# Decision Support System (v 1.0) for Air Quality Management in New Delhi, India

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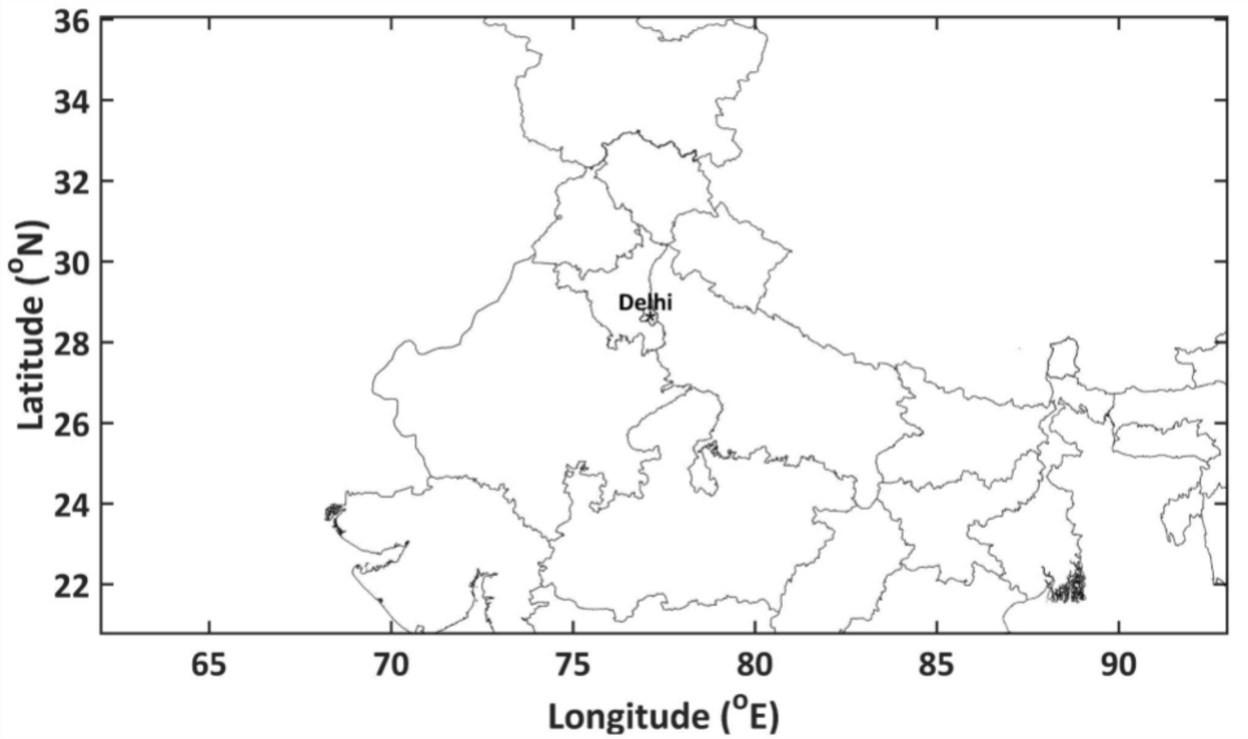
## Supplementary material

**Text S1:S5**

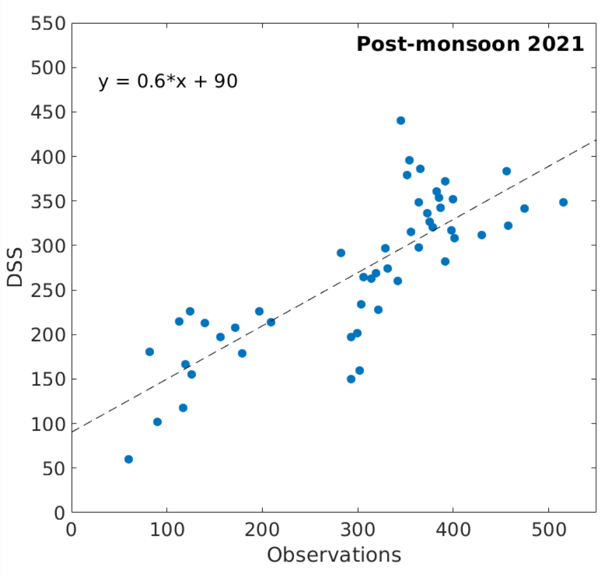
**Figures: S1:S3**

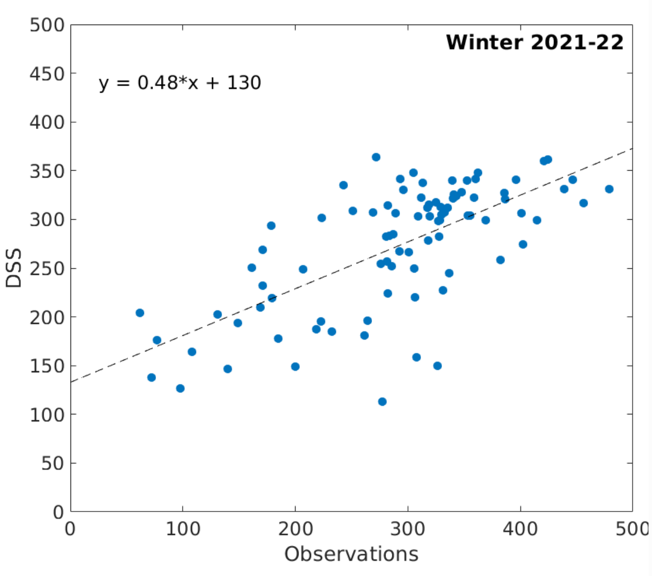
## 1. Domain details




**Supplementary figure 1**: The model domain used for DSS. The location of Delhi has been identified.

## 2. Comparison between DSS simulated air quality index and that derived from the corresponding measurements:



**Supplementary figure 2:** Comparison between DSS simulated air quality index (AQI) for $PM_{2.5}$ and the corresponding AQI calculated from the station measurements averaged over Delhi for both the seasons. The black-colored dotted line represents the best fit, and the equation for the best-fit line is written in the top left corner of each panel.

## 3. Formulae for statistical parameters for evaluating model-simulated $PM_{2.5}$ mass concentration

M = predicted concentration
$O$ = observed concentration
$n$ = sample size (number of hours or number of days)

1. Mean Bias = $(1/n) \times \sum_{1}^{n} (M - O)$

2. Mean Error = $(1/n) \times \sum_{1}^{n} |(M - O)|$

3. Root Mean Square Error = $\sqrt{((\sum_{1}^{n}(M - O)^{2})/n)}$

4. Normalized Mean Bias = $\frac{\sum_{1}^{n}(M-O)}{\sum_{1}^{n}O}$

5. Normalized Mean Error = $\frac{\sum_{1}^{n}|(M-0)|}{\sum_{1}^{n}O}$

6. Fractional Bias = $(\frac{1}{n}) \times \frac{\sum_{1}^{n}(M-O)}{\sum_{1}^{n}\frac{(M+O)}{2}}$

7. Fractional Error = $(\frac{1}{n}) \times \frac{\sum_{1}^{n}|(M-0)|}{\sum_{1}^{n}\frac{(M+O)}{2}}$

## 4. Contingency table and the formulae used for the calculation of statistical parameters

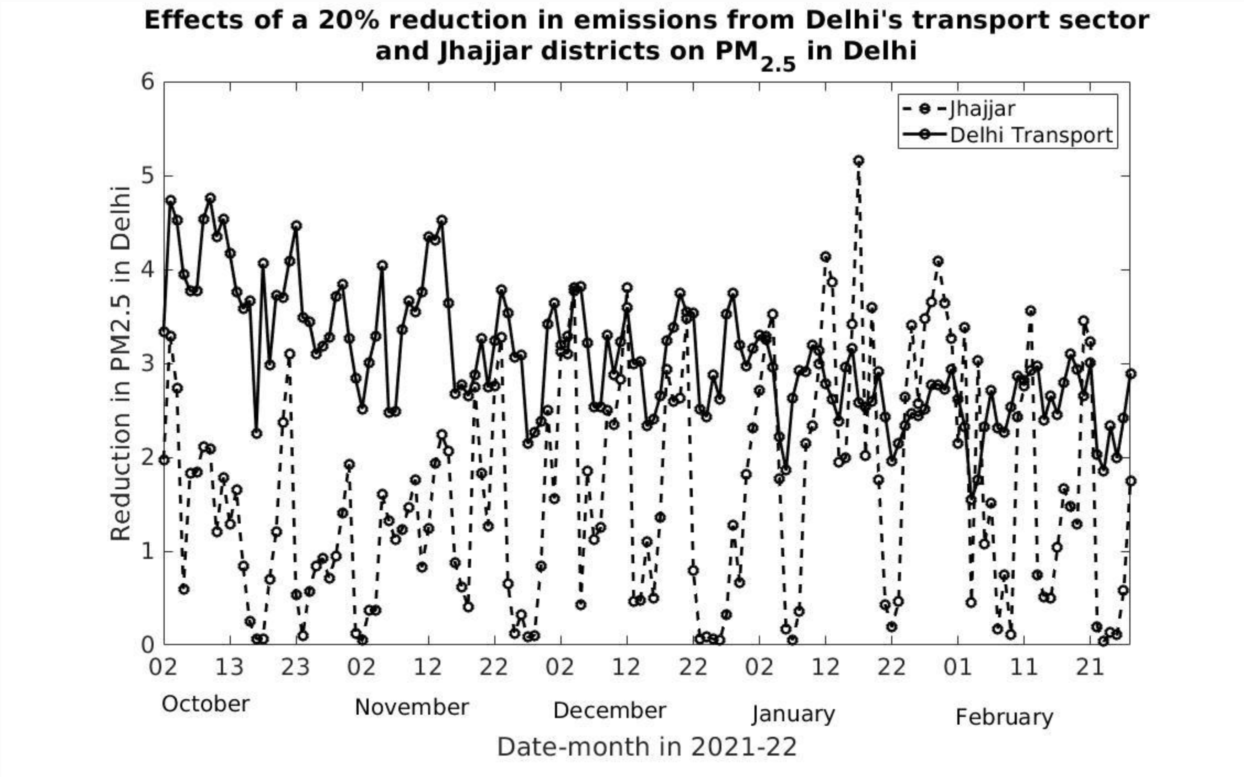
Considering all the entries in the observations and the forecasts we can compute the values of a,b,c, and d by using the following contingency table. Using those values, we can compute the required statistical parameters listed below.

| | | Observations | |
|---|---|---|---|
| | | Yes | No |
| Forecast | Yes | a | b |
| | No | c | d |

| Statistic name | Interpretation | Formula | unit | Ideal value |
|---|---|---|---|---|
| Accuracy (A) | Ability of the forecast to predict events and non-events | A=(a+d)/(a+b+c+d) *100 | % | 100 |
| False Alarm Rate (FAR) | The tendency of the model to give an incorrect forecast of a non-event | FAR = (b/(a+b)) *100 | % | 0 |
| Probability of Detection<br><br>(POD) or Hit rate | The ability of the model to give a correct forecast of an event | POD = (a/(a+c)) * 100 | % | 100 |
| Critical Success Index<br><br>(CSI), also called Threat Score | The ability of the model in correctly predicting the event when the event exists either in forecasts or in observations. | CSI = (a/(a+b+c)) * 100 | % | 100 |
| Success Ratio | Success rate for the forecasts | SR = 100 - FAR | % | 100 |

| | | | | |
|---|---|---|---|---|
| Bias | Ratio of the tendency of getting a false forecast for a non-event from the model to that of getting a false forecast for an event from the same model | Bias = POD/SR | - | 1 |

**5. Effects of a 20% reduction in emissions from Delhi's transport sector and Jhajjar districts on $PM_{2.5}$ mass concentrations in Delhi during the study period:**




**Supplementary figure 5**: Simulated effects of a 20% reduction in emissions from Delhi's transport sector and Jhajjar districts on $PM_{2.5}$ in Delhi during October 2021 - February 2022 period.