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Chemical composition of fog water and computation of air masses within the southern Atlantic fog zone

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With population growth and climate change increasing the exposure of communities and assets to extreme climatic conditions such as drought, it is crucial to assess possible alternative sources of good quality water such as fog, for climate adaptation of communities in arid regions. The Gobabeb and Walvisbay Town (herein referred to as the "Southern Atlantic Fog Zone") in the coastal desert of Namibia (the Namib Desert) experience fog events, which are beneficial to specific local ecosystems and human activities. Several studies have been conducted on the types and composition of fog in Gobabeb. However, knowledge on the possible sources of chemical contaminants of fog (including air pollution) using computations of air masses need to be improved.
Moreover, air pollutants can travel over great distance and remain suspended in the atmosphere before they are washed out by fog. Therefore, this study determined the chemical composition of fog based on the origin of its air masses; and investigated the possible addition of pollutants along the transport pathway. Backward trajectories for each fog water sample were computed to identify the origin of the respective air masses using wind speed, air temperature, soil temperature (at 10 cm and 20 cm depth), rainfall, relative humidity, leaf wetness and ion loadings. The backward trajectories were analysed using the Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model. The ion loadings of the four dominating ions; H+, NH4+, NO_3– and SO42– were enhanced in the air masses possibly advected from inland and dominated by anthropogenic influence. High concentrations of Na+ and Cl– as well as a high fraction of sea-salt-Mg2+ indicate high possibility of a maritime influence. The metals in fog water served as good indicators for local anthropogenic pollution of fog water.