

Shipping emissions and its contribution to port air quality by an ongoing field campaigns (SEISO-Bohai)

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East Asia has the most rapidly growing shipping emissions of both CO₂ and traditional air pollutants, but the least in-depth analysis. Recent study shows that shipping emissions in East Asia accounted for 16% of global shipping CO₂ in 2013, leading to large adverse health impacts with 14,500-37,500 premature deaths per year. Wintertime air quality was measured in port area as part of the Shipping Emission and Impacts by Switching Oil in Bohai Bay SEISO-Bohai campaign during December 2016-January 2017. SEISO-Bohai is a field campaign focusing on shipping emission and its contribution to air quality research. It was taken place at a site in a port of Bohai Bay. The site is located close enough to the ships while far from other sources. The particle and gas inlets were installed on the roof of a measurement container at 2.8 m above ground level. Inside the container, the particle speciation was measured with a Single Particle Aerosol Mass Spectrometer. The organic gases were measured by SIFT-MS, a high-sensitivity instrument with fast time response that employs a quadrupole mass spectrometer to measure volatile organic compounds. PM samples were collected by mid-volume samplers. The pre-fired quartz microfiber filters was used to determine organic and elemental carbon. The quartz microfiber filters were conditioned for 24 h before the sampling, then weighted by a five-digit microbalance. Meteorology conditions were continuously monitored with 1 min time resolution, including temperature and relative humidity at 4.8m height, wind speed and direction and pressure at station level. Carbon monoxide, the tracer for combustion emissions, was measured by vacuum ultra-violet fluorescence.

Port area reflects a mixture of regional background and nearby shipping and truck emissions. Both the strong regional influence of haze event and shipping emission influence were observed. Shipping emission flumes provide basic idea to check the compliance of sulfur content of shipping fuel for several container vessels. The measured SO₂ and CO₂ concentrations show that the fuel sulfur contents may be lower than previous estimation. A profile of PM from shipping exhaust was built, with major species of OM, SO₄, BC and elements, such as S, V, and Fe. The primary contribution of ship emissions to harbor PM_{2.5} concentrations will be determined after all data were processed.

Keywords: shipping emission, China, air quality, field campaigns, SEISO-Bohai