



Monitoring Shipping Emissions with In-situ Measurements of Trace Gases

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The importance of discussions about ship emissions has grown due to the increase of commercial shipping as well as the publication of studies showing their serious effects on human health and on our environment. Especially in coastal areas and harbor cities the impact of ship emissions becomes more and more relevant. The establishment of a Sulfur Emission Controlled Area (SECA) for North Sea and Baltic Sea based on the MARPOL Annex VI protocol by the International Maritime Organization (IMO) has been a first step to control and reduce sulfur dioxide (SO₂) emissions by consecutively regulating the sulfur content of fuels. To reduce nitrogen oxide (NO_x) emissions from shipping, the emission of newly built engines is limited according to the year the engine is built (Tier I – III regulations).

The project MeSMarT (Measurements of shipping emissions in the marine troposphere) has been established as a cooperation between the University of Bremen, the German Bundesamt für Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency) and the Helmholtz-Zentrum 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. Pollution relevant trace gases SO₂, NO₂, NO, CO₂ and O₃ are measured with in-situ techniques. Within the project different measurement sites have been set up. In Wedel near Hamburg measurements have been performed in close distance to the Elbe River where ships entering the Hamburg harbor are passing by. It is shown that ship emission peaks can be associated with individual ships and how this information can possibly help to monitor the compliance of ships with SECA regulations. On the island Neuwerk the measurement station is located about 6 km south of the main shipping route through the German Bight. An outlook is given on how the method of identifying ship plumes can be transferred to the Neuwerk data and how the ship emissions influence the local marine air quality.