講演番号	352

文献番号	20225352

Impacts of Transboundary Air Pollution from East Asia on Air Quality in Japan in 2050

Yoshiaki YAMADAYA[1], Kentarou HAYASHI[2], Tazuko MORIKAWA[3], Hiroyuki YAMADA[2], Kotaro TANAKA[1], Shinichiro OKAYAMA[4], Yoshiaki SHIBATA[5], Hiroe WATANABE[4], Toru KIDOKORO[6]

1) Ibaraki University, 4-12-1 Nakanarusawa, Hitachi, Ibaraki 316-8511, Japan
2) Tokyo Denki University, 5 Senjuasahi, Adachi-ku, Tokyo 120-8551, Japan
3) Japan Automobile Research Institute, 2530 Karima, Tsukuba, Ibaraki 305-0822, Japan
4) Nissan Motor Co., Ltd., 560-2 Okatsukoku, Atsugi, Kanagawa 243-0192, Japan
5) Institute of Integrated Atmospheric Environment, 1-2-8 Koraku, Bunkyo-ku, Tokyo 112-0004, Japan
6 Toyota Motor Corp., 1 Toyota, Toyota, Aichi 471-8571, Japan

KEY WORDS: Environment・Energy・Resources, Air Quality, ozone, $PM_{2.5}$, CMAQ [D2]

In recent years, there has been a strong emphasis on reducing greenhouse gas emissions. With reduced greenhouse gas emissions, the domestic emissions in Japan and the transboundary air pollution from East Asia change, leading to a change in O_3 and $PM_{2.5}$ concentrations in Japan. Using simulations, this study aimed to investigate the effect of the change in the domestic emissions in Japan and the transboundary air pollution from East Asia on O_3 and $PM_{2.5}$ concentrations in Japan in 2050.

Air quality simulations were performed with air pollutant emission estimates for 2015 and 2050. Emission estimates were referred from a previous study(1). The Community Multiscale Air Quality Modeling System (CMAQ) v5.3.2 was used for this simulation as an air quality model. The meteorological data were generated using Weather Research and Forecasting (WRF) v3.8.1. To investigate the effect of domestic emissions in Japan and transboundary air pollution from East Asia, three scenarios (Scenario1: 2015 Asia & 2015 Japan, Scenario 2: 2015 Asia & 2050 Japan, and Scenario 3: 2050 Asia & 2050 Japan) were calculated. Representative sites in Japan were selected based on population density and weather classification and O_3 and $PM_{2.5}$ concentrations were analyzed.

In the case of O_3, in spring, the transboundary pollution from East Asia was dominant in the north region of Japan, whereas the domestic pollution in Japan was dominant in the remaining regions of Japan. In summer, domestic pollution in Japan had an influence on O_3 concentration in the entire region of Japan. In autumn and winter, the effect of domestic pollution in Japan was either absent in most areas or was significant in increasing O_3 concentration.

In the case of $PM_{2.5}$, the result showed that concentration depended on the region and season and whether the effect of transboundary pollution from East Asia or that of domestic pollution in Japan is dominant. In autumn and winter, the transboundary pollution from East Asia had a relatively strong effect on $PM_{2.5}$ concentration in the west region of Japan, whereas the effect on $PM_{2.5}$ concentration was weak in the east region of Japan.

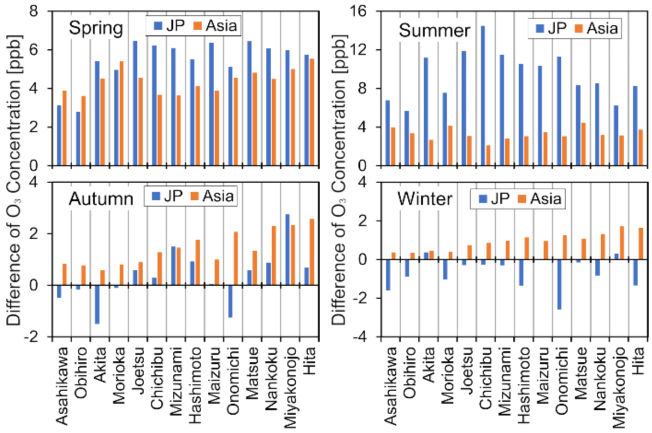

Fig. 1 Difference in O_3 concentration calculated using each scenario. (JP: Difference between O_3 concentration calculated using Scenario 1 and that calculated using Scenario 2; Asia: Difference between O_3 concentration calculated using Scenario 2 and that calculated using Scenario 3.

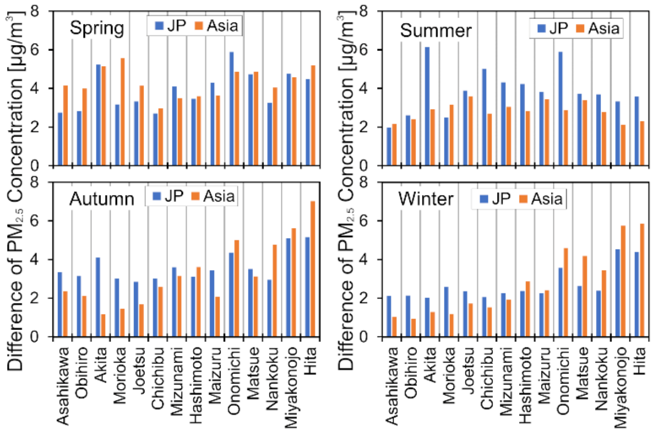

Fig. 2 Difference in $PM_{2.5}$ concentration calculated using each scenario. (JP: Difference between $PM_{2.5}$ concentration calculated using Scenario 1 and that calculated using Scenario 2; Asia: Difference between $PM_{2.5}$ concentration calculated using Scenario 2 and that calculated using Scenario 3.)

(1) T. Morikawa et al.: Air Quality Estimation in 2050: JSAE 2050 Challenge and Air Quality Estimation in 2050, Transactions of Society of Automotive Engineers of Japan, Vol.52, No.6, p.1261-1266 (2021).