



MAX-DOAS measurements of shipping emissions

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Air pollution from ships contributes to overall air quality problems and it has direct health effects on the population in particular in coastal regions, and in harbor cities. In order to reduce the emissions the International Maritime Organisation (IMO) have tightened the regulations for air pollution. E.g. Sulfur Emission Control Areas (SECA) have been introduced where the sulfur content of marine fuel is limited. Recently, on the 1st of January 2015, the allowed sulfur content of marine fuels inside Sulfur Emission Control Areas has been significantly decreased from 1.0% to 0.1%. However, up to now there is no regular monitoring system available to verify that ships are complying with the new regulations. Furthermore measurements of reactive trace gases in marine environments are in general sparse.

The project MeSMarT (Measurements of shipping emissions in the marine troposphere, www.mesmart.de) has been established as a cooperation between the University of Bremen and the German Bundesamt für Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency) with support of the Helmholtz Research Centre Geesthacht to estimate the influence of ship emissions on the chemistry of the atmospheric boundary layer and to establish a monitoring system for main shipping routes.

Here we present MAX-DOAS observations of NO_2 and SO_2 carried out from two permanent sites close to the Elbe river (Wedel, Germany) and on the island Neuwerk close to the mouths of Elbe and Weser river since the year 2013. Mixing ratios of both trace gases have been retrieved using different approaches (pure geometric and taking into account the radiative transfer) and compared to in situ observations (see Kattner et al., Monitoring shipping fuel sulfur content regulations with in-situ measurements of shipping emissions). Furthermore, simple approaches have been used to calculate emission factors of NO_x and SO_2 for single ships.