Geophysical Research Abstracts
Vol. 21, EGU2019-15180, 2019
EGU General Assembly 2019


# Mobile ship-borne sun/sky/lunar photometer and ceilometer observations during the AQABA campaign.

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For the first time, a CIMEL CE318-T sun/sky/lunar photometer, modified for mobile platform observations, and a JenOptik CHM15K ceilometer, have been embarked on a scientific research ship, providing measurements of column-integrated aerosols properties and vertical aerosols distribution during the AQABA (Air Quality and climate change in the Arabian Basin) campaign. Mapping of spectral Aerosol Optical Depth (AOD) and Angstrom Exponent (AE) computed between 440 and 870 nm allowed identifying various aerosol loadings and type along the ship transect from Toulon, France to Kuwait (June - July 2017). Moderately polluted conditions have been found over the Mediterranean Sea (mean AOD of 0.3 $\pm$ 0.1 at 440 nm) and when crossing the Suez Canal and sailing southward (mean AOD of 0.18 $\pm$ 0.04 at 440 nm) with AE levels indicating contribution of both fine and coarse particles (mean of 0.93). Desert dust transports with moderate AOD levels have been observed over the Red Sea (mean AOD of 0.44 $\pm$ 0.18 at 440 nm and AE below 0.6) and strong dust storms reaching AOD of 2 at 440 nm and AE below 0.27 have been encountered over 5 days when sailing from the Red Sea to the Gulf of Aden. High aerosol loadings with predominance of coarse particles were also recorded in the Gulf of Oman and in the Arabo-Persian Gulf (mean AOD of 1 $\pm$ 0.47 at 440 nm and mean AE of 0.25 $\pm$ 0.10), indicating desert dust transport from the Arabian Peninsula. Pollution from petrochemical activities was evidenced from higher AE (1 $\pm$ 0.16) and AOD at 440 nm (0.66 $\pm$ 0.12) levels in the Arabo-Persian Gulf on 30 July 2017, which dropped to 0.56 $\pm$ 0.1 and 0.33 $\pm$ 0.06, respectively, on 31 July when reaching Kuwait, indicating contribution of desert dust. Vertical profiling showed extent of aerosol layers up to 5 - 6 km along most of the transects around the Arabian Peninsula, indicating a predominant presence of desert dust in the free troposphere. Highly variable aerosol structures were observed, for example, a well-distinguished layer between 3 and 6 km during several days (10-12 July) when crossing the Red Sea (Mecca area). The ceilometer data were inverted in synergy with photometer data using the BASIC Klett-based algorithm in order to derive the aerosol extinction profiles at 1064 nm. Some examples of extinction profiles along different regions in the Arabian Basin will be presented.