An 8-year record of atmospheric trace gases and aerosols in Southeast Asia based on shipboard observation.

Presenting Author:
Hideki Nara, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan, nara.hideki@nies.go.jp

Co-Authors:
Hiroshi Tanimoto, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan
Yasunori Tohjima, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan
Hitoshi Mukai, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan
Yukihiro Nojiri, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan
Toshinobu Machida, National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki, 305-8506, Japan

Abstract:

The National Institute for Environmental Studies has performed long-term atmospheric monitoring over the Pacific Ocean using a commercial cargo vessel since 1994. Currently we conduct the monitoring work along three shipping routes: North Pacific (Japan–United States/Canada), Oceania (Japan–Australia/New Zealand), and Southeast Asia (Japan–Southeast Asian countries). The monitoring work was first implemented along the routes of North Pacific (Japan–United States/Canada) and Oceania (Japan–Australia/New Zealand), but was augmented by the monitoring work in the Southeast Asia region in September 2007. Along the Southeast Asia route, we observed climatically important trace gases and aerosols based on in-situ measurements (gases: CO₂, CH₄, CO, and O₃; aerosols: PM2.5, SPM, and black carbon) and flask sampling (CO₂, CH₄, N₂O, CO, H₂, SF₆, and O₂/N₂) followed by the laboratory analysis. Here we present analysis of the 8-year record (2007–2015) of CO₂, CO, and O₃ based on the in-situ measurements, examining the time-series variation of these three gases in respective 7 defined areas: off the east and west coast of Indochina and Malay Peninsula, and off the coast of Philippines, Borneo, and Indonesia along the shipping route. The analysis revealed different distribution features of CO₂, CO, and O₃ in each area that were controlled by the seasonal change of transport patterns driven by the Asian monsoon with strong disturbance by large-scale tropical biomass burnings.