

Shipping Emissions in the Arctic - Black Carbon (SEA-EFFECTS BC), 2015-2016

Summary

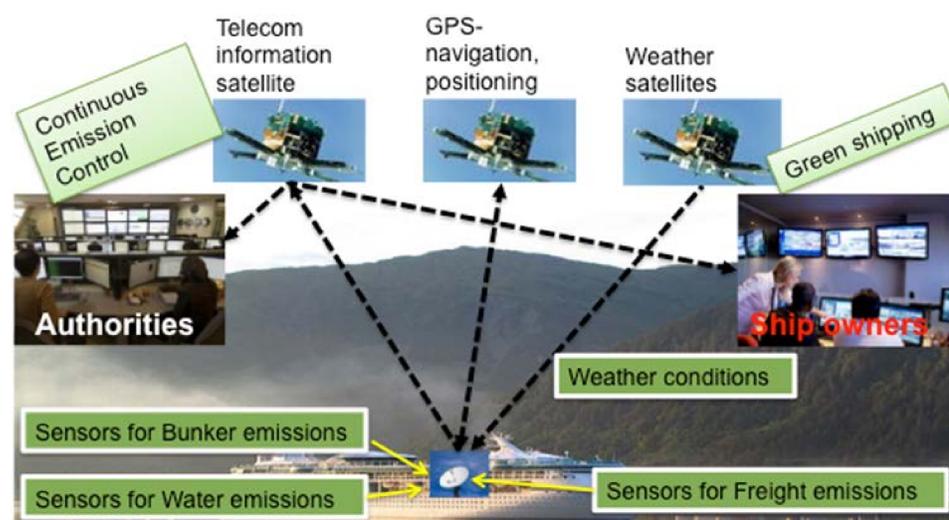
The SEA-EFFECTS BC project aims at more reliable and unequivocal basis of black carbon (BC) emission evaluation to shipping environment, and towards new options for on-line monitoring techniques. Definitions of sampling and sample treatment are essential for reliable measurements in ship environment, particularly when using new fuels and emission control technologies. This approach will also support generation of the reliable ship emission factors. In-depth analysis of other emissions in parallel to BC measurements increase understanding of the results obtained with different techniques, which is a prerequisite for further development. Business opportunities in the field of emission measurements are evaluated, including sensor and information technology.

Background

With the expected rise in commercial shipping in the Arctic, ship emissions are increasing. Growing attention is given to BC, which increases global warming and ice melting through deposition to ice and snow. IMO is evaluating needs for regional and global control of BC. Work is launched to establish methodology for BC, as no approved BC methods exist. Many other emissions species are already limited, such as SO_x and NO_x in certain emission control areas, and further limitations are anticipated.

Black carbon and on-line measurement techniques

BC measurements and its definition are known to be challenging; for example, results from different experimental techniques (absorptive, refractive and thermal) differ from each other. Only a few studies provide detailed insight on the BC emissions from ships. The work in WP1 on BC techniques is realised with Wärtsilä Vasa 4R32 marine engine at VTT's laboratory in co-operation with research organisations and industrial partners. BC will be measured with IMO relevant measurement methods, such as **OC/EC, MAAP, FSN, MSS and PAS**. In-depth analysis of particulate emissions will increase understanding of applicability of different techniques to measure BC from ships. WP1 offers also an exceptional platform for on-line emission monitoring techniques as four fuels tested (0.1 %S, 0.5 %S, 3.5 %S and biofuel) generate extensive exhaust gas matrix from marine engine.



On-board validation of measurement methods

In WP2 emissions from a ship equipped with scrubber will be used as a platform for validation of measurement methods adjusted in WP1. The emission measurements will cover gaseous emissions, BC by using several different methods and in-depth analysis of particulate matter emissions. In addition, aging of BC emission is studied. The results will also increase knowledge of the influence of SO_x scrubbing on particulate matter and BC emissions, which is a matter currently poorly known.

Impact of anticipated regulations on business potential

Globally there are 100 000 diesel ships, around 250 LNG ships and even some methanol ships and electric ferries. WP3 will reveal new business opportunities and design an integrated solution to fulfill the needs of BC measurement. The goal is to create a robust and maintenance free system offering continuous information of emissions. The integrated measuring solution covers various hardware, software and satellite communication techniques and devices with a real time connection to land base stations, thus authorities and ship owners.

Partners

VTT Technical Research Centre of Finland Ltd., Finnish Meteorological Institute, Tampere University of Technology, University of Turku, Wärtsilä Finland Oy, HaminaKotka Satama Oy, VG-Shipping Oy, Pegasor Oy, Spectral Engines Oy, Gasmet Technologies Oy, Vopak Oy and Kine Robot Solutions Oy.

Invited experts: A. Mäkinen (Trafi), K. Kupiainen (SYKE), J-P. Jalkanen (FMI).
External contributions: AVL (Austria), Gasera, UEF, and others.

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