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Fog water chemical composition in Namibia during the AEROCLO-sA 2017 campaign

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Namibia is an arid country where many rural and urban centers depend on ephemeral rivers for their water supply. These water sources are, however, limited and display seasonal salinisation. Fog occurs along the coast and extends for up to 100 km inland, and has been considered for a long time as a source of drinking water. Fog is also a vital source of moisture for the endemic flora and fauna of the Namib Desert. However, due to the current change in climate and air quality, fog occurrence and composition, of crucial importance for the local ecosystems and populations, may be impacted. In the frame of the campaign of the AEROCLO-sA (AErosol, RadiatiOn and CLOuds in southern Africa) project, fog collection experiments were performed at Henties Bay, along the Namibian coast, and at the desert site of the Gobabeb Research and Training Centre, in August and September 2017. Fog collection experiments were done using two pre-cleaned Caltech Active Strand Cloud Water Collectors (CASCC), run in parallel. A stainless steel CASCC was deployed and samples were analyzed for organics (TOC, DOC, organic acids, and specific organic markers), while a plastic collector was used for sampling and further analysis of pH, inorganic ions, metals and water isotopes. Complementary measurements were performed on some of these samples, such as UV-visible and 3D-fluorimetric analysis, and nebulization into an AMS-c-ToF. In addition to chemical analysis, we monitored the droplet and the aerosol size distributions.
During the field campaign, we observed several fog events (mostly at Henties Bay and two at the Gobabeb Research Station), including major occurrences of a reduction of visibility to less than 1 km for several hours. The chemical composition of fog water on the coast (at Henties Bay) revealed a high marine influence, and also some influence of crustal sources, but no impact of biomass burning. The organic content was high compared to sea water, and compared to other coastal fogs, suggesting a probable influence of marine microorganisms. These results will be presented and discussed relative to the local aerosol composition, and they will also be contrasted with observations from two fog events at the inland desert site. Overall, the results indicate that the Namibian fogs are unique in terms of both microphysics and chemical content, and further studies are needed to deepen our knowledge of these clouds, and their inter-relations to air quality and climate change.