

SASQUA

2026



XXV Biennial Congress

Central lowveld, Limpopo

SOUTH AFRICA

*Southern African Quaternary Climates,
Ecosystems and People – Perspectives
from the Lowveld*

31 August – 4 September 2026
Wits Rural Facility

Welcome

On behalf of the organising committee, we welcome you to the 25th biennial SASQUA Congress. We trust you will enjoy this meeting at the Wits Rural Facility in the Limpopo Lowveld, and that the week offers a productive exchange of ideas across the many disciplines that make up southern African Quaternary science.

Venue

The conference is held at the Wits Rural Facility, which offers visitor accommodation, seminar and conference venues, a restaurant, and laboratory facilities. The facility lies approximately 25 minutes from Hoedspruit Airport (HDS) and 30 minutes from the Kruger National Park.

Presentations

Oral papers: 12 minutes will be allocated per paper, followed by 3 minutes for discussion.

Posters: Posters need to be A0 portrait orientation. There will be one poster session, held on Tuesday 1 September from 16:30 to 17:30, combined with a cocktail function.

Meals

All meals - breakfast, lunch and dinner - are included for registered delegates. SASQUA will sponsor drinks on some evenings; otherwise a bar is available on site.

Social Functions

Sunday 30 August, afternoon: Arrival, registration, welcome drinks and braai

Thursday 3 September, evening: Conference dinner and prize-giving ceremony

Field Excursion

Wednesday 2 September: Full day field trip to the Kruger National Park, with a packed breakfast and lunch provided.

Thursday 3 September: sunset safari drive: Manyeleti Game Reserve – details will be announced at the congress.

Workshop

Dr Manuel Chevalier will run a data-analysis course aimed at strengthening analytical thinking and practical data skills in environmental and Quaternary sciences. Sessions run alongside the programme on Monday, Tuesday and Thursday, with a full day on Friday 4 September.

Organising Committee

Local Organising Chair:

Prof Marc Humphries

Organising Committee:

Dr Lynne Quick

Prof Justin Parteger

Dr Lauren Pretorius

Ms Asithandile Ntsondwa

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PROGRAMME

Sunday 30 August

Afternoon	<i>Arrival and registration</i>
Evening	<i>Welcome drinks and braai</i>

Monday 31 August

08:30 – 09:00	Registration	
09:00 – 09:15	Opening ceremony & welcome	
SESSION 1: The Cape in the Quaternary: landscapes, vegetation and ecosystems		
09:15	<u>Cawthra, H.C., Cole, J., Cole, P., Musekiwa, C. & Phikiso, Z.</u>	A re-evaluation of Cape Cenozoic sedimentary successions through high-resolution coastal geological mapping
09:30	<u>Quick, L.J., Manzano, S., Humphries, M., Esteban, I., Julier, A. & Chase, B.M.</u>	Late Quaternary palaeoenvironments of the Cape Floristic Region: new developments
09:45	<u>Gibbs, E.L., Chase, B.M. & Quick, L.J.</u>	Ancient flames of the Swartberg Mountains: reconstructing glacial–interglacial fire dynamics from microcharcoal preserved in a hyrax rock midden
10:00	<u>Nel, L.S., Quick, L.J., Manzano, S. & Chase, B.M.</u>	Fire and climate shaping vegetation across the Greater Cape Floristic Region: an insight into the Late Quaternary Period
10:15	<u>Faith, J.T., Abraham, J.O., Fillion, E.N., Karp, A.T. & Staver, A.C.</u>	Estimating the effects of large mammal herbivory on plant communities in the Cape Floristic Region
10:30 – 11:00	Tea	
SESSION 2: Geochronology, site formation and geoarchaeology		
11:00	<u>Armitage, S.J. & Wurz, S.</u>	Dating the Howiesons Poort at Klasies River Main Site Cave 1A using luminescence: doing the same thing and expecting a different result
11:15	<u>Sommer, C., Riedesel, S., Möller, G.H.D., Botha, G.A. & Will, M.</u>	Middle-to-Late Pleistocene landscape change and human occupation at the Jojosi dongas, KwaZulu-Natal, South Africa
11:30	<u>Chong, K.H.W., van Niekerk, K.L., Armitage, S.J., Hoelzmann, P., Cendrowska, M., Muller, A., Ehlert, M., Walsh, E., Nykamp, M., Page, S. & Henshilwood, C.S.</u>	Formation and preservation processes of Stone Age open-air sites in the semi-arid Little Karoo, southern Africa
11:45	<u>Miller, C., Mentzer, S., Val, A. & Porraz, G.</u>	Geoarchaeological investigations of LSA and MSA deposits from Bushman Rockshelter, Limpopo Province, South Africa

12:00	<u>Mentzer, S., Skaroglou, E., Sievers, C., Ligouis, B., van Wijk, Y., Miller, C. & Wurz, S.</u>	Identification of charred seed endocarps in micromorphology samples from Klasies River Main Site
12:15	Open discussion	
12:30 – 14:00	<i>Lunch</i>	
SESSION 3: Middle Stone Age behaviour, technology and coastal adaptation		
14:00	<u>Walsh, E., Armitage, S., Miller, C., Simon, M., Pereira, S., Mørkved, P.T., van der Bilt, W., Reeves, E., van Niekerk, K. & Henshilwood, C.</u>	Palaeolandscape dynamics during Middle Stone Age occupation at Blombos Cave and Klipdrift Complex: insights from coastal sedimentary deposits
14:15	<u>Muller, A., Cendrowska, M., Armitage, S.J., van Niekerk, K.L. & Henshilwood, C.S.</u>	Tracking diachronic changes in lithic technological strategies through the Blombos Cave sequence with computational 3D methods
14:30	<u>Richardson, L., Sealy, J. & Wurz, S.</u>	Adapting to changing sea levels in the MSA at Klasies River Main Site
15:00 – 15:30	<i>Tea</i>	
15:30 – 17:00	<i>Data analysis workshop session (Dr Manuel Chevalier, Data Sharp Academy)</i>	
18:30	<i>Dinner</i>	

Tuesday 1 September

SESSION 4: Pollen, charcoal and Holocene vegetation and fire dynamics		
09:00	<u>Manzano, S.</u>	From COMPOSITAS-SA to the Cape Pollen Flora: an insight into the palynological diversity of the Cape
09:15	<u>Bamford, M.K.</u> , Kock, S. & Hlophe, B.	Early Holocene charcoals from Stratum 4 of Wonderwerk Cave, South Africa
09:30	<u>Hlophe, B.</u> & Bamford, M.	Exploring environmental shifts in Limpopo during the Late Quaternary using macrocharcoal
09:45	<u>van Aardt, A.C.</u> , Scott, L., de Jager, J.C.L., Sjöström, J. & Norström, E.	A north-eastern Free State, Holocene pollen record from Marais Geluk wetland, South Africa
10:00	<u>Vasileva, A.</u> , Neumann, F., Cavazzin, B., Madella, M. & Whitehouse, N.	Holocene land cover shaped by climate and human impacts: a pollen-based reconstruction from South African semi-arid grasslands
10:15	Open discussion	
10:30 – 11:00	Tea	
SESSION 5: Wider southern African perspectives: Limpopo, KwaZulu-Natal, Namibia and Mozambique		

11:00	<u>Ramagadane, A., Sloan, A. & Kahle, B.</u>	Geomorphological analysis of the Quaternary active faults along the Limpopo Belt and Mozambique Belt: Kruger-Malale Scarp, Nwanedzi-Brak Scarp and Mazenga Grabens
11:15	<u>Prior, K. & Humphries, M.</u>	Hydroclimate variability in subtropical eastern South Africa associated with extreme ENSO events: past and present
11:30	<u>Maphutha, M.J. & Bamford, M.</u>	Past Miocene environment and modern vegetation of Gorongosa National Park, Mozambique
11:45	<u>Mocke, H., Pickford, M. & Senut, B.</u>	Termite ichnofossil occurrences in Namibia and their value as indicators of past climates, environmental change and biodiversity
12:00	Open discussion	
12:30 – 14:00	<i>Lunch</i>	
14:00 – 15:30	<i>Data analysis workshop session (Dr Manuel Chevalier, Data Sharp Academy)</i>	
16:30 – 17:30	<i>Poster and cocktail session (see poster list below)</i>	
18:30	<i>Dinner</i>	

Wednesday 2 September

Full day	<i>Field trip to Kruger National Park (packed lunch provided)</i>
18:30	<i>Dinner</i>

Thursday 3 September

SESSION 6: Palaeodiet, faunal records and palaeoanthropology		
09:30	<u>Vink, M., Leichliter, J., Vonhof, H., Sambo, R., Stratford, D., Bamford, M., Martínez-García, A. & Lüdecke, T.</u>	Dietary niche reconstruction of Paranthropus and early Homo at Sterkfontein Caves, South Africa
09:45	<u>Lethuba, M., Sahle, Y., Luyt, J. & Stynder, D.</u>	Preliminary Results on the Dietary Adaptations of Loxodonta atlantica zulu from EFTM and DFT2
10:00	<u>D'Eramo, G.A. & Badenhorst, S.</u>	The Late Acheulean fauna from Beds 1 and 2 at the Cave of Hearths, Makapan Valley, South Africa
10:15	<u>Nagel, I.M. & Badenhorst, S.</u>	The Later Stone Age fauna from the Cave of Hearths in the Makapan Valley, South Africa

10:30	Faith, J.T., Chase, B., Edwards, T., Koski, K., Luti, G., McGrath, A., Norwood, A., Pargeter, J., Pickering, R., Schroeder, L., Sokolowski, K., Stratford, D. & Stynder, D.	Palaeoanthropology beyond the Cradle: investigation of fossil-rich Pleistocene cave deposits in South Africa's Cango Valley
10:45 – 11:00	<i>Tea</i>	
11:00 – 12:30	<i>Data analysis workshop session (Dr Manuel Chevalier, Data Sharp Academy)</i>	
12:30 – 14:00	<i>Lunch</i>	
14:00 – 16:00	<i>Closing ceremony and Biennial General Meeting</i>	
Late afternoon	<i>Manyeleti Game Reserve sunset drive</i>	
Evening	<i>Dinner and prize-giving ceremony</i>	

Friday 4 September

All day	<i>Departures</i>
All day	<i>Data Analysis Workshop (Dr Manuel Chevalier, Data Sharp Academy)</i>

Poster session: Tuesday 1 September, 16:30–17:30

#	Presenter	Title
1	<u>Claassen, D.</u>, Linol, B. & Botha, G.A.	A palaeoenvironmental interpretation of Late Quaternary hillslope regolith in the Eastern Cape, South Africa
2	<u>Mthembi, P.</u>, Black, D., Claassen, D. & Medialdea, A.	Drilling and sampling of Quaternary sediments in support of neotectonic studies at Duiyfontyn, Western Cape
3	<u>Singh, R.</u> & Chiliza, S.G.	Analysis of April 2022 rainfall-triggered landslides in Quaternary sediments: a case study of the Durban region, South Africa
4	<u>Vieira, T.D.F.</u>, Stratford, D.J. & Reynard, J.	An examination of organic preservation processes at Strathalan SCB, Eastern Cape, South Africa
5	<u>Pereira, S.I.</u>, Reeves, E.P., Cendrowska, M., Mørkved, P.T., van der Bilt, W.G.M., Henshilwood, C.S. & van Niekerk, K.L.	Biomarkers reveal environmental and site use variability during the Middle Stone Age at Klipdrift Shelter, South Africa
6	<u>Walsh, E.</u>, Simon, M., D'Andrea, W., Henshilwood, C., van Niekerk, K., Mologni, C., Ziani, I., Rezek, Z., Hublin, J., Ben-Ncer, A. & Bouzouggar, A.	Biomarker insights into Middle Stone Age palaeoenvironments from northern and southern African cave sites
7	<u>Effiom, A.C.</u>, Ntukidem, A.U. & Bassey, M.E.	Pollen studies of common west tropical African Acanthaceae species

ABSTRACTS

Presented in programme order.

Oral Presentations

Session #1

The Cape in the Quaternary: landscapes, vegetation and ecosystems (Monday 31 August, 09:15–10:30)

O1 A RE-EVALUATION OF CAPE CENOZOIC SEDIMENTARY SUCCESSIONS THROUGH HIGH-RESOLUTION COASTAL GEOLOGICAL MAPPING

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Keywords: Cape South Coast, Bredasdorp Group, Sea level, Coastal erosion rates

The Council for Geoscience's technical programme is currently focused on remapping South Africa at a scale of 1:50,000 using topographic sheets as a basis. This programme aims to produce high-quality, fundamental geoscientific data and maps both onshore and offshore. Within this initiative, the Western Cape coastal map sheets are intended to show zones of coastal erosion, identify faults with neotectonic movement and better place the Cenozoic deposits in a context of deposition associated with sea-level fluctuations. This work offers an opportunity to readdress the stratigraphy of the Bredasdorp, Sandveld and West Coast groups. We focus here on results of recent mapping undertaken along the Cape south coast between Vermaaklikheid and Vleesbaai within the geological Bredasdorp Group. While original mapping in the 1980s served 1:250,000 scale compilations, recent publications on ages of Pleistocene deposits and advancements in high-resolution satellite imagery now allow for far greater precision in the delineation of geological units. Key findings so far include the refined mapping of the Pliocene De Hoopvlei Formation and considerations of neotectonics affecting its preservation; the subdivision of the Wankoe, Klein Brak, Waenhuiskrans and Strandveld formations to Member level from a stratigraphy perspective; and the identification of microbialite deposits along the coast which serves as a basis to constrain coastal groundwater discharge. Our mapping has delineated zones of susceptibility to coastal erosion by combining geology, topography, bathymetry, beach type and wave energy, and is working toward improving our understanding of Cenozoic landscape evolution in the region.

O2 LATE QUATERNARY PALAEOENVIRONMENTS OF THE CAPE FLORISTIC REGION: NEW DEVELOPMENTS

Quick, L.J. (1,2), Manzano, S. (3,4,5), Humphries, M. (6), Esteban, I. (7), Julier, A. (8) and Chase, B.M. (9)

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Keywords: Cape Floristic Region, Palaeoecology, Palaeoenvironments, Vegetation–climate dynamics

South Africa's Cape Floristic Region (CFR) is one of the world's most extraordinary biodiversity hotspots, and sits at the intersection of competing tropical and temperate atmospheric circulation systems, making it both climatically complex and highly sensitive to environmental change. Despite its global significance, the long-term climatic and ecological drivers underpinning its exceptional diversity remain poorly understood. This talk presents ongoing palaeoecological research aimed at reconstructing Late Quaternary environmental change across the CFR and its ecotonal boundaries. We employ a multi-proxy, multi-archive approach, combining pollen and non-pollen palynomorphs, charcoal, phytoliths, and geochemical analyses from two complementary archive types: sediment cores extracted from wetlands and rock hyrax (*Procavia capensis*) middens from montane regions. Together, these archives span coastal and interior subregions, enabling assessment of the spatiotemporal complexity of past climate and vegetation change. Key findings demonstrate distinct subregional climate trajectories within the CFR, including evidence for ecological tipping points and vegetation reorganisations during the Holocene. These records also provide critical environmental context for archaeological research, helping to elucidate the climatic settings in which early humans lived and adapted. Ongoing work is integrating these palaeoenvironmental datasets with modern pollen-vegetation calibration studies to improve the ecological interpretability of fossil records.

O3 ANCIENT FLAMES OF THE SWARTBERG MOUNTAINS: RECONSTRUCTING GLACIAL-INTERGLACIAL FIRE DYNAMICS FROM MICROCHARCOAL PRESERVED IN A HYRAX ROCK MIDDEN

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Keywords: Palaeoecology, Late-Holocene, Fire, Rock Hyrax Midden

This research project aims to reconstruct fire regimes during the Late Holocene by analysing microscopic and macroscopic charcoal preserved in hyrax, *Procavia capensis*, middens collected from sandstone rock shelters in the Swartberg region, South Africa. Fire is a key ecological driver in the Cape Floristic Region (CFR), particularly in transitional zones where Fynbos, Renosterveld, and Succulent Karoo biomes meet. No published charcoal-based fire history currently exists for the Swartberg Mountains. This study will fill that gap by producing high-resolution records of past fire activity and linking them to climatic changes, vegetation shifts, and potential human influence. Using established palaeoecological methods, the project will generate charcoal concentration curves and analyse temporal fire trends to establish a long-term fire baseline for the region. The results will contribute to broader efforts to understand fire–climate–human interactions in the CFR and will complement existing records from nearby sites like the Boomplaas Caves, Swartberg Pass and the Cango Caves. Outcomes include new data for conservation and palaeoecological research.

O4 FIRE AND CLIMATE SHAPING VEGETATION ACROSS THE GREATER CAPE FLORISTIC REGION: AN INSIGHT INTO THE LATE QUATERNARY PERIOD

Nel, L.S. (1), Quick, L.J. (1,2), Manzano, S. (3), Chase, B.M. (4,5)

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Keywords: Palaeoecology, Palaeoclimate, Greater Cape Floristic Region, Regime shifts, Pollen

The Greater Cape Floristic Region (GCFR) comprises a complex mosaic of fire-prone Fynbos and arid Succulent Karoo vegetation separated by sharp ecological and climatic gradients. These ecotonal landscapes are particularly sensitive to changes in rainfall seasonality, fire regimes, and other ecological drivers, yet high-resolution palaeoecological records remain scarce. This study investigates the long-term interactions between climate, fire, herbivory, and vegetation dynamics across the GCFR using multiproxy analyses of four new rock hyrax (*Procavia capensis*) midden records sampled along a Fynbos–Succulent Karoo ecotonal transect spanning the Gifberg Pass and eastern Cederberg region. Hyrax middens preserve fossil pollen, microcharcoal, and coprophilous fungal spores within well-stratified hyraceum deposits, providing one of the few continuous terrestrial palaeoarchives available in southern Africa's drylands. Fossil pollen, charcoal, and non-pollen palynomorphs will be analysed to reconstruct past vegetation composition, fire activity, and herbivore presence through time. Particular emphasis is placed on applying refined pollen classification methods for ecologically important families, notably the Asteraceae, to improve the detection of vegetation transitions along biome boundaries. The resulting records will assess how changes in winter rainfall intensity and the influence of tropical easterly and temperate westerly circulation systems interacted with fire to shape vegetation dynamics across the ecotone. By generating new fine-scale palaeoecological data from an underrepresented region, this research provides a

long-term perspective on ecosystem resilience and informs conservation initiatives, including the Sustainable Ceder Project, through improved understanding of past fire, climate, and vegetation relationships.

O5 ESTIMATING THE EFFECTS OF LARGE MAMMAL HERBIVORY ON PLANT COMMUNITIES IN THE CAPE FLORISTIC REGION

Faith, J.T. (1,2), Abraham, J.O. (3), Fillion, E.N. (4), Karp, A.T. (5), Staver, A.C. (3)

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Keywords: Ecology, Herbivory, Fire, Mammals

South Africa's Cape Floristic Region (CFR) is a biodiversity hotspot of global significance and a focus of paleo-science research on the relationships between climate, terrestrial ecosystems, and human-environment interactions. Given the dramatic human impacts on CFR ecosystems since European colonization (1650 CE), the extent to which present-day plant communities mirror those of the recent past is uncertain. In addition to other anthropogenic impacts (e.g., landscape transformation, altered fire regimes), ecological theory and empirical observations imply that the decimation of large herbivore populations would have had significant impacts on vegetation. Here, we synthesize >1200 observations of forage intake across 70 large mammal species, allowing us to estimate the consumptive effects of herbivores on CFR vegetation. Based on modelled relationships between mean annual precipitation and herbivore biomass, we estimate that herbivores in the CFR coastal lowlands consumed ~80-280 kg/ha. Though small compared to annual production (~1000-4000 kg/ha), the effects of herbivory are expected to be highly localized (e.g., on shale-derived soils) and more persistent than other disturbances (e.g., wildfire with return intervals of ~10 years). Consistent with previous suggestions, we anticipate that the loss of large herbivores over the last 350 years has facilitated shrubland encroachment and reduced grass availability. Mismatches between modelled mammal distributions (used for conservation planning) and late Holocene fossil records tentatively support this hypothesis, documenting ungulate grazers at sites where the present-day vegetation lacks adequate forage. Paleoecological evidence from sediment cores spanning the colonial era can provide a productive avenue for investigating this hypothesis further.

Session #2

Geochronology, site formation and geoarchaeology (Monday 31 August, 11:00–12:30)

O6 DATING THE HOWIESONS POORT AT KLASIES RIVER MAIN SITE CAVE 1A USING LUMINESCENCE: DOING THE SAME THING AND EXPECTING A DIFFERENT RESULT

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Keywords: Luminescence dating; Middle Stone Age; Geochronology

Klasies River Main Site in the Eastern Cape Province contains a long record of Middle Stone Age occupation, including one of the thickest Howiesons Poort sequences in southern Africa. Over the excavation history of the site, biostratigraphy, radiocarbon, uranium-series, electron spin resonance and luminescence techniques have been used to establish a chronology spanning the last ~125 ka. However, luminescence dating of the Howiesons Poort in Cave 1A has been hampered by changing geochemical conditions during burial. Post-depositional dissolution of shells has led to both a reduction in the volume of sediment present and changes in uranium-series geochemistry. Each process imparts a time-dependant (and unknown) change in sediment radioactivity, violating a key assumption of standard luminescence age calculations. Feathers (2002) circumvented this problem by using luminescence techniques to measure the radiation dose absorbed by paired quartz and K-feldspar extracts from individual samples. Since K-feldspar contains radioactive potassium, the difference between quartz and K-feldspar absorbed doses relates to the radioactivity of the latter, which is not modified by post-depositional changes in sediment geochemistry. Consequently, "subtraction ages" calculated using the difference between quartz and K-feldspar absorbed dose, and the internal dose rate of the latter, are impervious to changes in the bulk sediment. Recent improvements in luminescence measurement techniques for both minerals make it timely to re-date samples from the Howiesons Poort sequence, with the aim of producing a more precise and accurate chronology. We present single-grain quartz, K-feldspar and subtraction ages for the Cave 1A Howiesons Poort sequence.

O7 MIDDLE-TO-LATE PLEISTOCENE LANDSCAPE CHANGE AND HUMAN OCCUPATION AT THE JOJOSI DONGAS, KWAZULU-NATAL, SOUTH AFRICA

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Keywords: Geomorphology; Quaternary Sediments; Middle Stone Age; OSL Dating

The Jojosi dongas, a badland landscape in eastern South Africa, represent an exceptional archive of past landscape dynamics and early human occupation. Formed by gully erosion, their hillslope cover succession preserves colluvial and alluvial sediments and buried paleosols, documenting cyclical phases of landscape stability and instability over hundreds of thousands of years. Located on the boundary between savanna and grassland in KwaZulu-Natal, the site records repeated phases of gully cut-and-fill since the Mid-Pleistocene. The site features a series of open-air knapping sites that were repeatedly visited by humans between ~220,000 and ~110,000 years BP for specialized and persistent procurement of lithic raw materials. Between 2022 and 2024, we conducted extensive field campaigns that combined luminescence dating, stratigraphic correlation, geochemical analysis, and UAV mapping to reconstruct the complex three-dimensional stratigraphy and understand sediment redistribution processes across the slope. Luminescence dating reveals that

the Jojosi dongas extend the age of known landscape archives in this region from the Late Pleistocene well into the Middle Pleistocene. We applied a quantitative geostatistical model based on paleoclimate data to simulate vegetation development over the last 800,000 years. The results indicate that climate-induced oscillations between grassland and savannah influenced growing season length, fire regimes, and non-linear altitudinal shifts of the tree line, which promoted erosion phases reflected in the sedimentary succession. These dynamics are especially relevant for understanding the preservation conditions of lithic assemblages in exposed landscape contexts. Our findings advance the understanding of past landscape responses to climate change.

O8 FORMATION AND PRESERVATION PROCESSES OF STONE AGE OPEN-AIR SITES IN THE SEMI-ARID LITTLE KAROO, SOUTHERN AFRICA

Chong, K.H.W. (1,2,4), van Niekerk, K.L. (1,3,5), Armitage, S.J. (1,6), Hoelzmann, P. (7), Cendrowska, M. (1,3), Muller, A. (1,3), Ehler, M. (1), Walsh, E. (1,3,4), Nykamp, M. (7), Page, S. (5), Henshilwood, C.S. (1,3,8)

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Keywords: Open-air sites, Stone Age, Little Karoo, paleolandscape, semi-arid environment

Open-air archaeological sites provide valuable insights into human-landscape interactions. While their location and preservation rely on a range of environmental factors, in semi-arid environments, they are strongly dependent on eolian processes. We present the results of systematic geological mapping, stratigraphic analysis, and archaeological surveys in the Doorn River, Western Cape, South Africa. This area comprises a medium-order river channel that drains toward a low topographic point, producing a pan system. The channel is bounded by relic fluvial terraces and folded Devonian formations. The presence of intact lithic scatters from the Early, Middle, and Late Stone Ages was recorded on the top of rocky platforms, on nearby fluvial terraces, and along the pan shore. The scatters are composed of varying numbers of lithics, mostly quartzite in the early stages of reduction, including many tested nodules, suggesting the area was used for raw material procurement. Recurrence of technological strategy and the presence of several refits suggest high site integrity. The morphology of the scatters generally comprises coppice dunes and low vegetation cover. The site's preservation is linked to the formation of crevasse splay and eolian deposits subsequently exposed by surface runoff and deflation. The stratigraphic sections near the scatters confirm eolian deposits at the top of the sequences, corresponding to the occupied surface. These upper deposits are underlain by low-flow-regime fluvial sediments. We suggest that this area was ephemerally occupied during arid episodes by mobile hunter-gather groups exploiting the abundant quartzite.

O9 GEOARCHAEOLOGICAL INVESTIGATIONS OF LSA AND MSA DEPOSITS FROM BUSHMAN ROCKSHELTER, LIMPOPO PROVINCE, SOUTH AFRICA

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Keywords: Middle Stone Age, Later Stone Age, Geoarchaeology, Combustion, Micromorphology

Micromorphological and microcontextual investigations of deposits at Bushman Rockshelter demonstrate that both natural and anthropogenic processes of accumulation, as well as erosion and alteration, have impacted the stratigraphic sequence. Microscopic combustion residues, such as calcareous ashes, phytoliths, charcoal and char, point to repeated and significant burning of plant-derived fuels throughout both the Middle Stone Age (MSA) and Later Stone Age (LSA) occupations. These ashy deposits are interbedded with laterally-extensive, reddish-colored layers that are composed of clay-rich aggregates, ultimately derived from outside of the shelter. During the LSA, ashy deposits were structured within a midden against the back wall of the shelter. This observation, combined with evidence of short-term phases of abandonment during the MSA, implies that occupation was more intensive during the LSA relative to the MSA.

O10 IDENTIFICATION OF CHARRED SEED ENDOCARPS IN MICROMORPHOLOGY SAMPLES FROM KLASIES RIVER MAIN SITE

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Keywords: Middle Stone Age, micromorphology, cave, archaeobotany, micro-CT

Archaeological micromorphology is a well-established approach to documenting anthropogenic features and microstratigraphy in South African sites. A number of studies have employed micromorphology in the study of hearths, which frequently contain visible plant fragments, but identification is difficult due to the fact that the plant tissues are often randomly oriented with respect to diagnostic internal and external structures. At Klasies River Main Site (KRM), a number of Middle Stone Age combustion features have been documented using micromorphology. Sampled hearths, middens and so-called “carbonized partings” located in Cave 1A (Rockfall and Upper Members) are notable for the abundance of charred seeds visible in thin section. Here, we attempt to overcome the challenges of plant identification by pairing micromorphology with 3D reconstructions of seeds in the corresponding resin-indurated sediment blocks. We report on micro-CT scanning of blocks, segmentation of plant remains contained within, and comparison to reference materials which have allowed us to tentatively identify a majority of the preserved endocarps to the genus *Morella*. Organic petrology and micromorphological observations confirm that the seeds are burned and located in primary position within the features. Notably, when present in hearths, most remains are not associated with the heated substrates, which can be anthropogenic, biogenic or geogenic in origin but impacted post-

depositionally by heating. These substrates typically contain sand, fragments of tufa, bones, guano and more rarely, lithic artifacts. Alteration of the plant tissues include salt weathering, and heat-induced cracking which likely contribute to the overall poor recovery of macrobotanical remains during excavation.

Session #3

Middle Stone Age behaviour, technology and coastal adaptation (Monday 31 August, 14:00–15:00)

O11 PALAEO LANDSCAPE DYNAMICS DURING MIDDLE STONE AGE OCCUPATION AT BLOMBOS CAVE AND KLIPDRIFT COMPLEX: INSIGHTS FROM COASTAL SEDIMENTARY DEPOSITS.

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Keywords: Palaeolandscape, luminescence dating, biomarkers, MSA, South Africa

Cave sites along South Africa's coast provide key archives for understanding the early emergence of complex human behaviour in Middle Stone Age (MSA) Homo sapiens. Archaeological sequences in Blombos Cave (100 - 70 ka) and Klipdrift Shelter (65 – 60 ka) document shifts site use, subsistence strategies, and symbolic culture, with these sites containing Still Bay and Howiesons Poort technological complexes respectively. Changes in behaviour have often been linked to changing proximity to the coastline and regional climate variability, yet growing evidence from climate modelling studies suggests that environmental conditions likely varied at the local scale. Here, we reconstruct palaeoenvironmental conditions directly surrounding these two cave sites to examine local landscape dynamics. We targeted aeolianite, palaeosol, scree, and palaeobeach sequences for geochronological and palaeoenvironmental analyses. We present new luminescence ages to constrain the timing of landscape development, alongside sedimentological, mineralogical, and geochemical approaches to characterise the nature of depositional processes. Leaf wax biomarker analysis of palaeosol deposits, including quantification of n-alkane chain length distributions and stable isotope signatures provides a proxy for hydroclimate and biome conditions. These datasets are integrated with high resolution 3D drone mapping to reconstruct spatio-temporal patterns of palaeolandscape evolution around both sites. The combined record reveals alternating phases of landscape stability and instability during the Middle Stone Age. By linking these records with detailed analyses of within-cave sediments, this study offers a landscape-scale perspective on the environmental contexts for changing human behaviour at these sites.

O12 TRACKING DIACHRONIC CHANGES IN LITHIC TECHNOLOGICAL STRATEGIES THROUGH THE BLOMBOS CAVE SEQUENCE WITH COMPUTATIONAL 3D METHODS

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Keywords: Middle Stone Age; Blombos Cave; Lithic Technology; Still Bay

Blombos Cave (BBC) in South Africa's Western Cape contains Middle Stone Age human occupation layers from c.100–70ka. The site preserves evidence for the evolution of elaborate hominin behaviours like shell beads, decorated flakes, and engraved ochre, set amidst a backdrop of palaeoclimate and sea level fluctuations. This presentation concerns the more quotidian aspects of life at the site via analyses of their lithic toolkits. Using new computational 3D methods for quantifying technomorphological attributes of prepared cores, points, and scrapers, we chart diachronic changes in technological investment devoted to lithic technology. While variability in prepared core technology has long been used to track hominin skills, cognition, and dispersals, they remain notoriously difficult to classify and meaningfully quantify. With 3D scans of the prepared cores from BBC, we quantify their extent of preparation, recurrence, and exhaustion. Use-wear traces and automated 3D methods for quantifying tool shape and edge characteristics are also used to document changes in tool production and use throughout the sequence. Taken together, this evidence documents a gradual transition in technological investment from an emphasis on producing predetermined blanks from prepared cores to an emphasis on bifacial points. We also find no abrupt transitions in point-making strategies, finding that they instead undergo gradual trends that preface the introduction of Still Bay points. This evidence is more consistent with a local adoption of Still Bay technology, rather than any abrupt demographic replacement. Above all, these methods produce continuous datasets that are more amenable to comparisons with palaeoclimatic evidence.

O13 ADAPTING TO CHANGING SEA LEVELS IN THE MSA AT KLASIES RIVER MAIN SITE

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Keywords: Klasies River, Middle Stone Age, Birds, Seals, Coastal lifeways

The Klasies River Main site (KRM) provides a 100 ka record of Middle Stone Age (MSA) behavioural evolution, reflecting how hunter-gatherers adapted to fluctuating MIS 5-3 environments. Earlier models characterised MSA coastal people as opportunistic and less effective foragers than their Later Stone Age counterparts. This study challenges those views by assessing avian and pinniped remains (MNI=1,011 and 462 respectively) from Deacon's excavations. When the coastline was within 3 km of the site (MSA I and II), seals and [mainly marine] birds comprised nearly 50% of the KRM faunal assemblage. High frequencies of juvenile African penguins (30%) confirm

exploitation of nearby breeding colonies. Smaller numbers of freshwater birds indicate access to local wetland or riverine environments. Hunter-gatherers systematically hunted and scavenged seals and birds (especially penguins), but as the coast receded beyond 7 km from the site (during MIS 4), they shifted to seasonal scavenging of juvenile seals (70%) and offshore birds (e.g., albatrosses). Transport strategies also changed with distance; while whole seal carcasses were initially brought to KRM, receding coastlines led to shore-side processing of older seals, with only certain elements like flippers returning to the site. Evidence of specialised processing is visible through specific cutmarks on penguin bones, which are consistent with pelt removal, while distinct markings on the wing bones of both marine and terrestrial species indicate the systematic harvesting of feathers. These results demonstrate that MSA hunter-gatherers made deliberate, informed decisions about subsistence and resource utilisation, shaped by proximity to the sea.

Session #4

Pollen, charcoal and Holocene vegetation and fire dynamics (Tuesday 1 September, 09:00–10:30)

O15 FROM COMPOSITAS-SA TO THE CAPE POLLEN FLORA, AN INSIGHT INTO THE PAYNOLOGICAL DIVERSITY OF THE CAPE

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Keywords: Pollen, Botany, Cape Floristic Region

The Greater Cape Floristic Region (CFR) of South Africa is a globally renowned biodiversity hotspot, characterized by exceptional floral endemism and complex ecological dynamics. Reconstructing the Quaternary evolutionary history, paleoclimate, and environmental shifts of this region relies heavily on palynological data extracted from fossil records. However, the extreme hyper-diversity of the CFR poses a severe challenge for fossil pollen identification, frequently limiting taxonomic resolution to family or generic levels and obscuring fine-scale ecological signals. Here I introduce "The Cape Pollen Flora," a comprehensive morphological synthesis and reference framework designed to significantly enhance diagnostic precision in Southern African Quaternary palynology. Utilizing high-resolution light and scanning electron microscopy, we are analysing modern pollen grains from key diagnostic and dominant lineages, including Proteaceae, Restionaceae, and Asteraceae, alongside winter-rainfall zone succulents. By establishing clear, standardized criteria for exine ornamentation, aperture configuration, and grain size variations, this framework refines our ability to differentiate between ecologically distinct taxa that share overarching morphological traits. These advanced diagnostic capabilities allow for far more nuanced reconstructions of past vegetation dynamics, ancient fire regimes, and moisture gradients across the Cape during the Late Quaternary. "The Cape Pollen Flora" serves as a vital infrastructural tool that effectively bridges the gap between modern botanical richness and paleoecological modeling. Ultimately, elevating taxonomic resolution is crucial for understanding how these unique ecosystems

responded to past climate disruptions, providing essential baseline data for predicting future biodiversity vulnerabilities under global change scenarios.

O16 EARLY HOLOCENE CHARCOALS FROM STRATUM 4 OF WONDERWERK CAVE, SOUTH AFRICA

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Keywords: Charcoal Identification, Climate Reconstruction

Wonderwerk Cave is situated in the grassland biome northwest of Kuruman, northern Cape Province and has a two million year record of sporadic occupation in the cave deposits. Several teams have excavated the strata in the cave since the first operation by Malan and Cooke in the 1940s, followed by Beaumont's team in the 1970s and currently by Horwitz and Chazan. With new mapping methods and dating technology, the dating has been improved. Charcoal is rare in the 1 Ma strata but together with other proxies showed the earliest evidence of the controlled use of fire. In contrast, charcoal is very abundant in the Holocene strata and has been identified and used to reconstruct the past vegetation and climate. Stratum 4 (ca 11.4 to 4.6kya), however, has the greatest quantity of collected charcoal but has not been thoroughly studied. From initial studies and other proxies, this time period shows arid to wetter environments. The aim of this project is to provide more detail from the charcoals and more precise timing of the shifts in climate. Since the most abundant taxa have contradictory climate tolerances, such as *Searsia lancea* (drier), versus *Heteropyxis natalensis* and *Ochna serrulata* (wetter), we need to analyse a larger proportion of the samples to identify more species to be able to determine the past vegetation and climate of the Early Holocene. The new data and refined interpretation are presented here.

O17 EXPLORING ENVIRONMENTAL SHIFTS IN LIMPOPO DURING THE LATE QUATERNARY USING MACROCHARCOAL

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Keywords: Macrocharcoal, Palaeoenvironmental Reconstruction, Anthracology, Taxonomy, Vessel Anatomy

Macrocharcoal represents the most frequently recovered plant remains in archaeological sites and serves as a proxy for anthropogenic wood selection and palaeoenvironmental reconstruction. Charcoal assemblages from Middle Stone Age and Iron Age strata at Red Balloon Rock Shelter, Limpopo Province, South Africa, were analysed in this study. Taxonomic identification revealed at least 24 species, including *Ziziphus mucronata*, *Grewia flavescens*, *Mimusops zeyheri*, *Combretum molle*, *Croton gratissimus*, and *Searsia leptodictya*. These findings suggest ecological stability and vegetation patterns similar to contemporary conditions from 104 ± 5 ka to 250 ± 80 yrs BP. Beyond taxonomy, anatomical analysis of xylem vessel elements provides high-resolution data on rainfall patterns. Since woody plants adjust vessel frequency and diameter in response to water availability, i.e., low-rainfall environments typically exhibit woods with smaller, more numerous vessels, and high-rainfall environments exhibit woods with larger and fewer vessels, these features serve as palaeoclimatic indicators. Calculated vulnerability indices and conductivity capacities for the Red Balloon assemblage suggest a moderately humid environment, potentially more

mesic than present conditions. The charcoal accumulation is interpreted as anthropogenic, likely representing a combination of fuel wood, medicinal/aromatic applications, or debris from wood-carving activities.

O18 A NORTH-EASTERN FREE STATE, HOLOCENE POLLEN RECORD FROM MARAIS GELUK WETLAND, SOUTH AFRICA

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Keywords: Holocene, Pollen, Peat, Palaeoenvironments, Escarpment

Pollen analysis of the Marais Geluk wetland, which provided a previously studied proxy record for the north-eastern Free State escarpment, contributes to the Holocene palaeoenvironmental history of South Africa. Our research presents the palynology of a 175 cm peat sequence from the wetland. Podocarpus pollen shows the presence of mountainous ravine forests in the vicinity at around 9000- 6500 cal yr BP when Asteraceae were relatively prominent. Spikes in Passerina and Protea pollen around 6500 cal yr BP may indicate increased rainfall and more C3 vegetation. The presence of succulents such as Aloe, Crassulaceae and Aizoaceae are indicative of typical elements in the surrounding grassland environment. Between 5700 to 4150 cal yr BP the strong presence of aquatics can be indicative of a growing wetland. The Asteraceae to Poaceae families alternate during this phase, with the latter more prominent at c. 4500 cal yr BP, suggesting more rainfall. During 4150 to 2100 cal yr BP the increase in Aizoaceae and Passerina might be indicative of cooler conditions in the vicinity of the wetland. Asteraceae:Poaceae peaks continue to alternate during the period 2100 to 740 cal yr BP, with high concentrations of Cyperaceae and Gunnera indicating local wetland conditions. The last 740 cal yr BP is indicative of the presence of humans and of various exotic pollen during this time. Our results allow comparison with previously obtained proxies to reconstruct a more detailed, well-dated hydroclimatic record in the Free State, complementing scattered study sites in the region.

O19 HOLOCENE LAND COVER SHAPED BY CLIMATE AND HUMAN IMPACTS: A POLLEN-BASED RECONSTRUCTION FROM SOUTH AFRICAN SEMI-ARID GRASSLANDS

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Keywords: Palaeoecology, Palynology, Vegetation, Land use

Interpreting patterns and causal relationships of human–environment interactions in open dryland landscapes remains challenging. High-resolution sedimentary records are employed to clarify these links. This study presents a new record from the Gerhardminnebron wetland in the North West Province, South Africa, one of the deepest cores retrieved at the site, thus providing an unusually long and highly resolved pollen record within the inland grasslands of the subcontinent. Covering the

last 13 thousand years, the record aims to reconstruct the broader evolution of land cover in the Holocene and to contribute to the understanding of anthropogenic landscape transformation over the Iron Age, i.e., the last 2 millennia. A multi-proxy approach was utilised to enhance understanding of past local and regional ecological and sedimentary conditions of the sequence, including pollen, macro- and microcharcoal, non-pollen palynomorph, loss-on-ignition, and geochemical analyses. Palynological results indicate the presence of dry shrubland from the Early to the Middle Holocene, as evidenced by peaks in *Stoebe*, *Artemisia*, and *Amaranthaceae*, followed by a transition to grassland. During the Late Holocene, a wetter period is observed, succeeded by a renewed expansion of open landscapes towards the present. Finally, the record reflects the impact of European settlers, as evidenced by the emergence of neophytes (*Pinus*, *Populus*, *Plantago*, etc). The entire record is dominated by the charcoal assemblage associated with regional herbaceous fires. The research is part of the international AGRI-DRY project (MSCA Grant Agreement No. 101120560 – UKRI Grant No. EP/Y03290X/1; Co-PIs Marco Madella & Nicki Whitehouse; agri-dry.org).

Session #5

Wider southern African perspectives (Tuesday 1 September, 11:00–12:30)

O20 GEOMORPHOLOGICAL ANALYSIS OF THE QUATERNARY ACTIVE FAULTS ALONG THE LIMPOPO BELT AND MOZAMBIQUE BELT: KRUGER-MALALE SCARP, NWANEDZI-BRAK SCARP AND MAZENGA GRABENS

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Keywords: Quaternary, Active Faults, Paleoseismicity, East African Rift System

Paleoseismology is increasingly vital for seismic hazard assessment in stable continental regions like Southern Africa. Instrumental catalogs, spanning less than 100 years, are insufficient to capture the threat of faults with long recurrence intervals (10–100 ka). While infrequent, earthquakes in these stable regions can be devastating, as demonstrated by the 2006 Mw 7.0 Machaze and 2017 Mw 6.5 Moiyabana events. Despite geodetic data suggesting slow extension rates (<1 mm/yr), the potential for large-scale rupture remains a significant concern in areas previously considered low-risk. This study investigates past seismic activity on three active extensional structures: the Bosbokpoort and Tshipise faults in the Limpopo Belt of South Africa, and the Mazenga Grabens in Mozambique. Using stereophotogrammetry and TanDEM-X elevation maps, we extracted elevation profiles to measure scarp dimensions. These parameters were integrated into earthquake scaling equations to estimate potential magnitudes. Results indicate that the Bosbokpoort Fault features a 55 km length with 9 m cumulative slip, while the Tshipise Fault displays a 140 km length with 6 m cumulative slip. The Mazenga Grabens are approximately 10 km wide and 150 km long, exhibiting up to 40 m of average cumulative slip. All three structures show potential magnitudes exceeding Mw 7.0, significantly raising the seismic risk profile for their respective areas. Furthermore, these structures provide insight into the southward propagation of the East African Rift System (EARS). Deformation may either link the ENE-WSW Limpopo structures with the Urema Rift or branch eastward into the N-S trending Mazenga Grabens. If both trends persist, the Zimbabwe Craton may

eventually become a rigid microplate surrounded by rifting, mirroring the evolution of the Victoria Microplate.

O21 HYDROCLIMATE VARIABILITY IN SUBTROPICAL EASTERN SOUTH AFRICA ASSOCIATED WITH EXTREME ENSO EVENTS: PAST AND PRESENT

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Keywords: ENSO, Lake St Lucia, Drought, Holocene, Anthropocene

Palaeoclimate records indicate that hydrological conditions at Lake St Lucia have been marked by extreme drought events throughout the late Holocene, which continue to occur through the Anthropocene. The El Niño–Southern Oscillation (ENSO) is recognised as the dominant driver of hydroclimatic variability across southern Africa, and both palaeoclimate reconstructions and modern monitoring data from the Lake St Lucia region demonstrate a strong association between ENSO phases and extended drought episodes. Multiple lines of evidence suggest that the lake has experienced complete or near-complete desiccation several times over the past ~6000 years, including during the 2015/16 El Niño event. The ecological shocks associated with extremely low water levels and hypersalinity at Lake St Lucia have prompted various management interventions aimed at maintaining system stability. However, distinguishing natural climate-driven variability from human-amplified pressures is an important consideration in the conservation and sustainable management of a climate-sensitive estuarine system. Integrating long-term palaeoenvironmental reconstructions with contemporary monitoring provides critical context for evaluating system resilience, identifying thresholds, and aligning management strategies with the natural range of variability.

O22 PAST MIOCENE ENVIRONMENT AND MODERN VEGETATION OF GORONGOSA NATIONAL PARK, MOZAMBIQUE

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Keywords: East African Rift System(EARS), Miocene, Non-pollen palynomorphs, Palaeoenvironment, Phytoliths

The Gorongosa Palaeontological locality number 12 (GPL-12) is part of the many recent Miocene sites that have been discovered in the Cheringoma Plateau of Mozambique. The fossil sites are located at the southern end of the East African Rift System (EARS), where Miocene deposits are rare; they have also produced silicified wood, marine, estuarine, and terrestrial fossils, the first of their kind to be found in the EARS. Here, we reconstruct the vegetation and climate associated with vertebrate fossil finds using microfossil records of pollen, phytoliths, and charcoal from the Miocene sediment deposit from GPL-12 West. We also test the pollen and phytolith fidelity of modern ecosystems to separate very similar vegetation types. Standard methods were used to extract pollen and phytoliths from the palaeosols and modern soils. The sediment layers were highly oxidised and gave negative results for both pollen and phytoliths. However, four of fourteen layers produced reliable non-pollen palynomorphs (NPPs); i.e. from the 1) A brown sandy clay layer, 2) Red band clay, 3) Brown clay, and 4) Red-grey clay with fossils. The brown clay layer produced mostly dinocysts and other marine NPPs, indicating a marine environment. The other three

layers produced coprophilous and rust fungi, as well as NPPs that grow in stagnant, shallow water, and thus are affiliated with lacustrine environments. cf. *Mangrovia hallii* was found in the brown sandy clay layer, depicting an estuarine environment with mangroves. Modern NPPs were more terrestrial and showed an inland haline intertidal zone. C4 grasses dominated multiple vegetation types. Overall, the micro-fossil study supports previous claims that at times in the past, the Cheringoma Plateau was much closer to the sea than today.

O23 TERMITE ICHNOFOSSIL OCCURRENCES IN NAMIBIA AND THEIR VALUE AS INDICATORS OF PAST CLIMATES, ENVIRONMENTAL CHANGE AND BIODIVERSITY

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Keywords: Termite, Ichnofossil, Bioconstructions, Hives, Namibia

Over 3000 extant species of termites occur worldwide and of these, 165 are from southern Africa. Termites play important roles in ecosystems where they act as decomposers of plant matter, soil engineers, provide nutrient cycling, habitat creation and act as a food source for various organisms including humans. Fossilised termite hives are useful indicators of past climates, environmental change and biodiversity. Within southern Africa only four genera of termite have adapted to the extremely arid climate: -*Psammotermes*, *Microhodotermes*, *Baicaliotermes* and *Hodotermes*. Four species of the mound-building termite, *Macrotermes* live in Namibia. However, tall termite mounds seldom get fossilised as they tend to erode before they are buried. Fossilised termite hives have been recorded worldwide ranging in age from the Triassic to Pleistocene (USA, South Africa, Lesotho, Egypt, Libya, Tanzania, Chad and Argentina). Fossilised termite bioconstructions from Namibia include Early Miocene (20 Ma) *Hodotermes* hives from the northern Tsau /Khaeb National Park (Grillental Borrow Pit and Grillental 6), while Late Miocene strata at Rooilepel (southern Namib, 10 Ma) have yielded *Psammotermes* hives. In the Namib Naukluft Park, *Hodotermes* hives are known from the Late Miocene at Haiber Hill (11 Ma), and *Psammotermes* hives (desert adapted sand termite) have been collected at Elim (16 Ma) and Tree Pan (11 Ma). Plio-Pleistocene *Hodotermes* hives were discovered near Twyfelfontein and in the Torra Conservancy, Kunene Region, and near Aus in the //Kharas Region, indicating steppic-savanna palaeoenvironments in these areas. *Termitichnus* (*Hodotermes*) trace fossils were found in the central Namib in the Late Pleistocene Khommabes Carbonate Member.

Session #6

Palaeodiet, faunal records and palaeoanthropology (Thursday 3 September, 09:30–10:45)

O24 DIETARY NICHE RECONSTRUCTION OF PARANTHROPUS AND EARLY HOMO AT STERKFRONTEIN CAVES, SOUTH AFRICA

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Keywords: *Stable Isotopes, Paleodiet, Paleoclimate, Pleistocene*

Member 5 of the Sterkfontein Caves in South Africa has yielded hominin and faunal fossils associated with Oldowan (2.1 – 1.7 Ma) and Acheulean (1.7 – 1.4 Ma) stone tool industries. This provides a rare opportunity to investigate dietary differences between hominins linked to different industries within a single depositional context. Stable isotope ratios in diagenetically robust tooth enamel provide direct evidence for dietary behaviour. Carbon isotopes distinguish between browsing and grazing resource use, whereas nitrogen isotopes are linked to trophic position. Here, we present Member 5 carbon and nitrogen isotope data from fossil tooth enamel of *Paranthropus* (n = 2) from Oldowan deposits and early *Homo* (n = 3) from Acheulean deposits, as well as associated fauna (n = 144). *Paranthropus* has higher nitrogen isotope values than early *Homo*, yet both genera fall below those of contemporaneous carnivores. This pattern indicates that these individuals did not consume substantial amounts of mammalian meat, despite their association with Oldowan and Acheulean lithic industries and evidence for butchery. Carbon isotope values place both hominins within the range of mixed-feeding herbivores. However, early *Homo* shows a greater contribution of browse compared to *Paranthropus*. Combined carbon and nitrogen isotope signatures further distinguish the two genera, possibly indicating dietary niche partitioning with reduced ecological overlap and thus decreased ecological competition during the Quaternary at Sterkfontein.

O25 PRELIMINARY RESULTS ON THE DIETARY ADAPTATIONS OF LOXODONTA ATLANTICA ZULU FROM EFTM AND DFT2

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Keywords: *Dietary Adaptations, Stable Isotope Analysis, Mesowear Palaeodiet, Proboscidean Ecology*

This study investigates the dietary adaptations and ecological contexts of *Loxodonta atlantica zulu* from Elandsfontein Main (EFTM) and Duinefontein 2 (DFT2), two Middle Pleistocene sites located on the south-western coast of South Africa. We integrated stable isotopic ($\delta^{13}\text{C}$ and $\delta^{18}\text{O}$) and mesowear analyses of molar teeth and compared these to published datasets from other regions of Africa of the same period. Serial samples were taken along the growth axis of third molars for stable isotope analysis. Mesowear was assessed using a method developed for proboscidean teeth, measuring the angles of dentine valleys between enamel ridges on three central lingual lamellae with a contour gauge to calculate the mean mesowear angle. The integration of these proxies enabled a more refined reconstruction of how these proboscideans responded to environmental fluctuations, as well as the extent to which their dietary flexibility influenced their persistence. $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values suggested that they consumed largely C3-based diets (fynbos and C3 grasses) and had flexible drinking habits, where they likely relied on meteoric water during winter months and spring water during summer months. Mesowear angles ranged between 124° and 130°, indicating an ability to process grass while remaining consistent with a more generalised feeding strategy. The results suggest that proboscideans at EFTM and DFT2 were not obligate grazers but rather mixed feeders with adaptable foraging strategies. This supports other evidence that *Loxodonta atlantica zulu* was capable of inhabiting varied environments across Africa and

highlights the generalist potential of this taxon in the face of changing Middle Pleistocene environments.

O26 THE LATE ACHEULEAN FAUNA FROM BEDS 1 AND 2 AT THE CAVE OF HEARTHS, MAKAPAN VALLEY, SOUTH AFRICA

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Keywords: Late Acheulean; taphonomy; morphometrics; Cave of Hearths

This study evaluates the faunal assemblage from Beds 1-2 (Late Acheulean) at the Cave of Hearths (Makapan Valley) to reconstruct agents of accumulation, hominin subsistence behaviour and local palaeoenvironmental change. 684 specimens were analysed using standard quantification (NISP, MNI), skeletal-part representation, species-accumulation curves, spatial mapping, cortical-thickness coding and fracture-type assessment. Comparative morphological analysis and geometric morphometrics against reference collections were applied to improve species identifications and assess size and shape variation. Surface-modification recording documented burning, and carnivore damage; weathering, manganese staining and encrustation were recorded to assess post-depositional alteration. The sample is dominated by bovids and equids with a stratigraphic shift between beds: Bed 1 shows a higher representation of smaller-bodied taxa, while Bed 2 records increased large-bodied grazers, including extinct equids. Taphonomic signatures indicate mixed accumulation: anthropogenic processing occurs alongside carnivore modification attributable to brown hyena and leopard, elements consistent with raptor accumulation, and later secondary rodent action. Fragmentation and cortical-thickness patterns point to intensive long-bone processing in parts of the sample. We interpret Beds 1-2 as the product of multiple accumulating agents with a substantive, though not exclusive, role for Acheulean hominins in acquiring and processing large prey. Stratigraphic changes in taxonomic and feeding-group composition suggest increasing habitat heterogeneity and adaptive foraging flexibility among Late Acheulean hominins at Makapan.

O27 THE LATER STONE AGE FAUNA FROM THE CAVE OF HEARTHS IN THE MAKAPAN VALLEY, SOUTH AFRICA

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Keywords: Zooarchaeology, Later Stone Age, Hunting

This study examined the Later Stone Age fauna from Bed 10 at the Cave of Hearths located in the Makapan Valley, Limpopo, South Africa. The sample comprises 228 specimens (91% identifiable) and is dominated by ungulates, including plains zebra (*Equus quagga*), grey rhebok (*Pelea capreolus*), mountain reedbuck (*Redunca fulvorufula*), impala (*Aepyceros melampus*), and small to large indeterminate bovids (Bov I-III). Smaller taxa (rock hyrax, baboon, monitor lizard) and carnivores (brown hyena) also occur. Taphonomic modifications found on the specimens include cut and chop marks (3%), burning (8%), four bone tools (link-shaft, arrowhead, possible digging implement, polished tooth), carnivore gnawing (15%), porcupine gnawing (12%), and some digestive etching. SEM tooth-pit measurements indicate modification by a large carnivore, likely a brown hyena. However, the low Carnivore-

Ungulate Ratio (2,2), Carnivore Richness Index (0,22), and Leopard Index (0,55) indicate that humans were the main agents of accumulation in the sample, with carnivores and porcupines most likely gaining secondary access. A low Game Index (0,01) and Modified Degree of Vegetation Cover (0,02) suggest targeted hunting of larger ungulates in an open environment. Overall, the results support both hypotheses: The San/ Bushman hunted a broad range of ungulates, and humans were the main contributors to bone accumulation in Bed 10. The sample reflects skilled hunting, selective transport based on the size of the ungulate, marrow extraction, and bone-tool manufacture during the Late Pleistocene-Holocene transition in the Makapan Valley.

O28 PALAEOANTHROPOLOGY BEYOND THE CRADLE: INVESTIGATION OF FOSSIL-RICH PLEISTOCENE CAVE DEPOSITS IN SOUTH AFRICA'S CANGO VALLEY

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Keywords: Geochronology; human evolution; mammals; palaeoanthropology; taphonomy

Late Cenozoic fossil sites in Africa preserve a longer record of hominin evolution and its ecological context than anywhere on Earth. In southern Africa, many key hominin localities are within the Cradle of Humankind, with fewer sites known from elsewhere. Spatiotemporal gaps in this record pose a major obstacle to addressing central questions in palaeoanthropology and highlight a need for exploration of new regions. Here, we report on investigation of fossil-rich caves from South Africa's Cango Valley. The Cango Valley includes extensive outcrops of Proterozoic karstic limestone along the foothills of the Swartberg Range. Since 2022, our team has documented >20 caves, including small cavities and fissures, extensive deep cave systems, and caves reminiscent of those in the Cradle, where interred and indurated deposits have been exposed by erosion of the surrounding limestone. Test excavation and surface collection at four caves recovered well-preserved mammal assemblages typical of the Florisian Land Mammal Age (Middle and Late Pleistocene). An enigmatic and presently unnamed caprin antelope documented by the late James Brink is abundant, with analysis of a near-complete cranium supporting the erection of a new genus and species. Consistent with the fauna, U-Th dating of speleothems range in age from the Last Glacial Maximum to >500 ka, attesting to a lengthy fossil sequence that considerably extends the temporal extent of the southern Cape's Pleistocene fossil record. Collectively, our ongoing work suggests that the Cango Valley has

potential to expand our understanding of hominin and mammal community evolution beyond the Cradle of Humankind.

Poster Presentations

Poster Session

(Tuesday 1 September, 16:30–17:30)

P1 A PALAEOENVIRONMENTAL INTERPRETATION OF LATE QUATERNARY HILLSLOPE REGOLITH IN THE EASTERN CAPE, SOUTH AFRICA.

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(1) Council for Geoscience

(2) Nelson Mandela University, Earth Stewardship Research Institute

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Keywords: Masotcheni Formation, Reconstruction, Optical Stimulated Luminescence, Palaeoenvironment, Marine Isotope Stages

Inland regolith of the Late Quaternary Masotcheni Formation preserves a record of sediment accumulation, erosion, and soil formation that can reveal phases of landscape development linked to climatic shifts between marine isotope stages (MIS). In the Eastern Cape Province, the timing of colluviation and erosion is poorly constrained. This study reconstructs hillslope evolution over millennial timescales by combining lithostratigraphy, optically stimulated luminescence (OSL) dating, and palaeoenvironmental proxies. Regolith profiling and OSL dating at the Ngencu Gully, Mthatha, identified six stratigraphic units (P1–P6) deposited from the Middle Pleistocene to the Late Holocene. Initial sediment accumulation within bedrock palaeodrainages began during MIS 6 (157.7 ± 7.46 ka), likely linked to wetter phases within a cold, dry climate or during transition into MIS 5e. Sustained deposition (P1 and P2) occurred during MIS 5 (117.51 ± 5.13 ka to 84.66 ± 3.67 ka), during unstable climatic transitions. Accretion during MIS 4 and 3 was limited. During the arid MIS 2 (27.31 ± 6.09 ka), calcrete formed within P3. The absence of cut-and-fill structures suggests that large-scale erosion was uncommon before the Holocene. Holocene deposition (9.66 ± 0.80 ka) was followed by stability and the development of the P5 topsoil. A shift to erosional conditions in the Late Holocene ($\leq 1.26 \pm 0.19$ ka) produced P6 colluvial fans, coinciding with climatic variability and increased Iron Age land use. Presently, erosion continues through intensified gully incision. Findings show hillslope processes since the Pleistocene were associated with MIS transitional phases, while Late Holocene anthropogenic activity accelerating climate-driven erosion.

P2 DRILLING AND SAMPLING OF QUATERNARY SEDIMENTS IN SUPPORT OF NEOTECTONIC STUDIES AT DUYNEFONTYN, WESTERN CAPE.

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Keywords: Marine Terrace, Neotectonic, OSL, Dwynefontyn

The Council for Geoscience (CGS) participated in a drilling programme to acquire additional geological data at the Dwynefontyn site, Western Cape. Previous subsurface investigations relied largely on surface observations and sparse borehole records, resulting in significant uncertainties regarding Quaternary overburden and the depth and morphology of bedrock. The study aimed to improve understanding of subsurface stratigraphy, constrain the timing of sediment deposition to evaluate potential indicators of recent tectonic activity. A total of eleven (11) boreholes were drilled across key locations, targeting Quaternary marine terrace deposits and aeolian cover. These boreholes were drilled to depths of <34 m using the Sonic drilling method; they were logged in detail, sampled and photographed for QA/QC of the project. The drilling programme incorporated specialised dating techniques for geochronology, including Optically Stimulated Luminescence (OSL) dating. The OSL dating method provides a Late Quaternary depositional or burial age of sedimentary deposits. Geochronology results showed that the burial doses range from 190 to 320 Gy (burial dose) and had large variations in the derived ages which range from 44 to 706 Ka (age). These burial ages along with the geological investigations confirms the absence of neotectonic activity within sediments at the Dwynefontyn site since the Middle Pleistocene.

P3 ANALYSIS OF APRIL 2022 RAINFALL-TRIGGERED LANDSLIDES IN QUATERNARY SEDIMENTS: A CASE STUDY OF THE DURBAN REGION, SOUTH AFRICA.

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Keywords: Landslides, inventory, Durban, Quaternary sediments

Landslides pose a significant threat to infrastructure, human life, and sustainable land use. The April 2022 landslide events in the Durban region, KwaZulu-Natal, re-highlighted the severe consequences associated with slope instability. To understand the spatial distribution, characteristics, and impacts of these landslides, the Council for Geoscience undertook landslide mapping initiatives to improve hazard documentation and support the reduction of landslide-related risk. Therefore, this study aims to map and catalogue the April 2022 landslides within a Geographic Information System (GIS) framework. A GIS-based landslide inventory was developed for the Durban 1:50 000 map sheet area using an approach that integrated data derived from visual interpretation of multi-temporal Google Earth imagery (pre-and post-landslide events) and on-screen digitisation, field mapping, and/or published literature. The landslide inventory highlighted a widespread spatial distribution of slope failure events across the region. Field investigations and data analyses revealed that landslides are associated with a range of geological units, including Quaternary sediments of the Maputaland Group, as well as fluvial and aeolian deposits. Findings show >100 slope failures are associated with Quaternary sediments which are usually characterised by relatively low fines content, making them erodible and susceptible to slope degradation. Landslide activity varies in terms of movement type, material composition, size, and depth. Slope failures are often associated with steep hillslopes and anthropogenically modified embankments in different land use and vegetation conditions. The study results indicate that landslide occurrence is not governed by a

single factor, but by the combined influence of geological conditions, topography, environmental settings, and anthropogenic activities.

P4 AN EXAMINATION OF ORGANIC PRESERVATION PROCESSES AT STRATHALAN SCB, EASTERN CAPE, SOUTH AFRICA.

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Keywords: Geoarchaeology, taphonomy, site formation, LGM

Strathalan Cave B (SCB) is a Middle Stone Age (MSA) site with occupation from 29 ka to the onset of the LGM at 21 ka. Deposits associated with the LGM are rare in southern Africa, making SCB an essential site to study the environmental context of social and subsistence adaptations of people during this period. This research aims to identify the geochemical difference between the geogenic, sterile sediment of SCB and the organic-rich, anthropogenic sediment to understand how SCB sediments contribute to the preservation of organic remains, such as bone, during the LGM. This will be done through pH testing, granulometry, taphonomy, moisture and geochemical analysis. This will provide an understanding of preservation biases and the rarity of LGM sites in southern Africa. This research will contribute to a broader site formation study.

P5 BIOMARKERS REVEAL ENVIRONMENTAL AND SITE USE VARIABILITY DURING THE MIDDLE STONE AGE AT KLIPDRIFT SHELTER, SOUTH AFRICA

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Keywords: Biomarkers, Middle Stone Age, Paleoenvironment, Homo Sapiens, Paleoclimate

Coastal cave sediments in southern Africa constitute important archives for reconstructing late Quaternary environmental change and its relationship to early Homo sapiens occupation and behaviours. Klipdrift Shelter (KDS), at 65–51 ka, preserves Middle Stone Age sequences spanning the Howiesons Poort (HP) and post-HP periods - a key interval of environmental variability argued to drive human cultural-technological innovation. Here, we present an in-depth organic geochemical characterization (based on gas chromatography-mass spectrometry, GC-MS) of the diversity of sedimentary biomarkers in KDS cave sediments to investigate their usefulness in discerning environmental, fire activity, and site use changes through time. Biomarkers are generally well preserved across the sequence, with polar fractions dominated by alcohols and apolar fractions containing n-alkanes and polycyclic aromatic hydrocarbons (PAHs). Leaf-wax distributions (n-alkanes, n-alkanols) suggest arid climatic conditions during the HP, further indicating shifts from drought-adapted succulent Karoo-type vegetation earlier (~65 ka) to humid-adapted lowland fynbos-type later in the HP (~59 ka). These patterns may reflect shifts in environmental conditions and/or plant selection practices. Fire indicator biomarkers

(PAHs, n-alkanes) indicate increased burning activity and hotter combustion temperatures (~400°C) after the HP, which could suggest changes in fuel availability, raw material use, and/or human occupation intensities. Ongoing analyses of organic compound-specific stable isotope ratios (2H/1H, 13C/12C) and fecal biomarkers (e.g., stanols, sterols), complemented with archaeological datasets, will further augment and refine these interpretations. Overall, these results demonstrate the value of broad organic biomarker surveys for holistic evaluation of environmental and site-use variability in late Pleistocene archaeological cave archives.

P6 BIOMARKER INSIGHTS INTO MIDDLE STONE AGE PALAEOENVIRONMENTS FROM NORTHERN AND SOUTHERN AFRICAN CAVE SITES.

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Keywords: Biomarkers, MSA, South Africa, Morocco

The Middle Stone Age (MSA) in Africa represents a pivotal phase in Homo sapiens evolution, marked by major subsistence, technological, and cultural innovations. Whilst archaeological sites preserve rich evidence of behavioural complexity, the contexts in which innovations emerged, persisted, and disappeared, remain poorly understood. Challenges result from the use of non-co-located climate archives, where chronological uncertainties and spatial disconnects hinder direct comparisons with archaeological sequences. Climate modelling also indicates that late Pleistocene climate variability in South Africa likely operated at fine spatial scales, meaning regional climate records can mask important spatial heterogeneity. The appearance of comparable symbolic behaviours in both northern and southern African sites, despite being at opposite ends of the continent, further highlights the need for greater insight into how the environment shaped these trajectories. The European Research Council-financed PIONEER project (Palaeoenvironments of Human Behavioural Evolution in Africa) addresses these challenges by generating site-specific palaeoenvironmental reconstructions from sediments in key MSA cave sites in South Africa and Morocco. Using leaf wax biomarker analysis, through n-alkane chain length distributions and compound-specific hydrogen and carbon isotopes, this research will reconstruct local hydroclimate and biome variability between 125,000 and 50,000 years ago. By integrating these new datasets with detailed archaeological evidence of occupational intensity, resource use, and symbolic practices at the

stratigraphic-unit scale, this work will offer new insights into synchronicities between environmental fluctuations and cultural developments across multiple sites.

P7 POLLEN STUDIES OF COMMON WEST TROPICAL AFRICAN ACANTHACEAE SPECIES

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Keywords: Pollen morphology, Acanthaceae, Taxonomy, Palaeoenvironment

The flowering plants of the Acanthaceae Juss. family are a rich and taxonomically intricate group found in tropical locations, characterized by significant morphological variation in floral structures, growth patterns, and pollen types. This study offers an extensive and current analysis of the morphology and diversity of pollen types from common Acanthaceae species in West Tropical Africa, contributing to the taxonomy of the Acanthaceae family and facilitating pollen identification in palaeoenvironmental research across Africa. Samples were gathered from several locations in southern Nigeria, resulting in the collection of 23 species that underwent acetolysis. The species includes *Acanthus montanus*, *Acanthus ilicifolius*, *Andrographis paniculata*, *Anisostachya tenella*, *Asystasia gangetica*, *Brillantaisia owariensis*, *Dianthera secunda*, *Dicliptera adusta*, *Eremomastax speciosa*, *Graptophyllum pictum*, *Hypoestes forskaolii*, *Justicia flava*, *Justicia gendarussa*, *Justicia insularis*, *Nelsonia canescens*, *Odontonema cuspidatum*, *Phaulopsis grandiflora*, *Phaulopsis imbricata*, *Pseuderanthemum maculatum*, *Ruellia simplex*, *Sanchezia oblonga*, *Thunbergia erecta*, and *Whitfieldia elongata*. Examined pollen morphology, frequently reticulated but occasionally striate, with pollen apertures varying from tricolpate to tricolporate to polycolporate, exhibiting either homocolporate or heterocolporate aperture type. This variation will aid in the delimitation of these species in palaeoenvironmental investigations, hence improving palaeoenvironmental reconstruction.

DELEGATES

Simon Armitage
Marion Bamford
Greg Botha
Janine Botha
Hayley Cawthra
Manuel Chevalier
Debbie Claassen
Giovanni D'Eramo
Angela Effiom
Tyler Faith
Emma Gibbs
Marishka Guscott
Busisuwe Hlophe
Marc Humphries
Simoné Kock
Malefeu Lethuba
Tina Lüdecke
Tim Maggs
Saul Manzano
Mmatolo Julliet Maphutha
Susan Mentzer
Christopher Miller

Helke Mocke
Ponani Mthembi
Antoine Muller
Inge Nagel
Luke Nel
Samuel Pereira
Naomi Porat
Kei Prior
Lynne Quick
Anzani Ramagadane
Leesha Richardson
Louis Scott
Judith Sealy
Rebekah Singh
Christian Sommer
Andri van Aardt
Aleksandra Vasileva
Tanita Vieira
Marissa Vink
Ella Walsh
Kurt H. Wogau Chong

