Hg physicochemical processes at atmospheric interfaces, in the age of climate change

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Atmospheric interfaces, such as aerosols, clouds, and air/wate/snowice/soil/vegetation/built surfaces, play exciting roles from affecting the plenatary energy budget and climate change, to photochemistry, catlysis, and biogeochemical cycling. Although, there are signficant advances in understanding physicochemical and biogeochemical process in atmospheric interfaces, there is much unknown, As a result, the IPCC (2018) has idenfied the the major uncertainty in the domain of climate change to be aerosol and aerosol cloud interactions The WHO (2018) has also pointed out that air pollution, particulalry smaller aerosols, are the cause for premature death of ~ 8 million human beings every year, globally. Indeed, some physicochemical processes such as size, hygroscopicity, configuration, number density, contact angle, surface photochemistry, which are understaood to be gap-of-knowledge in climate change, are also kely gap-of-knowldege in toxicocological and health studies.

In this paper, we will discuss three areas of recent advances from our labs to the furthering understanding of the physicochemical processes of Hg at atmospheric interfaces. Firstly, we will present some kinetics reactions of mercury on various nanoparticles of atmospheric relevance. Secondly, we will explore the novel evidence for the existence of airborne mercury nanoparticle and development of technology for mercury nanoparticles in air and water. Lastly, we present the impact of mercury surface with emerging contaminants such as nanoplastics, on ice nucleation processes which are involved in aerosol-cloud interactions in climate change. We will discuss research and development opportunities and challenges in this area, which will be relevant to both health and climate research.