Research of Condensation of Supersaturated Water Vapor

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Clouds in the atmosphere have a significant influence on weather conditions, and play a prominent part in the processes of energy exchange between the Sun, the surface of the Earth and the atmosphere. That is why it is important to research the mechanisms of clouds formation and the processes developing at different stages of formation. It is essential to estimate the influence of cosmic radiation, as well as other natural and anthropogenic factors on these processes.

Nucleation of droplets in the cooled water vapor requires the presence of condensation centers [1-3]. In order to observe the dynamics of droplets nucleation, the Institute of Atmospheric Optics SB RAS developed a unit on basis of the two-chambered cell with capacity exceeding 40 m^3 [4] which allows creating supersaturated H_2O vapor. At that, the unit offers the possibility of controlling thermodynamic parameters under varied pressure, test gas mixture composition and influence of ionizing radiation.

The study was focused on nucleation of nanoparticles and droplets. The nucleation developed under the gradual decrease in pressure of the test gas mixture when the unit conditions were made similar to Wilson chamber, type-II. The gas mixture was also exposed to the charged particle beam under gradual pressure decrease and supersaturated H_2O vapor. To this effect the unit was equipped with the electron gun [5]. Air, binary mixtures of H_2O-CO_2 and H_2O-N_2, as well as the air with high concentration of CO_2 and N_2 were used as test mixtures.

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Exploring synergies of aerosol and climate mitigation strategies

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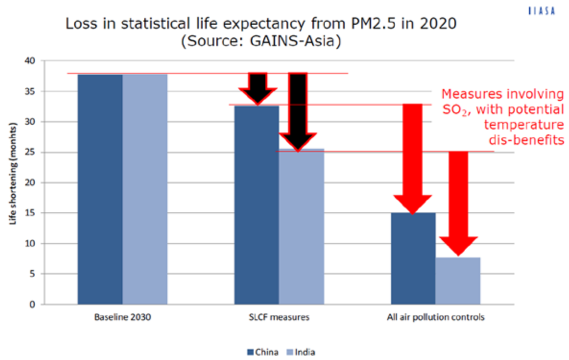
Recent work has highlighted the scope for reductions of short-lived climates pollutants (SLCP) that yield significant benefits to human health and agricultural crops at the local scale while limiting temperature increase in the near-term [1, 2]. Identified measures would achieve large cuts in emissions of CH_4 and BC, but minimize further emission reductions of cooling aerosols, such as SO_2, beyond what is already implied in current legislation. Climate policies, cutting emissions of several pollutants, would also bring important health benefits [3].

While implementation of measures addressing SLCP or specific climate polices would result, beyond climate benefits, in significant air quality and ecosystem improvements, they will not be sufficient to remediate all current air quality problems and achieve sustainable air quality around the world. Additional air quality measures will need to involve further reductions of cooling aerosols, such as SO_2 emissions, which however will result in a clear climate dis-benefit, at least in the near term (Figure 1).

The presentation will review available emissions scenarios



for measures or policies that could compensate climate dis-benefits of SO_2 mitigation by co-controls of long-lived greenhouse gases.

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