총회 초청강연 초록

Regional Air Pollution Problems in East Asia and International Role of Research Exchange

Hajime Akimoto
Institute for Global Change Research (IGCR/FRSGC)
3173-25 Showamachi, Kanazawa-ku, Yokohama, Kanagawa 236-0001, Japan
akimoto@frontier.esto.or.jp

As economy and population have been growing, air pollution problems both in local and regional scale came to the surface in East Asia in last decades. In addition to urban problems, regional air pollution is also becoming a big issue of international concern. Urban and regional air pollution issues are closely related and we have to tackle the problem by understanding underlying scientific reality and taking a strategic approach to mitigation. In this talk I will focus on a regional aspect of air pollution focusing on Northeast Asia.

Regional air pollution here includes acid deposition, aerosol and ozone. All of these phenomena are commonly characterized by precursor emissions, long range transport accompanying atmospheric reactions, and surface deposition. Acid deposition has been widely publicized in East Asia. Acidification of rain water occurs by uptake of gaseous and particulate air pollutants by cloud/rain water. Since acidity of rain water is determined by ionic balance between acidic anion and base cation, prediction of acid rain necessitates rather complex phenomena including atmospheric oxidation of precursors by homogeneous and heterogeneous chemistry, long range transport and uptake of acidic gasses and aerosols into cloud water. Particularly in Northeast Asia buffering capacity by yellow sand is an important factor to determine the acidity in addition to anthropogenic air pollutants. Due to these complicated nature of acid deposition, model prediction still needs further development before reliable regional picture will be drawn. Another difficult feature of acid deposition study is the complex nature of impacts on ecosystems which are not well established yet.

Ozone is a toxic gas both for human health and ecosystem health. Increase of tropospheric ozone in northern hemisphere has been known to be at least a factor of 2 to 3 higher than in the previous century due to the increase of anthropogenic emission of NOx, CO and VOC. Our recent study has revealed that surface ozone concentration in 'background' air in Northeast Asia often reaches higher than 60 ppbv in spring and autumn. The observed concentration is already at harmful level for decline of forest trees and decrease of crop yields. Thus, ozone pollution in East Asia should be of great concern together with acid deposition. Modeling of ozone in a global scale has revealed that East Asia is one of high ozone region in parallel with Europe and North America. Future prediction by a model shows that the concentration of ozone will further increase in Northeast Asia due to further increase of precursors emission. Increase of 'background' level of ozone also enhances urban and suburban photochemical air pollution.

Regional models for prediction of temporal and spatial variation of ozone and aerosols in Northeast Asia has been developed. Such models can elucidate mechanisms how these pollutants are formed and transported and will help to establish source-receptor relationships of these air pollutants in a regional scale. Those models are also milestones for developing a reliable regional model for acid deposition. In order to validate these models well planned region-wide observational programs are very important. Internationally coordinated programs, exchange of observational data as well as exchange of research experience are all necessary to tackle for such regional air pollution problems.