Geophysical Research Abstracts
Vol. 19, EGU2017-18210-2, 2017
EGU General Assembly 2017

Ultrafine particle concentration and new particle formation in a coastal arid environment

Balint Alfoldy, Mohamed Kotob, and Jeffrey P. Obbard
Environmental Science Center, Qatar University, P.O.Box: 2713, Doha, Qatar (balint@qu.edu.qa)

Arid environments can be generally characterised by high coarse aerosol load due to the wind-driven erosion of the upper earth crust (i.e. Aeolian dust). On the other hand, anthropogenic activities and/or natural processes also generate significant numbers of particles in the ultrafine size range.
Ultrafine particles (also referred as nano-particles) is considered as aerosol particles with the diameter less than 100 nm irrespectively their chemical composition. Due to their small size, these particles represent negligible mass portion in the total atmospheric particulate mass budget. On the other hand, these particles represent the majority of the total particle number budget and have the major contribution in the total aerosol surface distribution. Ultrafine particles are characterised by high mobility (diffusion) and low gravitational settling velocity. Consequently, these particles can be transported long distances and their atmospheric lifetime is relatively high (i.e. in the Accumulation Mode). Ultrafine particles play important role in the atmosphere as they take part in the atmospheric chemistry (high surface), impact the climate (sulphate vs. black carbon), and implies significant health effects due to their deep lung penetration and high mobility in the body.
The Atmospheric Laboratory of Qatar University is conducting real-time monitoring of ultrafine particles and regularly taking aerosol samples for chemical analysis at the university campus. In this paper, recent results are presented regarding the size distribution and chemical composition of the ultrafine aerosol particles. Based on the concentration variation in time, sources of ultrafine particles can be clearly separated from the sources of fine or coarse particles. Several cases of new particle formation events have been observed and demonstrated in the paper, however, the precursors of the secondary aerosol particles are still unknown. Literature references suggest that among the sulphuric acid, iodine molecules can also play important role in new particle formation at coastal environments.
Chemical analysis of size-segregated aerosol samples demonstrates that sulphate aerosol has a mean diameter at 300 nm that can be the Accumulation Mode of the previously nucleated sulphate particles. The mean diameter of black carbon particles was found at 180 nm. The new particle formation events were detected under 10 nm and particle concentration can reach up to 1.8x10^5 cm^{-3} during severe events.
The results demonstrate the significant natural and/or anthropogenic contribution of ultrafine particles to the total aerosol budget in an arid, coastal environment.