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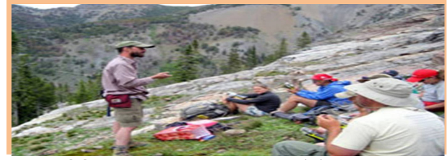

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Change of climatic conditions due to atmospheric aerosols

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DESCRIPTION

The Atmospheric particles in the form of solid or liquid phase suspended in air is known as aerosols. Aerosols are produced by two major processes, namely, bulk to particle and gaseous to particle conversions from the various natural and anthropogenic sources. The aerosols size ranges from 0.001 µm to 100 µm. Though, it is smaller in size the aerosols have a high impact on the global climate system. Aerosols alter the earth's radiation budget by absorbing or scattering the radiation based on their physical, chemical, and optical properties which is referred as a direct effect. And also it has an indirect effect on the earth's climate through modifying the cloud microphysical properties. The changes in the amount of aerosol concentration will affect the cloud mean droplet size, cloud life time and cloud albedo and the precipitation process. As a result, it affects the hydrological cycle, atmospheric chemistry, and dynamical processes, such as the development of the Polar Stratospheric Cloud (PSC), ozone degradation, and the formation of Artic haze, etc. Aerosols are also harmful to human health because they degrade the air quality, which can lead to major illnesses such as cardiovascular disease and lung cancer. Therefore, the continuous monitoring and characterization of the physical, chemical, optical and dynamical properties of aerosols are indeed to estimate the climate as well as the human health impact.

The accurate estimation of aerosols impact and its magnitude on the climate forcing is still challenging due to heterogeneity in spatio-temporal and its vertical distribution. The spatio-temporal heterogeneity is mainly attributed due to the various sources, sinks, long range transport and meteorological process. Similarly, the vertical distribution of aerosols is the most important factor in determining the global radiation budget. As well as the indirect and semi indirect effect also strongly depends on the altitudinal characteristics of aerosols. Hence, to monitor the global coverage of physical, optical, chemical and radiative properties of aerosols are quite challenging for satellite and model observations. On the other hand, the diurnal variation and hourly estimation of aerosol effect is substantially lower in satellite as well as ground based observations. Hence, to improve the scientific understanding on aerosols it demands large spatial, temporal and altitudinal coverage in regional as well as global scale.

In atmosphere, the aerosols are generally formed by two various mechanism, namely gas to particle and bulk to particle conversion. Gas to particle conversion is a process of gaseous precursor converting into a particulate matter or aerosol. It covers the size ranging from 0.001 µm to 0.1 µm. This process involves homogeneous homomolecular nucleation, homogeneous hetromolecular nucleation, heterogeneous hetromolecular nucleation. The homogeneous homomolecular nucleation forms a new solid ultra-fine particles or liquid from a gas phase consisting of a single gas species. The homogeneous hetromolecular nucleation forms a new particle from gaseous phase consisting of two or more gases.

CONCLUSION

The heterogeneous hetromolecular nucleation modifies the particle by condensation of gaseous species on preexisting nuclei. In general, nucleation requires more energy than condensation thus the heterogeneous hetromolecular nucleation is pronounced in the formation of aerosols through Gas Particle Conversion (GPC) process. A major component of aerosol production in global aerosol system is contributed by the mechanical disintegration or BPC process. This process includes weathering, lifting of dust, sea spray, volcanic dust etc. The disintegration of particles by the action of wind, temperature variation and other chemical process is known as BPC or mechanical disintegrate process.