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## EDITORIAL

# Guest Editorial for the Special Issue: Southern African mountains – their value and vulnerabilities

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## Introduction

Southern African mountains – defined as those African highlands south of the Congo Rainforest and Lake Ruwka, including the Malagasy Highlands and several mountainous western Indian Ocean islands (Joseph *et al.*, 2022; Clark *et al.*, *in press*) – comprise some of the most diverse and fascinating montane systems in the world (McCarthy and Rubidge, 2005). While mostly not as high, as long, or as rugged as many other mountains around the world, southern Africa's ancient mountains (Partridge and Maud, 1987; McCarthy and Rubidge, 2005) contain highly diverse geologies, landforms, complex vegetation mosaics, provide critical ecosystem services, and harbour exceptionally rich biodiversity (Cowling and Hilton-Taylor, 1994; Bristow 1985; van Wyk and Smith, 2001; Mucina and Rutherford, 2006; Clark *et al.*, 2011; Mzumara-Gawa *et al.*, *in press*). In addition, many southern African mountains are poorly explored or poorly researched in most disciplines (Clark *et al.*, 2011, 2019; Bayliss *et al.*, 2014; Delves *et al.*, 2021; Huntley and Ferrand, 2019; Mzumara-Gawa *et al.*, *in press*) – especially in terms of the context of transboundary co-operation (DeMotts 2017; Clark *et al.*, 2019). In addition, policy representation is very limited, and southern African mountains remain largely marginal to national and regional (e.g. Southern African Development Community, SADC) policies and agendas (Clark *et al.*, 2019, *in press*; SADC 2019).

The 1<sup>st</sup> Southern African Mountain Conference (SAMC2022), themed *Southern African mountains – their value and vulnerabilities*, was conceptualised by the Afromontane Research Unit (ARU, University of the Free State, UFS), and co-planned with the African Mountain Research Foundation (AMRF; a UK Charitable Trust), and the Global Mountain Safeguard Programme (GLOMOS; United Nations University & Eurac Research). It was implemented by The Peaks Foundation, a non-profit organisation dedicated to developing young and promising researchers in southern Africa and

promoting science as an essential component for sustainable futures.

SAMC2022 was the first in a series of planned “SAMC” events (i.e. every three years) to bring together key stakeholders in the scientific, policy, practitioner, and livelihoods sectors, with the intention of stronger transboundary and transdisciplinary co-operation for mountains, and to provide an impetus for a stronger science-policy-industry interface. Part of the rationale was to create a pipeline of stronger southern African representation at the International Mountain Conference (IMC) series held every three years in Innsbruck (Austria), each September following SAMC. This is particularly as Africa is the least-well represented continent in the global mountain community of practice.

SAMC2022 was held at Champagne Sports Resort in the KwaZulu-Natal part of the Maloti-Drakensberg, South Africa, 14<sup>th</sup> to 17<sup>th</sup> March 2022, under UNESCO patronage. It received strong support from mountain research groups and sponsors locally and abroad. SAMC2022 was supported by 259 delegates from 21 countries; 71 (27%) delegates were from countries other than South Africa. A total of 166 papers across disciplines were presented in 27 sessions arranged in six parallel tracks.

A high-level special event hosted by UNESCO Southern Africa set a very strong tone for stronger regional interest in mountains at a policy level, including a potential “Southern African Mountain Convention” or treaty under SADC – comparable to the already existing Alpine Convention or Carpathian Convention. Important and impactful focus workshops and session tracks were run by the Mountain Research Initiative (MRI) in partnership with GEO Mountains (on long-term monitoring activities and associated data availability for climate change-related applications across Africa's mountains), Oppenheimer Research and Conservation (on Climate Change), the Centre for Biological Control (CBC, Rhodes University, on mountain invasions), Global Mountain

Biodiversity Assessment (GMBA) in partnership with the ARU (on southern African mountain biodiversity data), Botanical Gardens Conservation International (BGCI, on Mt Mulanje), and the UFS and Dresden University of Technology (“MoRE Water”).

Key outcomes and priorities from SAMC2022 were:

- (i) to drive stronger regional research collaboration across borders, for which SAMC2022 very effectively provided the networking opportunity;
- (ii) to drive a stronger science-policy-practitioner interface at multiple scales, from provincial to trans-national;
- (iii) that capacity building for stronger regional research and representation on global platforms will be crucial for achieving sustainable mountain development in southern Africa; and
- (iv) to encourage cross-disciplinary work on individual mountain systems.

The way forward is to:

- (i) keep encouraging the existing community of practice in their activities and efforts;
- (ii) invest in enthusiastic young researchers, policy makers, and practitioners; and
- (iii) drive strategic high-level advocacy, such as with UNESCO, SADC, and in time the African Union, for regional co-operation at a political level for southern African mountains.

As part of mobilising more research on southern African mountains, an invitation was made for papers presented at SAMC2022 to be submitted to the *Transactions of the Royal Society of South Africa* as part of a “SAMC2022 Special Issue”. A total of 23 papers were submitted, with nine papers by 29 authors accepted for publication.

### Geographical and topical diversity

Five (56%) of the nine papers focus on the Maloti-Drakensberg (Curtis *et al.*, 2023; Gordijn and O’Connor, 2023; Grab 2023; Stewart and Challis, 2023; van der Walt *et al.*, 2023). This follows the trend of the Maloti-Drakensberg generally being the most well-researched mountain system in southern Africa, across disciplines – see as another example the mountain pastoralism special issue in the *African Journal of Range and Forage Science* (Clark *et al.*, 2021). Within the Maloti-Drakensberg, two of the five papers are confined to South Africa (one in the Eastern Cape and one in KwaZulu-Natal), while one is confined to Lesotho, and two are transboundary (i.e. South Africa and Lesotho). This supports the general narrative of South African research outputs on the Maloti-Drakensberg being more than from Lesotho, but the transboundary contributions are a positive signal. One paper (11%) focuses on the arid transboundary northern Namibian–southern Angolan Escarpment (De Cauwer *et al.*, 2023), which is still one of the least-studied areas of the extensive Western Great Escarpment (i.e. extending from Namaqualand to central Angola). One paper (11%) is South African-wide (Hamer *et al.*, 2023), and two papers (22%) are African-wide (Gwate *et al.*, 2023; Marchant and Thorn, 2023).

Four (44%) of the nine papers are situated within the biophysical sciences (De Cauwer *et al.*, 2023; Gwate *et al.*, 2023; Hamer *et al.*, 2023; van der Walt *et al.*, 2023), one (11%) within the humanities (Stewart and Challis, 2023), and four (44%) are multi-disciplinary (Curtis *et al.*, 2023; Gordijn and

O’Connor, 2023; Grab 2023; Marchant and Thorn, 2023). The Maloti-Drakensberg papers are the most diverse, covering climate (Grab 2023; van der Walt *et al.*, 2023), social sciences / anthropology (Stewart and Challis, 2023), social-ecological theory (Gordijn and O’Connor, 2023), and environmental science (Curtis *et al.*, 2023). The Namibian-Angolan and South African papers are biodiversity-inventory focused – the former exploratory of an under-studied area (De Cauwer *et al.*, 2023) and the latter focused on data-mining (Hamer *et al.*, 2023). The African-wide papers focus on non-native species (Gwate *et al.*, 2023) and the need for science-based policy (Marchant and Thorn, 2023).

### What the papers report

The Maloti-Drakensberg has experienced, and is experiencing, variable climates and change. Stewart and Challis (2023) showcase how linking latest San art dating with archaeological records shows how climate change 2–3,500 years before present deeply influenced San subsistence lifestyles, spirituality, and art. Grab (2023) shows how modern climate change-linked events are being embedded in Basotho social memory – but not always congruently with actual meteorological records. Van der Walt *et al.*, (2023) show us how increasingly vulnerable the Maloti-Drakensberg is becoming to heatwave events – with as-yet unknown biophysical and cultural-social implications. Although the Maloti-Drakensberg may be one of the most well-studied mountain systems in the southern African region, these papers show us that there are still many gaps in knowledge across disciplines, and that integrating data from different disciplines enriches our cultural-landscape understanding for past, present and future. On a continental scale, this is encouraged by Marchant and Thorn (2023), who emphasise the dangers of implementing well-meaning “restoration” interventions in African mountains without the necessary historical-cultural-biophysical context and cross-disciplinary informed implementation. Poor understanding of context can result in much greater disasters than the original problem.

Southern Africa is renowned for its phenomenal biodiversity across a wide range of taxonomic groups, with a large proportion of this biodiversity associated with mountains (Cowling and Hilton-Taylor, 1994; van Wyk and Smith, 2001; Clark *et al.*, 2011; Mzumara-Gawa *et al.*, in press). Hamer *et al.* (2023) show us that 40% of plant records in South Africa are from mountains, while invertebrate data still requires major taxonomic investment and digitisation to be effectively analysed. De Cauwer *et al.* (2023) showcase a snapshot of the poorly documented Kaokoveld Centre of Floristic Endemism – incorporating a large component of the arid Western Great Escarpment – with endemism of woody species rivalling parts of the more mesic Afromontane forests in eastern Africa. One of the biggest threats to southern African mountain biodiversity and water production is rapidly range-expanding woody species (native and non-native; e.g. Hahn 2018) – Gwate *et al.* (2023) paint a set of potential future scenarios in African mountains under three problematic woody species (two native and one native) under different climate change simulations.

### Conclusion

SAMC2022 was a highly successful event, effectively riding the first wave of post-COVID-19 in-person events in the region. Subsequent African participation at IMC2022 increased from four African delegates in 2019 to some 20 in

September 2022. Since SAMC2022, The Peaks Foundation has been contracted to manage other major academic events (including the 5<sup>th</sup> National Global Change Conference, GCC5, in January 2023). Sponsorship by Planet Labs has enabled open access remote sensing data for a wide range of southern African mountain projects. A German Embassy-funded event (*Maloti-Drakensberg – Safeguarding and Preservation of the Dragon Heritage*) was run by The Peaks Foundation, GLOMOS and the ARU in December 2022, building on local Maloti-Drakensberg momentum for transboundary co-operation. Additionally, some findings and experiences from these activities in southern Africa mountains will be presented during the international *Adaptation Futures Conference* in Montreal, Canada, October 2023, within the session *Mutual learning across Indigenous, Local and Scientific Knowledges to better adapt to interconnected risks: towards building a global Community of Practice*, led by UNU-EHS.

The set of papers in this Special Issue provides a small glimpse into the diverse topics and geographies reflected at SAMC2022. From iconic and popular Table Mountain in the south, to the virtually unknown fastnesses of the Angolan Escarpment, from the arid appeal of the Namibian Escarpment to the soaring buttresses of the Maloti-Drakensberg, southern African mountains provide a canvas for every discipline to leave its mark towards a sustainable future.

The ARU, AMRF and UNU-GLOMOS – together with many other valued partners in the region – look forward to welcoming delegates to SAMC2025, 17<sup>th</sup> to 20<sup>th</sup> March 2025, at Champagne Sports Resort, South Africa.

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