An alkaline world: a new assessment of the global chemical climate for PM2.5 formation and nitrogen and sulphur deposition

Speaker:	Dr. Yao GE Research scientist, Division for Climate Modelling and Air Pollution, Norwegian Meteorological Institute, Norway
Date:	31 March 2023 (Friday)
Time:	HKT 1:30 p.m. – 2:30 p.m.
Venue:	Room 3598 (Lifts 27-28)

Abstract

The reduction of atmospheric reactive nitrogen (Nr) and sulfur (Sr) species is a key objective for air quality control policies as they contribute to the formation of PM2.5, which has significant effects on human health and climate, and their deposition affects ecosystem productivity. The chemical climate for Nr and Sr pollution has undergone dramatic changes in the past two decades. Therefore, it is necessary to update our understanding of global Nr and Sr chemistry and investigate their mitigation under current atmospheric conditions. Since a range of emission sources and atmospheric chemical and physical processes contribute to Nr and Sr concentrations, atmospheric chemistry transport models (ACTMs) are essential tools to identify the key processes controlling their impacts and effective mitigation. In this talk, I will present my research on global modelling of Nr and Sr species using the EMEP MSC-W ACTM coupled with WRF meteorology. Firstly, I will introduce the model-measurement comparisons of reduced nitrogen (RDN), oxidized nitrogen (OXN), and oxidized sulfur (OXS) species covering 10 monitoring networks worldwide that measure surface concentrations and wet deposition. Secondly, I will summarize our global analysis of current Nr and Sr gas-aerosol partitioning and regional budgets. This analysis quantitatively demonstrates that successful control of SO2 and NOx emissions has resulted in atmospheric NH3 excess in many areas, leading to a new significance of alkaline air, with adverse impacts on ecosystems. Finally, I will present our work that quantifies the sensitivities of emissions reductions for mitigating PM2.5 and N and S deposition. This work highlights a global picture of the effectiveness of NH3, NOx, and SOx emissions reductions for mitigating both concentrations and deposition of Nr and Sr pollutants.

Biography

Dr. Yao Ge is an early-career research scientist in the Division for Climate Modelling and Air Pollution at the Norwegian Meteorological Institute (MET Norway). She obtained her PhD in Chemistry from the University of Edinburgh, where she focused on global atmospheric modelling of inorganic reactive N and S species, using the EMEP atmospheric chemistry and transport model. Before that, she completed an MPhil in Chemistry at the Hong Kong University of Science & Technology, and a BSc in Chemistry at the Ocean University of China. Currently, at MET Norway, her research involves developing chemistry mechanisms in the EMEP model to investigate the role of various anthropogenic volatile organic compounds in the formation of surface ozone and secondary organic aerosol, as well as strategies for their mitigation.