

## Impacts of ship emissions on atmospheric particulate matter and gaseous components over the Seto Inland Sea areas

\*田内 萌絵<sup>1</sup>、川本 雄大<sup>2</sup>、山地 一代<sup>1</sup>、中坪 良平<sup>3</sup>、大下 佳恵<sup>3</sup>、板野 泰之<sup>4</sup>

\*Moe Tauchi<sup>1</sup>, Katsuhiro Kawamoto<sup>2</sup>, Kazuyo Yamaji<sup>1</sup>, Ryohei Nakatsubo<sup>3</sup>, Yoshie Oshita<sup>3</sup>, Yasuyuki Itano<sup>4</sup>

1. 神戸大学、2. 高松地方気象台、3. 兵庫県環境研究センター、4. 大阪市立環境科学研究センター

1. Kobe University, 2. Takamatsu Local Meteorological office, 3. Hyogo Prefectural Institute of Environmental Sciences, 4. Osaka City Research Center of Environmental Science

Our interest issue is to be clear control factors of elevated atmospheric pollutants over the Seto Inland Sea (SIS) and surroundings, where PM<sub>2.5</sub> levels are still higher than the other regions in Japan (Nakatsubo et al., 2020). The SIS area is closed and congested with many people live along its coastal zones. Even now, it has been concerned that high sulfur emissions from vessels using heavy fuel oil with relatively high sulfur content effect on air quality.

From 1 January 2020, in such a situation, the sulfur contents in fuel oil used on board ships operating outside emission control areas have been reduced from 3.50% to 0.50% (the sulfur limits). The global sulfur limits will make significantly reductions of sulfur oxides emissions from ships, and that should have major health and environmental benefits for the world, especially for populations living close to ports and coasts. The reduced ship sulfur emissions are expected to affect not only ambient sulfur-containing substance concentrations but also the other atmospheric pollutant components.

To assess the impacts of the fuel sulfur changes on air quality of the SIS areas, we investigated concentrations of SO<sub>2</sub> and PM<sub>2.5</sub> substances in the atmosphere over both land and sea from March 2017 to March 2020 only for the duration of the research voyage. Automatic sampling data at ambient air pollution monitoring stations facing to SIS were used for analyzing the coastal-landmass pollutants. As regards the marine air mass, SO<sub>2</sub> and PM<sub>2.5</sub> were sampled over the SIS area on board Training-ship Fukaemaru owned by Kobe University.

From January 1 to March 31 in 2018, percentage of sulfate ion in PM<sub>2.5</sub> along the SIS area is about 24.1%. We are carefully watching the atmospheric particulate matter and gaseous components around the SIS after starting the sulfur limits. Continued observation research should contribute for improvement of air quality and formulating environmental policy in the future.

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