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MARINE VESSEL BLACK CARBON POLLUTION

APPLICATION NOTE

MOTIVATION

The duration of use is usually significantly longer for marine vessels than for roadside vehicles. Therefore, these vessels are often powered by relatively old engines which may propagate air pollution. Also, the quality of fuel used for marine vessels is usually not comparable to the quality of fuels used in the automotive sector and therefore, port areas may exhibit a high degree of air pollution. In contrast to the multitude of studies that addressed outdoor air pollution due to road traffic, only little is known about ship-related air pollution.

Ship emissions contribute also to global warming. It is estimated that the transportation sector contributes around 15% to global greenhouse gas emission, to which 10% come from shipping.

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RESEARCH TOPICS

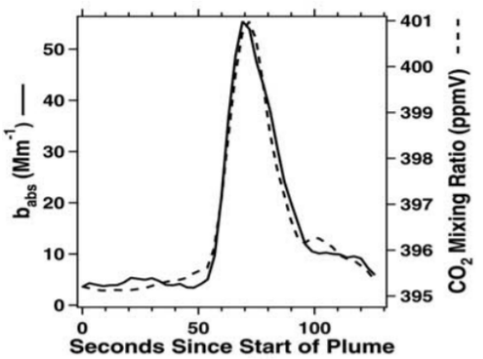
MARINE VESSEL BLACK CARBON POLLUTION

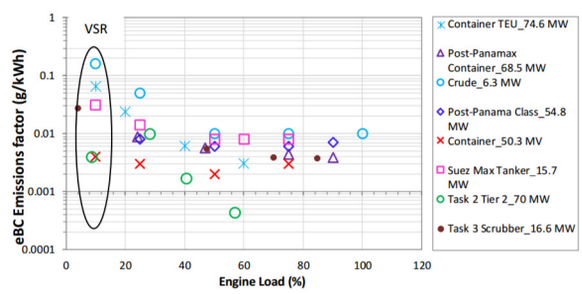
SHIP EMISSION FACTORS
- Emission factors for individual ships can be determined by measuring ship plumes.
- EF range from 0.1 to 1 g/kg of fuel and increase at low loads.
- Super polluters can be identified and fined.
- Using shipping fuel consumption data, global shipping emissions can be estimated.

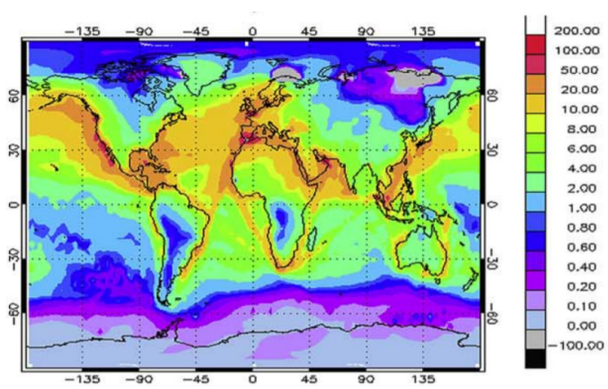
EFFECTS ON PORTS
- Ports are usually in the vicinity of urban areas.
- Cruise ships need a large amount of electric energy when they stay at berth which is produced by diesel engines.

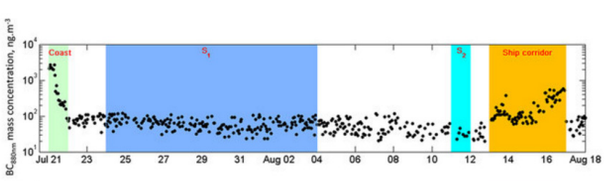
ABATEMENT MEASURES
- Abatement effect can be mesured.
- Lower speeds can increase BC emissions if engines are not properly tuned.
- Shifting from high sulfur, high ash residual fuels to low sulfur, low ash distillate fuels will decrease BC emissions up to 80 %.
- BC removal by scrubbers is between 40–70 %.

EFFECTS OF OFF-SHORE SHIPPING
- Aethalometer was installed at Goonhilly Downs on the Lizard peninsula in Cornwall UK, which is typically downwind of busy shipping lanes, with very low background pollution levels.
- For the most time no substantial increase due to shipping was observed.









Related aticles

D. A. Lack et. al., „Light absorbing carbon emissions from commercial shipping ", Geophysical Research Lett. (2008).

- M. V. Ramanaet. al., „CCN concentrations and BC warming influenced by maritime ship emitted aerosol plumes over southern Bay of Bengal", Scientific Reports, 6, 30416 (2016).
- D. M. Butterfield et. al., „An Investigation into the Effects of Off-Shore Shipping Emissions on Coastal Black Carbon Concentrations", Aerosol and Air Quality Research, 17, 218–229 (2017).
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Aerosol d.o.o.
Kamniška 39 A
SI-1000 Ljubljana
Slovenia
+386 1 439 1700

Keeping an Eye on the Air