

Programme	Title of the Project and research team	Project Overview	Objectives/ Outcomes
<p>African Earth Observation Network (AEON) AEON'S IPHAKADE links earth systems science with earth stewardship goals, increasing needs for greater transdisciplinarity, greater geotechnical skills development, and social cohesion. The programme reflects the essence of <i>Earth Stewardship Science</i> where science is used in the broadest sense of the word, covering all fields of scientific enquiry and testing</p>			
<p>AEON</p>	<p>1. Earth-Ocean Link from the Indian Ocean to the Karoo ecosystem: System Studies linking Life to the Power of Tectonics and Climate Change</p> <p><u>Research team:</u> Prof Moctar Doucouré (moctar.doucoure@mandela.ac.za) Dr Bastien Linol (bastien.linol@mandela.ac.za)</p> <p>2. Know and Quantify Your Water: Determining the sustainability of Groundwater Resources</p>	<p>- Environmental instability during climate oscillations has been a powerful determinant driving the evolution of Indian Ocean ecosystems: the question remains how climate is shaped by tectonics and how life adapts to it; and how we can use key answers to guide sustainable living. <i>Earth-Ocean Link</i> (EOL) focuses on the origin and evolution of the African margin along the Indian Ocean, particularly at the south-eastern tip of the continent. An integrated approach including plate tectonics, seismic stratigraphy, onshore and offshore sedimentology, and geochemistry help us reconstructing vertical motion and ocean changes, which in return is useful to reconstruct past faunal corridor between the different continents through time. In particular, biogeographic mechanisms in resolving the co-evolution of Africa's Eastern Margin and its primate fauna.</p> <p>- Surface water pollution and the destruction of wetland ecosystems inhibit the ability of utilising surface water as main source of water supply. This, coupled with the</p>	

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	<p><u>Research team:</u> <i>Dr Cathy Clarke</i> (cdowding@sun.ac.za) <i>Prof Moctar Doucouré</i> (moctar.doucoure@mandela.ac.za)</p> <p>3. Monitoring and modelling groundwater flow through gravity and satellite remote sensing</p> <p><u>Research team:</u> <i>Prof Moctar Doucouré</i> (moctar.doucoure@mandela.ac.za)</p>	<p>continued decrease in annual precipitation, will further put pressure on the already stressed and forecasted water supply of South Africa.</p> <ul style="list-style-type: none"> - It is thus critical to understand groundwater resources by establishing linkages and feedbacks between global climate change and precipitation patterns, since precipitation is the primary recharge mechanism for groundwater. The sustainability of groundwater resources requires detailed studies on the hydrochemical character and volume of precipitation entering the groundwater system. Optimization of the sustainable development and use of the groundwater resources is implemented through development of geological and hydrogeological knowledge and in-field geophysical surveys. - Groundwater plays a major role in supplying water to millions of people in Africa and offers several advantages over surface water, including less vulnerability to pathogenic contamination and a slower response to climate variations. It is generally the only perennial water source in semi-arid areas 	

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	<p><i>In collaboration with Researchers at Queens University and University of Glasgow</i></p> <p>4. The Critical Zone of South Africa: Unravelling the Dynamics of its Complex Coevolving Geo-ecosystems</p> <p><u>Research team:</u> <i>Prof Cornie van Huyssteen</i> vanHuyssteenCW@ufs.ac.za) <i>Prof Moctar Doucoure</i> moctar.doucoure@mandela.ac.za)</p>	<p>such as in south(ern) Africa. This project aims to assess the extent of available resources, plan sustainable abstraction rates and system responses to short-term environmental shocks, such as periods of droughts and long-term environmental changes. Measurements for monitoring will combine a novel gravimeter-on-a-chip using a microelectromechanical system (MEMS), with the Gravity Recovery and Climate Experiment (GRACE) satellite data. MEMS measurements will provide information on changes at small scale while the GRACE data provides information on water mass storage changes at large scale.</p> <p>- This project aims to research the sustainable exploration and exploitation of Southern Africa's natural resources; including groundwater, energy, and minerals. The region of specific focus is known as the Critical Zone, extending from the top of the vegetation canopy through land surface, vegetation and water bodies down to, and including, the zone of freely circulating groundwater. This is a complex coevolving geo-ecosystems that can be chemically and physically understood through soil-based investigations and remote sensing</p>	

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	<p>5. Africa Alive Corridors – Transdisciplinary Analyses of Africa</p> <p><u>Research team:</u> <i>Prof Moctar Doucouré</i> (moctar.doucoure@mandela.ac.za) <i>Dr John Anderson</i> (jmanderson.gondwana@googlemail.com)</p>	<p>(geophysical) mapping. While the soil-based investigations focus on chemical and morphological differentiations (e.g. of wetlands), the mapping of the critical zone from near-surface to the subsurface exploit characteristics of the earth’s materials and their mineralization.</p> <p>- The Africa Alive Corridors (AAC) project is part of a global initiative to stem the 6th extinction and deal with global climate change. AAC is an innovative initiative that utilises Earth Stewardship Science to determine a sustainable trajectory for the people of Africa by weaving Africa’s unique biological, cultural, and geological four-billion-year autobiography. AAC is about ‘transdisciplinary autobiography’ that links the past and present with the future of Africa along 20 corridors, each with 20 heritage nodes. Each Corridor is being mapped and documented as an autobiography and offer a science based strategy to stem/manage the 6th extinction and to protect African heritage. Its 20 nodes incorporate advancements and modern concepts in the understanding of ecosystem health, ecological modelling, and relationships between geological and ecosystem evolution.</p>	