

# 35<sup>TH</sup> INTERNATIONAL GEOLOGICAL CONGRESS

27 AUGUST - 4 SEPTEMBER 2016 | CAPE TOWN, SOUTH AFRICA



## Pre 18 Karoo magmatism and Continental breakup

**FIELD TRIP LEADER: Michael Watkeys**



The record of sedimentation, volcanism and continental breakup in the Lebombo Mountains and the Kruger National Park where Karoo sediments and volcanics are beautifully exposed in river sections. These provide evidence of the earliest break-up of the Gondwana continent in the form of dyke swarms and faults. This field trip will require short walks to choice geosites in the company of an armed ranger and expert guides. The inextricable link between the abiotic and biotic (earth /life link) is better revealed in Kruger than perhaps anywhere else in South Africa.

The Lebombo developed during formation of the ca. 180 Ma Karoo Igneous Province and subsequent break-up of Gondwana. This field trip travels along the Lebombo from south to north, commencing in Durban, KwaZulu-Natal, going through Swaziland and into the Kruger National Park.

The trip will visit outcrops of Karoo sedimentary rocks, volcanic rocks, sills and dykes as well as exposures of faulting related to Gondwana break-up. It offers the opportunity of undertaking traverses across the southern Lebombo and the northern Lebombo. The walks to outcrops are not strenuous and in the Kruger National Park will be accompanied by an armed game guard.

**Field Trip Leader: Mike Watkeys**

**Start: Durban**

**End: Johannesburg**

**Dates: 8 days, Friday 19th to Saturday 27th August 2016**

## ITINERARY

DATE	ROUTING
<b>19 AUGUST 2016</b>	<b><i>SALT ROCK HOTEL FOR OWN ACCOUNT AND BOOKED INDIVIDUALLY</i></b>
<b>20 AUGUST 2016</b>	GHOST MOUNTAIN INN, MKHUZE (Breakfast, Packed lunch and Dinner)
<b>21 AUGUST 2016</b>	GHOST MOUNTAIN INN, MKHUZE (Breakfast, Packed lunch and Dinner)
<b>22 AUGUST 2016</b>	LOWER SABIE REST CAMP, KRUGER NATIONAL PARK (KNP) (Breakfast, Packed lunch and Dinner)
<b>23 AUGUST 2016</b>	LOWER SABIE REST CAMP, KNP (Breakfast, Packed lunch and Dinner)
<b>24 AUGUST 2016</b>	OLIFANTS RIVER LODGE ?? Olifant River Lodge is in Middelburg! OLIFANTS REST CAMP, KNP (Breakfast, Packed lunch and Dinner)
<b>25 AUGUST 2016</b>	OLIFANTS REST CAMP, KNP (Breakfast, Packed lunch and Dinner)
<b>26 AUGUST 2016</b>	LETABA REST CAMP, KNP (Breakfast, Packed lunch and Dinner)
<b>27 AUGUST 2016</b>	DEPART LETABA REST CAMP AND TRAVEL TO O.R. TAMBO INTERNATIONAL AIRPORT, JOHANNESBERG (Breakfast and Packed lunch).
	<b>END OF TOUR</b>

<p><b>19 AUGUST 2016</b></p>	<p>Field trip participants arrive in Durban and transferred to the Salt Rock Hotel, Salt Rock on the KwaZulu-Natal North Coast.</p> <p><b>Accommodation at the Salt Rock Hotel, Salt Rock is not included in the field trip costs.</b></p>
<p><b>20 AUGUST 2016</b></p>	<p>This day will involve examining beach and cliff outcrops of the KwaZulu-Natal North Coast near Salt Rock before travelling to Mkhuze in northern KwaZulu-Natal.</p> <p>The coastal outcrops expose Karoo Supergroup Permian sedimentary rocks that are intruded by Jurassic dolerite sills of the Karoo Igneous Province. A variety of intrusive features are exposed, including magma flow indicators, as are faults related to the break-up of Gondwana and the extraction of the Falkland Plateau that formed the offshore Natal Valley.</p> <p>For the first half of the journey to Mkhuze, the landscape comprises rolling hills underlain by the Karoo Supergroup beneath which the basement rocks are Mesoproterozoic in age. At about halfway there is a zone where this Mesoproterozoic basement is thrust northwards over the Archaean Kaapvaal craton. North of this the landscape changes with a coastal plain to the E of the road underlain by Cretaceous and Tertiary sedimentary rocks. These are overlain by Quaternary sediments that include the high coastal dunes mined at Richards Bay while inland there are coal mines in the Karoo Supergroup. The road then follows a flat region underlain by Karoo basalts between the hills of the Rooi Rand to the W and the southern Lebombo to the E.</p> <p><b>Accommodation for two nights will be at the Ghost Mountain Inn, Mkhuze.</b></p>
<p><b>21 AUGUST 2016</b></p>	<p>This day will be spent undertaking a traverse across the southern Lebombo.</p> <p>The term Lebombo is used here in its geological sense where it is often called the Lebombo monocline. This refers to the whole N-S province along the eastern margin of the Kaapvaal craton that is related to Jurassic volcanism, extension and continental break-up. However Lebombo (<i>sensu stricto</i>) refers to a range of ridges, up to 800m high, that extends from northern KwaZulu-Natal northwards through Swaziland and along the border between South Africa and Mozambique. The positive topography is formed by the Karoo rhyolites, one of the World's largest rhyolite provinces.</p> <p>The traverse across the southern Lebombo follows the road from Pongola to Jozini. In the W, exposures of flat-lying Karoo Supergroup sedimentary rocks with dolerite sills are intruded by vertical MORB-like Rooi Rand dykes. Further E the sedimentary rocks and sills progressively dip more steeply eastwards with an accompanying decrease of dip of the Rooi Rand dykes towards the W. This change in dip is the result of domino-style faulting. The Rooi Rand dykes become closer spaced and eventually become a multiple dyke swarm just W of the contact of the Karoo basalts. Further E the overlying Jozini rhyolites are exposed along the west-facing Lebombo scarp slopes. These high temperature ash flows are intruded by Cretaceous dykes and unconformably overlain to the E by early Cretaceous sedimentary rocks.</p> <p><b>Accommodation for the night will be at the Ghost Mountain Inn, Mkhuze.</b></p>

<p><b>22 AUGUST 2016</b></p>	<p>This day will involve travelling northwards parallel to the Lebombo through Swaziland, back into South Africa and then into the southern Kruger National Park.</p> <p>The trip will enter Swaziland via the Golela border post and continue along the road following the area underlain by Karoo basalts. Here the flat topography is interrupted by small ridges formed by the appropriately named TwIn Ridge rhyolites that are interlayered with the basalts. The Rooi Rand dyke swarm to the W peters out in central Swaziland while in the E the Jozini rhyolites become overlain by the Mbululzi rhyolites.</p> <p>The trip will exit Swaziland at the Mananga border post, travel to Komatiport and then enter Kruger National Park through Crocodile Bridge and continue to Lower Sabie Rest Camp.</p> <p><b>Accommodation for two nights will be at Lower Sabie Rest Camp, Kruger National Park</b></p>
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<p><b>23 AUGUST 2016</b></p>	<p>This day will be spent in southern Kruger Park between the Lower Sabie Rest Camp and Crocodile Bridge.</p> <p>This is the area in which the low-Ti tholeiitic basalts are overlain by the high-Ti tholeiitic basalts. A variety of volcanogenic features are preserved while the upper part of the sequence is intruded by the Komatiport Complex.</p> <p><b>Accommodation for the night will be at Lower Sabie Rest Camp.</b></p>
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<p><b>24 AUGUST 2016</b></p>	<p>This day will be taken up with the drive north from Lower Sabie Rest Camp to Olifants Rest Camp.</p> <p>For most of this trip the road follows the Karoo basalt. There is an occasional deviation onto the aeolian Clarens sandstone that underlies the basalts.</p> <p><b>Accommodation for two nights will be at Olifants Rest Camp.</b></p>
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<p><b>25 AUGUST 2016</b></p>	<p>This day will be spent on a traverse across the northern Lebombo following the Olifants River. This is the most complete preserved stratigraphic sequence of the Karoo Igneous Province.</p> <p>The traverse will commence in the W where the Clarens Formation is overlain by a thin pyroclastic sequence and then by the Mashikiri nephelinites. These are succeeded by the Letaba picrite basalts and then by the Sabie River tholeiitic basalts, the uppermost of which are trachybasalts. Interlayered with the tholeiitic basalts are the Olifants Beds rhyolites. The basalts are intruded by the N-S trending Balule dolerite dyke swarm and by rhyolite dykes. In the E the Lebombo ridge is formed of rhyolites and granophyres.</p> <p><b>Accommodation for the night will be at Olifants Rest Camp.</b></p>
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<b>26 AUGUST 2016</b>	<p>This day will involve travelling north to Letaba Rest Camp.</p> <p>The basalts in this area are intruded by a variety of mafic dykes exposed along the banks of the Letaba River. In addition there are composite dykes varying from felsic rhyolitic to mafic across the dyke.</p> <p><b>Accommodation for the night will be at Letaba Rest Camp.</b></p>
<b>27 AUGUST 2016</b>	<p>This day will be spent travelling from Letaba to Johannesburg.</p> <p>The trip will leave Kruger National Park through the Phalaborwa gate by which time the Archaean Kaapvaal craton is exposed. This is intruded by the 2060 Ma Palaborwa alkaline igneous complex which has been mined for copper, phosphate and vermiculite. The trip will then travel parallel to the Murchison greenstone belt, notable for the Antimony Line and emeralds, to the Drakensberg escarpment that is formed by the Palaeoproterozoic Transvaal Supergroup. Beyond the escarpment the road passes over the eastern portion of the 2052 Ma Bushveld Complex and then onto Karoo Supergroup sedimentary rocks. The approach to Johannesburg is marked by waste dumps associated with gold mining of the 3.1 Ga Witwatersrand Supergroup.</p> <p><b>The field trip will end at O.R. Tambo International Airport, Johannesburg.</b></p>

#### Meal Key

BB	Bed and Breakfast
DBB	Dinner, Bed and Breakfast
DBB+	Dinner, Bed and Breakfast plus one additional activity
DBB++	Dinner, Bed and Breakfast plus two additional activities
FB	Full Board (includes 3 meals per day)
FB+	Full Board (includes 3 meals per day) plus one additional service
FB++	Full Board (includes 3 meals per day) plus two additional services
FI	Fully Inclusive (includes all meals and local drinks), plus all activities

#### NOTES:

***This field trip leaves South Africa, travels through Swaziland and then enters South Africa again. Each participant must check whether he or she will require a re-entry visa for South Africa and/or a visa for Swaziland, and be in possession of those visas prior to the field trip departure.***

#### Vehicles:

This quote is based on 15-seater vehicle (or similar) depending on availability.

**MINIMUM NUMBERS 20****MAXIMUM NUMBERS 30****COST INCLUDES:**

- 2 Nights accommodation at the Ghost Mountain Inn on a BB basis
- 2 Nights accommodation at Lower Sabie Rest Camp on a BB basis
- 2 Nights accommodation at Olifants Rest Camp on a BB basis
- 1 Night accommodation at Letaba Rest camp on a BB basis
- 8 x lunch
- 8 x dinner
- 2 x 500ml bottled water per passenger per day
- Transport in private touring vehicles
- Local English speaking driver on all transfers
- Local English speaking guide on all sightseeing excursions
- Guide and Driver meals & accommodation where necessary
- Entrance fees to sightseeing venues as stated in the itinerary above
- Portorage at airports and hotels (1 x standard piece of luggage per person)

**COST EXCLUDES**

- All airfares, air reservations and airport taxes
- All other accommodation
- All other meals
- All other transport
- All other sightseeing
- Personal expenses such as tips for meals, gratuities for guides & drivers, all alcoholic and other beverages, telephone calls and laundry
- Any other services not mentioned above