

# **Unmasking the Himalayas: How Climate Change and aerosols Chokes the Roof of the World**

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## **Abstract**

The Himalayas often known as the 'Third Pole' and a sentinel for climate change, serve as a vital indicator of the Earth's rapidly transforming environment. Due to human interferences from foothill to highest altitude this region has high load of pollutant which act as positive feedback for disturbed local climate. Changes in atmospheric circulation patterns, combined with increased emissions from both human sources and natural events, are disrupting the delicate balance of the Himalayan atmosphere. These altered atmospheric dynamics, marked by shifting circulation patterns, along with heightened emissions, are causing air quality to decline throughout the Himalayan region. This study utilises the ERA5 high-resolution reanalysis dataset to unravel the intricate relationship between climate change and aerosol dynamics in the Himalayan atmosphere. Through this analysis of the spatiotemporal variability of aerosols and their intricate interactions with meteorological parameters, the critical role of climate change has been established in amplifying the aerosol burden over this iconic mountain range. The study observed a notable increase in aerosol concentrations over the Himalayas, indicating a significant amplification of aerosol pollution driven by climate change. The analysis highlights the intimate connection between shifting atmospheric circulation patterns and intensified aerosol emissions from anthropogenic activities and natural sources. These factors collectively disturb the fragile equilibrium of the Himalayan airshed. The altered atmospheric dynamics characterized by changing circulation patterns contribute to the degradation of air quality throughout the Himalayan region. Additionally, the study underscores the urgent need for proactive measures and collaborative efforts to mitigate the escalating air quality challenges posed by climate change in this ecologically sensitive area.

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