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- › [Absorbing aerosols and pre-summer monsoon hydroclimate variability ove...](#)

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Absorbing aerosols and pre-summer monsoon hydroclimate variability over the Indian subcontinent: The challenge in investigating links

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Abstract

The sub-monthly evolution of the interannual variations of absorbing aerosols and related hydrometeorology over South Asia in the pre-monsoon period

is investigated from the analysis of pentad-resolution observational datasets.

It is shown that pre-monsoon (late April-early May) variations are characterized by increased aerosols, reduced cloudiness and precipitation, and increased downward shortwave radiation. Lead-lag regressions indicate the significant influence of synoptic scale advection (and related vertical motion) in simultaneously shaping the aerosol distribution and associated significant hydroclimate (precipitation, cloudiness, surface shortwave radiation, and 2-m air temperature) over the Indo-Gangetic Plain.

The above findings can be interpreted as a manifestation of the aerosol "semi-direct" effect if one is not mindful of the prevailing circulation anomalies and their concurrent impact on aerosol and hydroclimate. The complex interplay among aerosols, dynamics and precipitation also shows the challenge of extracting the aerosol impact from an observational analysis. Finally, the analysis points to the pitfalls of a columnar, circulation-blind framework in investigating aerosol-monsoon interactions, a concern of relevance in analyses of the impact of long-term aerosol trends, as well. (C) 2009 Elsevier B.V. All rights reserved.

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Absorbing aerosols, Pre-monsoon hydroclimate, BLACK CARBON AEROSOLS, OPTICAL-PROPERTIES, CLIMATE, ANOMALIES, IMPACTS, MODELS, CLOUDS, TOMS, HAZE, ASIA

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