Vigyan Samachar: MoES News

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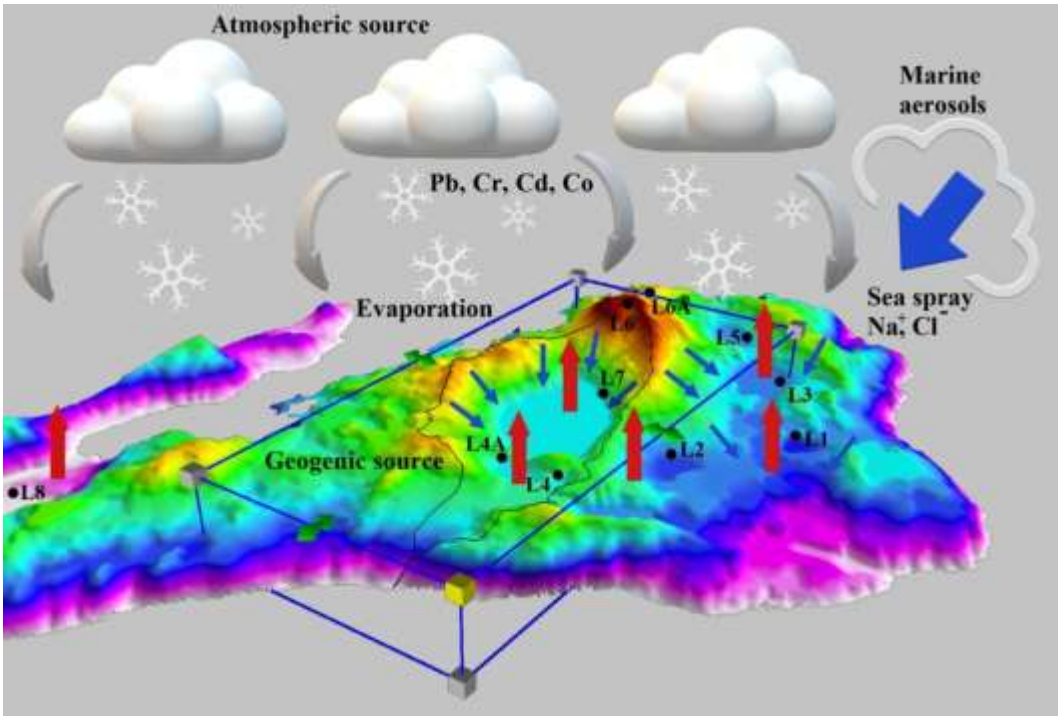
Improving Antarctic ecosystem through the marine aerosols and rock-water interactions

The National Center of Polar and Ocean Research (NCPOR) in a recent study is providing valuable insights on the functioning of major biogeochemical cycles by understanding the chemical composition of lake water in Antarctica which plays a vital role in assessing the ocean-to-cloud relationship.



Climate systems depend on marine biochemical processes that produce organic compounds in ocean waters, emissions from the ocean, marine aerosol formation, and transition of the subsets of aerosol populations to cloud droplets and ice crystals.

Aerosols are important drivers of climate that affect the planetary radiation balance by scattering and absorbing direct sunlight, and indirectly by modifying cloud microphysical properties. Dimethyl Sulfide (DMS) is the most important gaseous source of aerosols, although many other volatile organic compounds emitted from a large surface area of the ocean have the ability to strongly influence reflective properties and the

lifetimes of marine stratiform clouds. Stratiform layer clouds are cloud formations that are formed under relatively stable conditions.

NCPOR scientists revealed that rock and water interactions are the primary source for dissolved metals in lake water, followed by long-distance atmospheric transport in the form of aeolian dust. Mineral groups such as evaporation, sulfate, carbonate, metal oxides, and hydroxides are responsible for the dissolution of metal complexes in lake water. In addition, lakes falling within a micro basin have shown to increase concentrations of major ions due to the dissolution of minerals deposited during the preceding dry season.

NCPOR also found that rock dominance, precipitation/snow and evaporation/sea spray via marine aerosols are important hydrogeochemical processes that control the groundwater composition of the lacustrine systems in Antarctica. Silicate weathering and evaporation dissolution also contribute ionic loads to lake water. Increased knowledge of rock-water interaction would help better understanding of the hydrogeochemical characteristics of lakes that can help effective management and utilization of groundwater resources too.

The ions are associated with sedimentary rock minerals and interact with atmospheric carbon dioxide, thereby eliminating the wide variety of pollutants arising from such activities either in the oceans or locally in lakes affecting the overall aquatic ecosystem of the lakes. Similarly, trace metals are associated with major elements and they play an important role in the carbon and nitrogen cycles.

Led by N.S. Magesh and Anoop Tiwari, the research team comprised Sathish Mohan Botsa, Soniya Dessai, Mamta Mestry, Tara Da Lima Leitao of NCPOR, Ministry of Earth Sciences, Goa. The research paper has been published in the Journal of *Science of the Total Environment* (available online from 30 November 2019).