【Grant-in-Aid for Scientific Research (S)】

Integrated Disciplines (Environmental Science)

Title of Project : Precise analysis of HOx cycle in the air by novel techniques and new development of oxidants and aerosols chemical dynamics

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Research Project Number : 16H06305 Researcher Number : 40211156
Research Area : Environmental analysis
Keyword : HOx cycle, Ozone, Oxidants, PM2.5, Air pollution

【Purpose and Background of the Research】

Photochemical oxidants and PM2.5 are one of most important issues of environment. In spite of reductions of ozone precursors ozone abundance still has positive trend in most of area in Japan. Scientific evidence for mitigation strategy of these issues is required. The fact that modeling studies systematically underestimate for prediction of oxidants and secondary organic aerosols (SOA) abundances implies a lacking of scientific understanding for the formation mechanism of these secondary pollutants. For the reduction strategy and precise prediction of these oxidants, further understanding of atmospheric processes is necessary.

In order to explore the cause of underestimation for secondary pollutants, the following sub themes are set as follows, 1.Establishment of the methodology to determine the cycle number of HOx cycle and HOx yields in the ambient air, 2. Determination of productions rates for oxidants driven by HOx cycle, 3.Comparison of production rates between observation and prediction by HOx cycle analysis, 4.Photochemical chamber studies for growth and aging of SOA induced by HOx cycle and establishment of synthetic modeling system for the predictions of these oxidants, 5.Evaluation of the contributions of unknown reactivity for the formation of oxidants and aerosols.

【Research Methods】

Instruments for HO_2 and RO_2 reactivity measurements by laser spectroscopy will be constructed. The yield determination system for OH, HO_2 and RO_2 will be developed. Ozone and UV-lights induced HOx radical production rate measurement system will be constructed. Semi-volatile compounds driven by HOx cycle will be developed. Photochemical chamber studied for growth and aging of SOA and variation of chemical and physical properties induced by HOx cycles will be performed and synthetic modeling system for the prediction of secondary pollutants will be improved. Intensive field study of HOx cycle, semi-volatile compounds, and SOA will be planed in the final year and the theory of HOx cycle system will be tested.

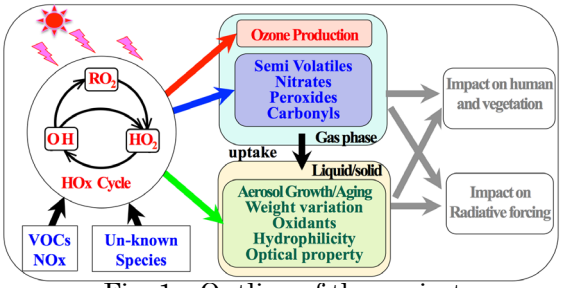

Fig. 1 Outline of the project

【Expected Research Achievements and Scientific Significance】

Quantitative analysis of HOx cycles will be capable and prediction of secondary pollutants such as ozone, organic nitrates and SOA will become more precisely through this project. Understanding of growth/aging processes of SOA induced by HOx cycle is quite important to consider its atmospheric behavior such as its residence time, physical properties.

Since oxidants and SOA are considered to provide significant impact on both human and vegetation and on radiative forcing, prediction of such secondary pollutants will contribute for social demand greatly.

【Publications Relevant to the Project】

A laser-flash photolysis and laser-induced fluorescence detection technique for measuring total HO_2 reactivity in ambient air; Miyazaki et al.. *Rev. Sci. Inst.*, 84, 076106 (2013).

【Term of Project】 FY2016-2020

【Budget Allocation】 139,600 Thousand Yen

【Homepage Address and Other Contact Information】

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