



Estimated long-term effects of wash water from emission control systems on seagoing vessels

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The main objective of the project 'Scrubber Washwater Survey' (SWS) is to gain further knowledge about the effects of exhaust gas cleaning systems (EGCS), which are increasingly used in the shipping sector. In order to reduce the atmospheric pollution in the coastal environment and to improve the air quality of port cities, the limit of the sulphur content in marine fuels was reduced from 1.00% to 0.10% on 01.01.2015 in the North- and Baltic Sea. One possibility to comply with this regulation is to install an EGCS on-board that washes the SO_x emissions from the exhaust fumes. The installation enables the same emission reduction as the use of low-sulphur fuel. This technique uses seawater for exhaust gas scrubbing. This washwater will be enriched with water-soluble and particulate-bound pollutants and discharged into the sea. A better understanding of the possible long-term accumulation will enable the assessment of the impact on the marine environment.

An increased use of EGCS can lead to widespread adverse effects on the marine environment. Here, the long-term spatial accumulation is estimated by simulating the distribution of washwater in the North Sea and the Baltic Seas. The dilution and spread are calculated conservatively as passive tracers by means of a mesoscale Eulerian propagation model coupled to the ocean circulation model HBM, which is operationally used at the BSH. The concentration of various pollutants in the washwater was obtained from different measurement campaigns. The source input of washwater is calculated with the EMMA (Emissions Modell Marine Abgase). It uses a database of AIS ship positions and engine performance for calculation of the exhaust gas emission. The ships are subdivided in categories and linked to the IMO's GISIS data base, which enables to assess the potential number of vessels with EGCS and to derive the emission of washwater per day and area.

Two different scenarios have been developed for simulating the temporal and spatial emission of washwater and potential concentrations of pollutants. These are the current state scenario (CSS) and a "maximum installation" scenario (MIS). CSS is based on the number of ships that had EGCS installed by March, 20th 2018 as they are listed in the IMO's GISIS data base. This ship density is applied for the modelled time period of one year (Jan, 1st 2015 until Dec, 31st 2015). MIS is based on the assumption that all ships, where an installation of an EGCS would be considered economically feasible, have installed an EGCS. This ship density is applied for the modelled time period of three years (Jan, 1st 2015 until Dec, 31st 2017). The potential impacts of the use of EGCS on the marine environment are discussed. Here, we present the distribution pattern and concentration of polycyclic aromatic hydrocarbons (PAH) as well as the hotspots of accumulation and temporal evolution. Spatially differentiated conclusions for the "German Bight" area are made possible from the calculated distribution patterns.