world and to demonstrate the excellence of geoscientific research in South Africa and Africa.

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Latest publication releases

Bulletins

Bulletin 141: Mineralogical, geochemical and isotopic constraints on the evolution of the Lower Main Zone and Platreef on the Northern Limb of the Bushveld Complex by F. Roelofse

Bulletin 142: Cretaceous to Recent evolution of the Durban Bluff and adjacent continental shelf by H.C. Cawthra

Bulletin 143: A preliminary understanding of deep groundwater flow in the Table Mountain Group (TMG) aquifer system by K.F. Netili

Bulletin 144: Landslide classification, characterisation and susceptibility modelling in KwaZulu-Natal by R.G. Singh

Bulletin 145: Acquisition, processing and enhancement of multi-channel radiometric data collected with ultralight aircraft-mounted detectors by H. Coetzee

Bulletin 146: Stratigraphy and sedimentology of the Karoo Supergroup in the Gemsbok Sub-basin (Botswana and Namibia) by V. Nxumalo

Bulletin 147: Investigation of hydrochemistry and uranium radioactivity in the groundwater of Namaqualand, Northern Cape, South Africa by J.T. Leshomo

Bulletin 148: The geological evolution and sedimentary dynamics of Hout Bay, South Africa by M.R. MacHutchon

Geological Explanations (1:50 000 scale)

Explanation: Sheet 2429BC (Scale: 1:50 000). Geology of the Lebowakgomo area by R.W. Belcher

Explanation: Sheet 2527DD (Scale: 1:50 000). The geology of the Broederstroom area by B.A. Ingram and D.M. van Tonder

Explanation: Sheet 2528CC (Scale: 1:50 000). The geology of the Centurion area by S.A.B. Laubscher, M. van der Neut, D. van Tonder and D. Gqiba

Explanation: Sheet 2528CD (Scale 1:50 000). Geology of the Rietvlei Dam area by B.A. Ingram, H. Minnaar and M. Britz

Explanation: Sheet 2627BC (Scale 1:50 000). Geology of the Westonaria area by M. van der Neut, G.J. Davids, H. Coetzee and M. Cronwright

Explanation: Sheet 2926AB (Scale: 1:50 000). The geology of the Maselspoort area by P.J.A. Bosch

Explanation: Sheet 2926BA (Scale 1:50 000). The geology of the Sannaspos area by I.G. Haddon, P.J.A. Bosch and D. van Niekerk

Explanation: Sheet 2926BB (Scale 1:50 000). The geology of the Thaba Nchu area by P.J.A. Bosch

Explanation: Sheets 3317BB & 3318AA, 3217DB & DD and 3218CA & CC (Scale 1:50 000). The geology of the Saldanha, Vredenburg and Velddrif environs by D.L. Roberts and H.P. Siegfried

Explanation: Sheets 3318AC & AD (Scale 1:50 000). The geology of the Yzerfontein–Darling area by H.P. Siegfried and L. Nhleko

Explanation: Sheets 3418BB & BD (Scale 1:50 000). The geology of the Somerset West–Hangklip area by H.P. Siegfried, L. Nhleko and F.D.J. Stapelberg

Geological Explanations (1:250 000 scale)

Explanation: Sheet 2816 (1:250 000). The geology of the Alexander Bay area by H. Minnaar, P.M.W. Botha and D. Roberts

Explanation: Sheet 3017 (1:250 000). The geology of the Garies area by C.H. de Beer

Explanation: Sheet 3018 (1:250 000). The geology of the Loeriesfontein area by P.H. Macey, H.P. Siegfried, H. Minnaar, J. Almond and P.M.W. Botha

Metallogenic Explanations

Explanation: Metallogenic Map Sheet 2526 Rustenburg (Scale 1:250 000). The metallogeny of the Rustenburg area by R.H. Baillie, M.C. du Toit, D.L. Ehlers, J. Astrup and D. Hage

Explanation: Metallogenic Map Sheet 2628 East Rand (Scale 1:250 000). The metallogeny of the East Rand area by G. Henry and W.R. Oosterhuis

Explanation: Metallogenic Map Sheet 2918 Pofadder (Scale 1:250 000). The metallogeny of the Pofadder area by A.L.D. Agenbacht and W.R. Oosterhuis

Explanation: Metallogenic Map Sheet 3118 Calvinia (Scale 1:250 000). The metallogeny of the Calvinia area by D.I. Cole

Explanation: Metallogenic Map Sheet 3324 Port Elizabeth (Scale 1:250 000). The metallogeny of the Port Elizabeth area by S. Frost-Killian and D.L. Ehlers

Engineering Geological Explanations

Explanation: Engineering Geology: The engineering and geotechnical conditions for the Silverton 2528CB 1:50 000-scale map sheet by S. Ngubelanga

Explanation: Engineering Geology: Sheet 2931CA (Scale 1:50 000). The engineering and geotechnical conditions for the Verulam area by C.A. Willard

Explanation: Engineering Geology: Sheets 3418AB & AD: Soil profiles developed on the rocks of the Cape Peninsula, Western Cape, South Africa by F.D.J. Stapelberg

Popular Geoscience Series

Popular Geoscience Series 4: Meteorite Impact! The Danger from Space and South Africa's Mega-Impact, The Vredefort Structure, 3rd Edition by W.U. Reimold and R.L. Gibson

Popular Geoscience Series 5: The Bushveld Complex: An introduction and review of its crustal setting, emplacement and mineralization by H.V. Eales

Others

Atlas on geological storage of carbon dioxide in South Africa by M. Cloete

Technical report on the geological storage of carbon dioxide in South Africa by J.H.A. Viljoen, F.D.J. Stapelberg and M. Cloete

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