2018 Conference of the National Association for Clean Air

30 OCTOBER - 1 NOVEMBER | GAUTENG

Annual Conference Proceedings
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The organising committee would like to thank the following sponsors for their contributions to making the 2018 National Association for Clean Air Conference a great success:

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Conference Secretariat
National Association for Clean Air
17 Riverview
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www.naca.org.za
WELCOME MESSAGE

Dear friends, colleagues, special guests and members of the South African air quality fraternity,

It gives me great pleasure to welcome you to the 37th edition of the annual conference of the National Association for Clean Air (NACA) to be held at the Riverside Sun in Vanderbijlpark. The hosting of this conference in the Vaal Triangle coincides with the review of the development of the Air Quality Management Plan for the Vaal Triangle Anshled. It also represents a breakaway from the traditional approach of recent years to jointly host the conference in collaboration with the Department of Environmental Affairs (DEA), the format of which comprised the government Lekgotla, followed by the joint workshop and the NACA Conference.

Council took a decision following fairly intense debate and scrutiny to only hold conferences in Gauteng (Johannesburg or Pretoria), Durban, Cape Town and the Vaal Triangle in future. This was prompted by low attendances in recent years at conferences outside of the major centres which have resulted in lower attendance numbers and a consequent loss in revenue for NACA. The conference plays a vital role in the South African air quality sphere and it is important that it is well attended. It is vital that NACA plays in providing training for air quality practitioners.

This change in arrangements has necessitated a change in the structure of the 2018 conference. Instead of a 2-day conference on a Thursday and Friday, as was the norm in the past, the conference will now take place on a Wednesday and Thursday (31 October and 1 November). However, this will be preceded by a joint DEA-NACA Stakeholder Workshop on Tuesday (30 October) entitled “Framework to support emission monitoring and reporting in the South African Atmospheric Emission Listing and Inventory (SAELI)” in light of this, I would like to take this opportunity to thank DEA and in particular, the National Air Quality Officer, for their continued support of NACA and its initiatives. Following the joint workshop, NACA has introduced a new item to its programme, that is, a conference workshop, which is based on a topical aspect of air quality management. This year, the focus will be on “Greenhouse Gases and Climate Change in South Africa: Contextualising the challenge”. The intention of the conference workshop is to provide delegates with a form of training on an aspect of air quality management. For their gracious participation in the workshop, I would like to thank the various presenters.

The past year has been an eventful and exciting one for NACA. In addition to the conference, which continues to serve as a premier meeting place for the South African air quality family, several seminars and training courses were held. In support of DEA, “Emission Management” training courses for government officials were held in seven of the provinces in the past year. The “Introduction to Air Quality Management” training course was presented in February this year in Centurion to delegates from industry and consultancies and to students from the Mongusuthu University of Technology (MUT) in September. A successful “Introduction to Dispersion Modelling” training course was also held, followed by the more advanced 4-day “Aermod and Calpuff Dispersion Modelling” course, which was presented by Jessie The of Lakes Environmental, the company that developed the models. All courses achieved near full attendance, emphasising the need for such courses in South Africa and the critical role that NACA plays in providing training for air quality practitioners.

This year, Caradee Wright stepped down as a co-editor of the Clean Air Journal (CAJ). We thank her for her dedication, hard work and enthusiasm over the years. We welcomed Kristy Langerman as the new co-editor. The journal published its first issue for 2018 earlier this year and is finalizing the November/December issue. We thank the community for their support of the CAJ as we work towards developing it into an internationally recognized journal on air quality and atmospheric science.

It was also our pleasure to award a bursary during 2018 to Yusuf Mansoor of Wits University for his M.Sc. degree in the field of air quality management. The various branches of NACA each held a single seminar during the year.

On the financial front, the 2017/18 financials showed a significant improvement from the previous year. The 2016/17 financial year realized a net loss of R236 647. This increased to a profit of R142 108 in the 2017/18 financial year, representing a R378 755 turnaround. This turnaround is primarily attributable to the increased revenue from hosting last year’s conference in Gauteng and the income generated from the many training courses that were held during the last financial year.

The current Council is serving its second and final year. My term as President comes to an end at the end of this year and my Vice President, Prof. Stuart Piketh, will assume the role of President. Miss Gabi Mkhatshwa was voted in by Council as our new Vice President. During the upcoming AGM, three new Council members will be nominated to replace outgoing Council members.

I would also like to take this opportunity of thanking our many sponsors and exhibitors for this year’s Conference. Special mention must be made of Eskom, our Platinum Sponsor for so generously contributing to our Conference. I would also like to thank C&M Consulting Engineers, our Gold Sponsor, Enviroserv and Lakes Environmental, our Silver Sponsors and our many Bronze Sponsors. I wish to also thank the 23 members of the Scientific Review Committee, who selflessly give their time and scientific expertise each year to ensure our academic papers are of the highest standard.

On a personal level, I would like to take this opportunity to thank my Council for the sterling work they have done this year despite demanding personal work commitments. Thank you also to Beverley Terry, who has now served NACA for the past 10 years.

Mr Benton Pillay
President
National Association for Clean Air
LIST OF EXHIBITORS

C&M Consulting Engineers
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COMMITTEES

The organising committee would like to thank all those who gave their time and effort in the various aspects of the conference organisation.

2018 Local Organising Committee

Benton Pillay
Beverley Terry
Gabi Mikhailova
Herman van der Walt
Martin van Nierop
Roelof Burger
Stuart Piketh
Willie Kok

Conference Organisers

Mongoose Communications & Design (Pty) Ltd.

Scientific Review Committee

Papers submitted for oral presentation were subject to a scientific review process by two reviewers. The National Association for Clean Air wishes to thank the review committee for their effort and time.

The papers included in this proceedings were reviewed by two of the specialists listed below. A total of 42 abstracts were submitted and screened by the editors, 27 full papers were submitted for review and 25 were accepted and included in the proceedings. Reviewers verified that comments were suitably addressed in the final papers.

Co-chairpersons of the Scientific Review Committee

Professor Stuart John Piketh
Dr Roelof Burger
North-West University

Dr Joseph Adesina
North-West University

Dr Katye Altieri
University of Cape Town

Prof Harold Annegarn
North-West University

Dr Johan Paul Beukes
North-West University

Dr Stephen Broccardo
North-West University

Dr Gregor Feig
South African Environmental Observation Network (SAEON)

Dr Gerhard Fourie
EnvironNgaka CC

Dr Rebecca Garland
CSIR

Dr Micky Josipovic
North-West University

Dr Gerrit Kornelius
University of Pretoria

Dr Kristy Langerman
University of Johannesburg

Dr Hanlie Liebenberg-Enslin
Airshed Planning Professionals

Ms Seneca Naidoo
CSIR

Prof Kobus (JJ) Pienaar
North-West University

Prof Hannes Rautenbach
South African Weather Service

Dr James Tshilongo
National Metrology Institute of South Africa

Dr Martin van Nierop
Gondwana Environmental Solutions

Dr Pieter van Zyl
North-West University

Prof Sivakumar Venkataaraman
University of KwaZulu-Natal

Dr Andrew Venter
Sasol

Dr Caradee Wright
South African Medical Research Council
TUESDAY, 30 OCTOBER 2018

07:00 - 08:00   Registration & Refreshments

08:00 - 13:00   Department of Environmental Affairs (DEA) and the National Association for Clean Air (NACA) Multi-Stakeholder Workshop. Framework to support emission monitoring and reporting in the South African Atmospheric Emission Licensing and Inventory Portal (SAAELIP).

13:00 - 14:00   Lunch

14:00 - 14:30   Afternoon NACA Workshop Attendee Arrival & Refreshments

14:30 - 17:30   NACA Conference Workshop: Greenhouse Gases and Climate Change in South Africa: Contextualising the Challenge.

14:30 - 15:00   South Africa’s Approach to GHG Emission Reduction

15:00 - 16:00   Meet Current Legislative Requirements, whilst Avoiding the Pitfalls

16:00 - 16:30   Projected Climate Change Futures over Africa

16:30 - 17:30   Questions & Answers – panel of workshop speakers

18:00 - Late   NACA and C & M Consulting Engineers Ice-Breaker Cocktail

WEDNESDAY, 31 OCTOBER 2018

07:30 - 08:30   Registration & Refreshments

08:30 - 08:40   Opening by NACA President

08:40 – 08:45   NACA Conference Platinum Sponsor

08:45 - 09:05   Feedback from the Department of Environmental Affairs, Air Quality Governance Lekgotla 2018

09:05 - 09:25   Effective Visualisation of Annual Air Quality Trends in Priority Areas

09:25 - 09:45   Perceptions of Air Pollution in a Low-Income Community on the Highveld

09:45 - 10:15   Latest Developments in Air Quality Legislation – Clearing the Smoke?

10:15 - 10:30   Questions & Answers

10:30 - 11:00   Mid-morning Refreshments - Exhibition and Poster Viewing

11:00 - 11:20   Correlating Dust Concentration Measurements Aloft with Opencast Mining Surface Operations

11:20 - 11:40   Composition of Dustfall Samples Taken from a Monitoring Bucket Close to a Derelict and Ownerless Asbestos Mine in Koegas, Northern Cape

11:40 - 12:00   The Applicability of Using m-NDHI to Identify Ambient Particulate Air Quality from Remotely Sensed Images in the Vaal Area, Gauteng
## Wednesay, 31 October 2018

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<th>Speaker(s)</th>
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<tr>
<td>12:00 - 12:20</td>
<td>A comparative Study of Emission Factors and Continuous Emission Monitor Systems for Power Station Gaseous Emission Inventories</td>
<td>John Keir</td>
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<tr>
<td>12:20 - 13:20</td>
<td>Lunch</td>
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<tr>
<td>13:40 – 14:00</td>
<td>Use of CALPUFF to Model the Atmospheric Dispersion of Mercury over the South African Highveld</td>
<td>Monray D. Belelie</td>
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<td>14:00- 14:20</td>
<td>Meteorological Variables Associated with Particulate Matter Concentrations at Six Polluted Sites in South Africa</td>
<td>Anzel de Lange</td>
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<tr>
<td>14:40 - 15:00</td>
<td>Calculating Health Effects of Coal-fired Power Station Emissions</td>
<td>Kristy E. Langerman</td>
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<td>15:00 - 15:30</td>
<td>Mid-afternoon Refreshments - Exhibition and Poster Viewing</td>
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<tr>
<td>15:30 - 15:50</td>
<td>A novel method to conduct source apportionment of continuously measured trace gases</td>
<td>Edwin Cogho</td>
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<td>15:50 - 16:10</td>
<td>The use of satellite fire radiative power observations to estimate the availabilities (activity patterns) of pyrometallurgical smelters</td>
<td>Johan P. Beukes</td>
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<td>16:10 - 16:40</td>
<td>Land Use Regression as a Tool to Quantify PM2.5 Concentrations and Identify Suitable Offset Sites on the Highveld</td>
<td>Farina Lindeque</td>
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<td>16:40 - 16:50</td>
<td>Assessing the application of AERMOD in modelling tall stack emissions on the Highveld</td>
<td>Prince Chidhindi</td>
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<td>16:50 - 18:00</td>
<td>NACA Annual General Meeting, Plenary Venue</td>
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<tr>
<td>18:00 - Late</td>
<td>Informal Braai &amp; Awards Ceremony</td>
<td>Riverside Sun, Island on the banks of the Vaal River</td>
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## Thursday, 1 November 2018

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<td>Tea &amp; Coffee Refreshments</td>
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<td>08:30 - 09:30</td>
<td>Monitoring - Session Chair: Dr Martin van Nierop</td>
<td>Gondwana Environmental Solutions</td>
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<td>09:30 - 09:50</td>
<td>Local Development of Passive PM Monitors</td>
<td>Tinashe Mukota</td>
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<td>09:50 - 10:10</td>
<td>Development and Validation of Accurate Primary Gas Standards for the Quantification of Nitrous Oxide in Nitrogen at Low Nanomole per Mole Levels for Ambient Measurements in South Africa</td>
<td>Silindile L. Lushozi</td>
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<tr>
<td>10:10 - 10:40</td>
<td>Mid-morning Refreshments - Exhibition and Poster Viewing</td>
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<tr>
<td>10:40 - 11:00</td>
<td>Dissemination and Traceability of NMISA Gas Standards for Accurate Measurements</td>
<td>Napo Ntsasa</td>
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<tr>
<td>11:00 - 11:20</td>
<td>Characterising Household Respirable Particulate Matter in Sharpeville, Gauteng</td>
<td>Thapelo A. Letsholo</td>
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<td>11:20 - 11:40</td>
<td>Contextualization of Airborne Microplastic Pollution in the South African Environment</td>
<td>Carina Verster</td>
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<td>11:40 – 12:00</td>
<td>Assessing the Potential of Thermal Insulation Offset Opportunities on the South African Highveld</td>
<td>Newton R. Matandirotya</td>
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<tr>
<td>12:00 - 13:00</td>
<td>Lunch</td>
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<tr>
<td>13:00 – 13:20</td>
<td>Characterizing Indoor PM4 loading of Two Contrasting Houses in Kwa zamokuhle, Mpumalanga</td>
<td>Marvin M. Qhekwana</td>
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## KEYNOTE SPEAKER

**Dr Stephan Borrmann,**  
Johannes Gutenberg University and Max-Planck Institute for Chemistry, Mainz, Germany  

**THE UPPER TROPOSPHERE AND LOWER STRATOSPHERE IN THE ASIAN AND WEST AFRICAN MONSOONS: IN-SITU MEASUREMENTS OF AEROSOLS AND CLOUDS**

**ABSTRACT:** During the Asian and West African monsoons large meteorological structures develop which reach into the UTLS with impact on the aerosols and the precursor gases entering the stratosphere. Embedded in the Easterly flow in West Africa these are widespread fields of Mesoscale Convective Systems (MCS) which reach altitudes of 16 to 18 km. Further Northeast the Asian Monsoon Anticyclone (AMA) forms from mid-June until October in an altitude band from 12 to 20 km. The AMA extends from East Asia to the Middle East and, as a fairly closed rotating air mass it is reminiscent of the polar vortex, albeit with a strong convective uplift. Long range transport from as far as Eastern China provides materials which are carried aloft by the West African MCS and the deep convective AMA clouds. Sources (e.g., biomass burning) from the regional boundary layers also contribute here. The anvil outflows of the West African MCS and the AMA clouds release the uplifted (and partly processed) source gases and aerosols into the UTLS. Here New Particle Formation events (NPF) generate new aerosols from the inorganic and organic precursors by homogeneous nucleation. Such NPF occur in clear, cloud free air, as well as in the presence of ice particles in the margins of Cb and MCS anvils. CALIPSO measurements revealed a distinct aerosol layer (the Asian Tropopause Aerosol Layer; ATAL) between 15 and 16.5 km within the AMA, the physical and chemical characteristics of which still are unclear. However, in other tropical vertical profiles (e.g., Hawaii, Brazil, Burkina Faso, Australia) enhancements of submicron aerosol mixing ratios also have been observed -outside of “confinements” like the AMA- between 350 K and 380 K theta altitude levels. Only about 50% of these particles evaporate when exposed to 250 °C heating. Since these phenomena occur at and above the tropopause in areas with slow upwelling motion, they may contribute to the global stratospheric aerosol. By contrast, recent hypotheses indicate, the aerosol particles nucleated in the UT (probably from organic condensable gases) above Amazonia are transported downward, possibly supplying CCN for cloud development in the middle troposphere. With emphasis on in-situ measurements this presentation provides an overview of the aerosol properties at the gateway to the stratosphere in the tropical UT/LS.

### THURSDAY, 1 NOVEMBER 2018

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| 13:20 - 13:40 | Assessment of Changes in Concentrations of Selected Criteria Pollutants in the Vaal and Highveld priority Areas  
Gregor Feig |
| 13:40 - 14:00 | Spatial and Temporal Trends of PM$_{10}$ and SO$_2$ in the Richards Bay Area  
Mark Zunckel |
| 14:00- 14:20  | Biogenic Volatile Organic Compounds in a Savannah-Grassland Region  
Pieter van Zyl |
| 14:20 - 15:20 | Panel Discussion  
Mapping the Future of Air Quality Management in South Africa |
| 15:20 - 15:40 | Awards for Best Papers  
Announcement of NACA 2019 |

**CLOSING**

15:40 Mid-afternoon Refreshments
Clean Air Campaign

Making our air cleaner and better to breathe is the best thing to do for the health of our families, ourselves and our communities.

Let’s do it together!

CALPUFF View
Long Range Puff Air Dispersion Model

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