Title:	Evaluation of extreme dust storm over the northwest Indo-Gangetic plain using WRF-Chem model
Authors:	Shukla, K. K. (/jspui/browse?type=author&value=Shukla%2C+K.+K.) Attada, Raju (/jspui/browse?type=author&value=Attada%2C+Raju)
Keywords:	Evaluation dust storm Indo-Gangetic model
Issue Date:	2021
Publisher:	Springer Link
Citation:	Natural Hazards, 110, 1887–1910.
Abstract:	This study uses a high-resolution Weather Research and Forecasting model coupled with the chemistry module (WRF-Chem) to analyze the dust storm that occurred during 12–17 June 2018 over the northwest Indo-Gangetic Plain (NW-IGP). The performance of WRF-Chem is validated against the ground- and space-based datasets before being used to investigate the impact of the dust storm on the air quality and radiative changes. The aerosols and meteorological parameters from in situ, satellite and reanalysis were used to evaluate the WRF-Chem model. The horizontal and vertical distributions of dust aerosols reproduced by the WRF-Chem agree with the observations. However, the WRF-Chem-simulated mean aerosol optical depth (AOD ~ 1.21 ± 0.17) is slightly underestimated compared to MODIS AOD (1.60 ± 0.32). Furthermore, the evolution of dust storm and associated changes in atmospheric and air quality conditions are well simulated by the WRF-Chem. The ERA5 and WRF-Chem suggest that the dust storm is triggered by the low-pressure system over the NW-IGP, which helps in bringing the dust-laden air masses from the west and southwest of the study region with the strong southwesterly winds. Our results reveal that the dust storm has a significant impact on air quality and horizontal visibility. During the peak time of the dust storm, the horizontal visibility dropped drastically from 4 to 0.48 km. In addition, the daily averaged in situ and model-simulated PM10 and PM2.5 concentration abruptly increased by a factor of two on peak time of the storm that deteriorated the air quality. The WRF-Chem-simulated dust-induced net radiative forcing shows the surface cooling (− 16.18 ± 3.88 Wm−2), atmospheric warming (+ 11.62 ± 4.96 Wm−2) and top of the atmospheric cooling (− 4.57 ± 0.92 Wm−2) due to the presence of elevated dust aerosols.
Description:	Only IISER Mohali authors are available in the record.
URI:	https://doi.org/10.1007/s11069-021-05017-9 (https://doi.org/10.1007/s11069-021-05017-9) http://hdl.handle.net/123456789/4356 (http://hdl.handle.net/123456789/4356)
Appears in Collections:	Research Articles (/jspui/handle/123456789/9)

Files in This Item:

File	Description	Size	Format

Need To Add…Full Text_PDF..pdf (/jspui/bitstream/123456789/4356/1/Need%20To%20Add%e2%80%a6Full%20Text_PDF..pdf)	Only IISER Mohali authors are available in the record.	15.36 kB	Adobe PDF	View/Open (/jspu

Show full item record (/jspui/handle/123456789/4356?mode=full)

(/jspui/handle/123456789/4356/statistics)