

## ***Interactive comment on “Emissions of NO, NO<sub>2</sub>, and PM from inland water transportation” by Ralf Kurtenbach et al.***

**Anonymous Referee #1**

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Inland water transport emissions of NO<sub>x</sub>, CO<sub>2</sub> and PM were investigated under real world conditions at the river Rhine, Germany during a campaign from February 20, to February 22, 2013. An average NO<sub>2</sub>/NO<sub>x</sub> emission ratio of  $0.08 \pm 0.02$  was determined, which is indicative of ship diesel engines without after-treatment systems. The NO<sub>x</sub> emissions of all investigated motor ship types (cargo, petroleum tanker and push tow) and for different operation parameters (L=loaded, U=unloaded, A=upstream and D=downstream) were above the threshold values of national German guidelines, while the obtained PM<sub>1</sub> emissions were just within. The implementation of after-treatment systems is recommended for reduction of NO<sub>x</sub> emissions to acceptable values in relation to national German guidelines. 1 Introduction General comments According to the European Commission's White Paper from 2011 an increasing part of road freight transported over more than 300 km distance should shifted to other transport modes

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such as waterborne or rail transport. This will reduce the direct impact on climate change. Following this development the knowledge of the corresponding NO<sub>x</sub>, VOC, PM and CO emission variations that means environmental impact is important. This paper contributes more real-world information about this topic. The paper addresses relevant scientific questions within the scope of ACP. The paper presents novel concepts, ideas and tools. The scientific methods and assumptions are valid and clearly outlined so that substantial conclusions are reached. The results are sufficient to support the interpretations and conclusions. The description of experiments and calculations are sufficiently complete and precise to allow their reproduction by fellow scientists. The authors should more clearly indicate their own new/original contribution and the representativeness of their results (Why a three-days campaign is representative?). The quality and information as well as the captions of the figures are good. But the captions of some figures and tables should be improved so that these are understandable without the text. The related work is well cited. The number and quality of references is appropriate. Title and abstract reflect the whole content of the paper. The overall presentation is well structured and clear. The language is fluent and precise. The mathematical symbols, abbreviations, and units are generally correctly defined and used. Specific Comments NO, NO<sub>2</sub>, O<sub>3</sub>, CO<sub>2</sub>, PM<sub>1</sub> and PM<sub>10</sub> concentrations were measured together with wind speeds and wind directions so that NO<sub>2</sub>/NO<sub>x</sub> emission ratios and emission indices of NO<sub>x</sub> and PM<sub>1</sub> can be calculated. The correct NO<sub>2</sub>/NO<sub>x</sub> ratio is obtained by plotting Ox, which is the sum of NO<sub>2</sub> and O<sub>3</sub> versus the measured NO<sub>x</sub> concentration. Errors were calculated using error propagation for the different measured compounds. An outlook is missing to address open questions as e.g. the influences of water level and river streaming velocity. Why NMVOCs were not detected to find carcinogenic substances? Technical corrections For some reports the institution, city and country are missing in the references. In some references a “.” should be set instead of a “,” after the paper title.