

Chemical composition and characterization of aerosols off Namibia: results from AEROCLO-sA project

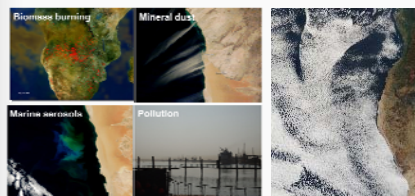


Paola Formenti¹, Danitza Klopfer, Servanne Chevaillier¹, Barbara D'Anna^{3,7}, Karine Desboeufs¹, Jean-François Doussin¹, Anaïs Feron¹, Chiara Giorio^{4,5}, Marc Daniel Mallet^{1,6}, Cécile Mirande-Bré

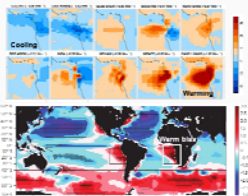
Anne Monod⁷, Cyrielle Denjean⁸, Andreas Namwoonde⁹, Sylvain Triquet¹, and Stuart Piketh²
¹ LISA, CNRS, Université Paris Est Créteil et Université de Paris, Institut Pierre Simon Laplace, Créteil, France; ² North-West University, Potchefstroom, South Africa; ³ IRLYON, UMR CNRS 5256, Université Lyon 1, Villeurbanne, France; ⁴ Università degli Studi di Padova, Padova, Italy; ⁵ University of Cambridge, Cambridge, United Kingdom; ⁶ University of Tasmania, Hobart, Tasmania, Australia; ⁷ Aix Marseille Univ., CNRS, LCE, Marseille, France; ⁸ CNRM, CNRS/MétéoFrance, Toulouse ⁹ SANUMARC, University of Namibia, Henties Bay, Namibia

The south-east Atlantic ocean

A natural laboratory with a complex folding of aerosol of different origins and stratocumulus deck

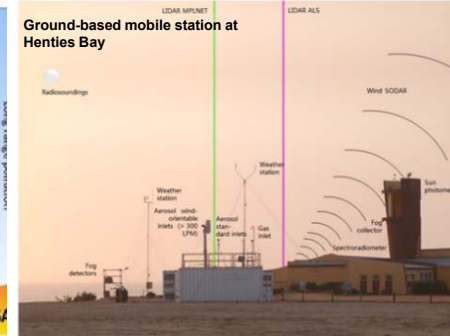
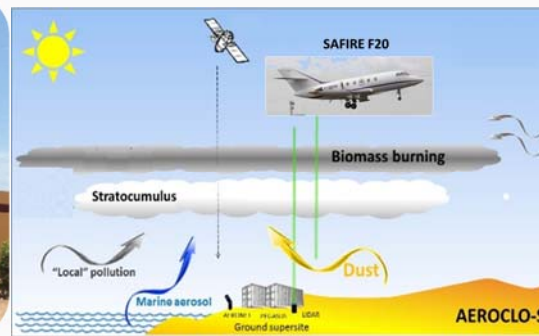
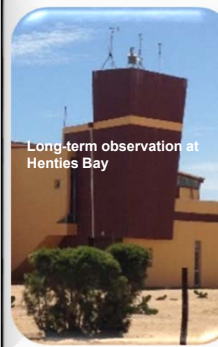


Uncertainties in predicting their effects on the atmospheric radiative budget and on the SST



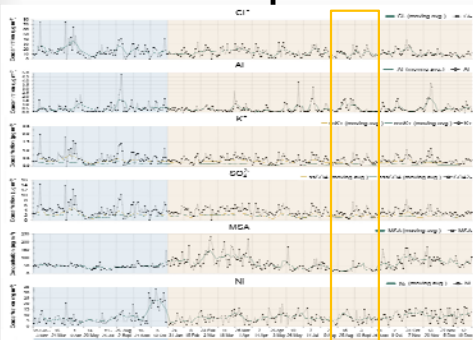
Which are the aerosol optical and hygroscopic properties? How are they distributed with respect to the clouds?
 Which are the dynamical processes responsible for their emission and transport? Which is their spatial distribution? Which is their direct, semi-direct and indirect effect?

Long-term and field campaign observations (23 Aug-12 Sep 2017)

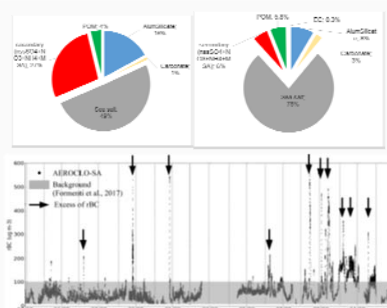
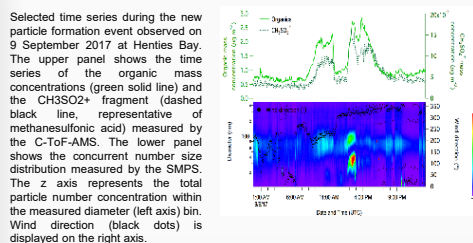


Sampling on filters and impactor, Analysis by XRF and IC

Chemical composition

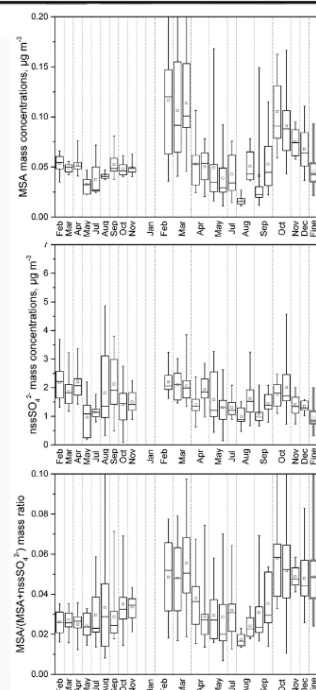


Time series of elemental analysis during 2016 and 2017. The campaign period is highlighted in orange.

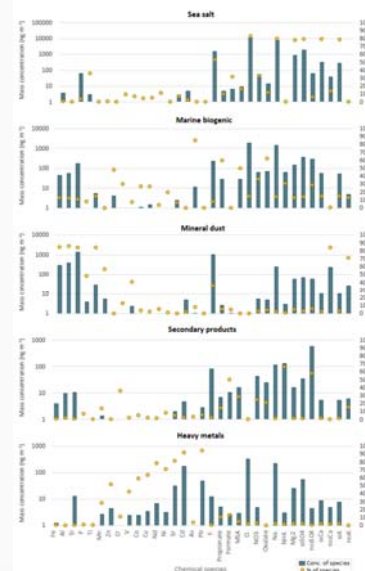


During the campaign the chemical composition is dominated by sea salt both in the PM, and in the total mass fraction. Occasional peaks of rBC (peak values up to 620 ng m⁻³) were detected. Their origin is under investigation.

Box and whisker plots for the time series of (top) the MSA mass concentrations; (middle) nssSO₄ mass concentrations; and (bottom) the MSA/(MSA+nssSO₄) mass fraction of particles smaller than 10 µm in diameter (PM₁₀) at the HBAO observatory (in black). Values obtained during the AEROCLO-sA field campaign in the submicron mass fraction (grey box) and in the total particulate matter fraction (red box) are also shown in the rightmost part of the plot.



Profiles of the five sources identified by the PMF analysis. Blue bars denote the mass concentrations of individual elements/ionic species (left logarithmic axis, ng m⁻³) while the yellow points indicate the percent of species attributed to the source (right axis).

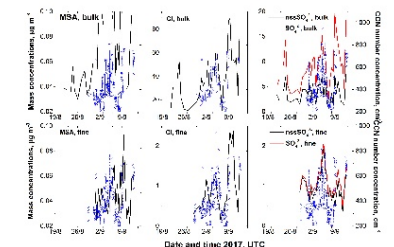


Aerosol hygroscopicity

The GF is size dependent: accumulation mode particles are more hygroscopic than Aitken mode particles. GF ~18.8 in the accumulation mode suggests the presence of organic coatings (less hygroscopic) on sea salt particles.

| Particle dry size | Weakly hygroscopic GF=1.3 | Moderately hygroscopic GF=1.7 | Highly hygroscopic GF=1.7 |
|-------------------|------------------------------|----------------------------------|------------------------------|
| 50 nm | 4.8 | 77.7 | 17.4 |
| 100 nm | 2.8 | 56.2 | 40.9 |
| 200 nm | 0.8 | 33.4 | 65.9 |

Time series of mass concentrations of methanesulfonic acid (MSA), Cl⁻, sulfate (SO₄²⁻, red line) and its non-sea salt fraction (nssSO₄²⁻) measured at Henties Bay during the field campaign. The total CCN number concentrations measured concurrently is represented by the dotted light blue line. The upper panel represents mass concentrations for the bulk aerosols. The lower panels represent mass concentrations in the sub-micron fraction.



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contact: paola.formenti@lisa.u-pec.fr
 Data will be distributed by the French national atmospheric data center AERIS
<http://baobab.sedoo.fr/AEROCLO/>
 Prior public release (2-year embargo period) data can be requested for collaborative research at aeroclo-sc@lisa.upec.fr