Title:	Air Pollution Potential Characteristics over India using Reanalyses and Machine Learning Approaches
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Abstract:	The level of atmospheric pollutants is a serious concern due to its adverse impacts on human health. The ventilation coefficient (VC) is one of the indicators which measures the dispersion capacity of air pollutants (air pollution potential) in the atmosphere, providing insights into air quality. In this study, we aim to investigate the spatio-temporal variations and trends of VC over the Indian subcontinent using India's first high-resolution regional reanalysis (IMDAA) and global reanalysis datasets (ERA5) for the period 1980-2019. The spatial pattern of seasonal climatological mean ERA5 and IMDAA derived VC shows a lower magnitude during winter and post-monsoon seasons, indicating poor air quality over the Indian region, especially in northern parts of India. We noticed a gradual declination of VC during different seasons, implying an increasing surface-level air pollutants and worsening air quality over India. The study further investigates the changes of VC during strong phases of El Niño and La Nina events and results reveal that the El Niño significantly impacts air quality over northern and western parts of India during pre-monsoon and monsoon. At diurnal scale, the VC exhibits highest variability during daytime due to increased solar radiation, while remaining low and stable during night due to radiative cooling. These important characteristics of VC is well represented in IMDAA, albeit with some discrepancies. Furthermore, we have examined the fidelity of a machine learning model-Convolutional Neural Network and Long Short-Term Memory (CNN-LSTM) model, in predicting the of VC for the year of 2019 over Delhi. Various statistical metrics are computed to evaluate the performance of the CNN-LSTM model. The results confirm that the model successfully predict the VC compared to observations from ERA5.
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