Lifetimes and Loss mechanisms of NO$_3$ and N$_2$O$_5$ during the AQABA ship campaign

Justin Shenolikar (1), Stephen Borrmann (1), James Brooks (2), Efstratios Bourtsoukidis (1), Eoghan Darbyshire (2), Frank Drewnick (1), Philipp Eger (1), Lisa Ermle (1), Friederike Fachinger (1), Horst Fischer (1), Ivan Tadic (1), Jonathan Williams (1), Jos Leelieveld (1), and John Crowley (1)

(1) Max Planck Institute for Chemistry, Mainz, Germany (justin.shenolikar@mpic.de), (2) University of Manchester, Manchester, United Kingdom

We report on measurements of NO$_2$, NO$_3$, and N$_2$O$_5$ made by thermal-dissociation Cavity-Ringdown Spectroscopy (TD-CRDs) taken during the Air Quality and Climate Change in the Arabian Basin (AQABA) campaign in June-August 2017. N$_2$O$_5$ was observed on a total of 18 nights and ranged from below the limit of detection (~6 ppt) to ~200 ppt. In this data set, which covers the Mediterranean Sea, Red Sea, Arabian Sea and Arabian Gulf regions, we derive steady-state lifetimes ($\tau_{ss}$) of NO$_3$ and N$_2$O$_5$ and perform an analysis on the night-time loss processes due to direct gas-phase reaction with volatile organic compounds (VOCs), reaction with NO, heterogeneous loss processes (e.g. reaction of N$_2$O$_5$ on aerosol) and dry deposition.