

# MODELLING OF VARIATION IN VEHICULAR POLLUTION CONCENTRATION WITH TIME PERIOD AND SEASON

## INTRODUCTION

- Air pollution in urban areas is increasing
- Air Quality Models are a unique tool for development of rational and objective management strategies

## Background and Motivation

- Air quality modelling requires two kinds of input data namely emission and meteorology
- Generally meteorological data are collected from nearby meteorological stations of study domain and it is extrapolated with space and time
- This causes inaccuracy in the model results
- However, Weather Research and Forecasting (WRF) Model can provide onsite meteorological data which is more accurate and can save considerable time and resources.

## Study Area Chembur

Latitude = 19.05° N  
Longitude = 72.89° E  
6500 m east-west direction  
8450 m north-south direction

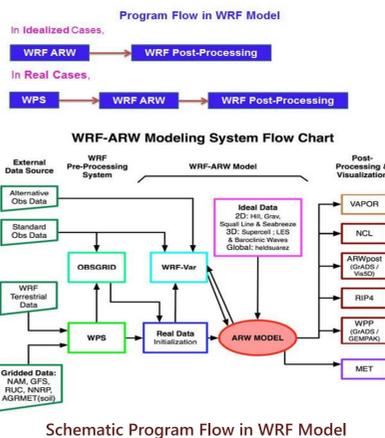
**Major Industries**  
BPCL, HPCL, TPCL and RCF

**Major Line sources**  
V. N. Purav Marg, R. C. Marg, Narayan Gajanan Acharya Marg, Ghatkopar-Mankhurd Link road, B. D. Patil Marg and Eastern Expressin Highway

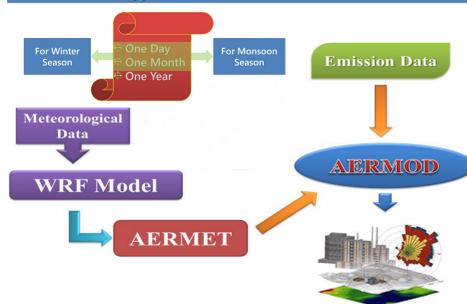


## Weather Research Forecasting Model

The main purpose of meteorological model systems is weather forecasting. Meteorological grid models use mathematical formulations that simulate atmospheric processes such as the change of winds and temperature in time. WRF, used in this study, is a recent and advanced numerical meteorological model to be adopted by NOAA's National Weather Service.



## Methodology

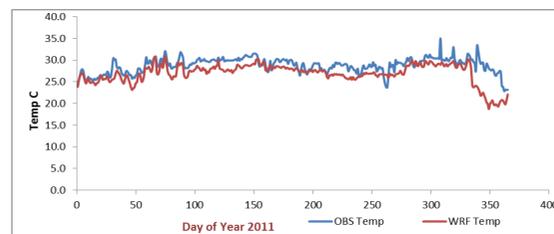


## Results and Discussion

### Comparison of WRF results

9 meteorological parameters have been simulated hourly for the year 2011

### Temperature Profile

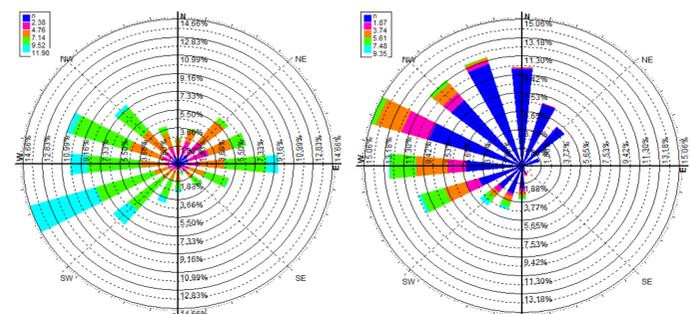


Comparison of Daily Average Temperature from WRF with Observed Data

### Wind Profile

For maximum period of time, wind is blowing towards north-west direction

Annual wind rose of RCF industry, Mumbai compares well with simulated WRF wind rose.

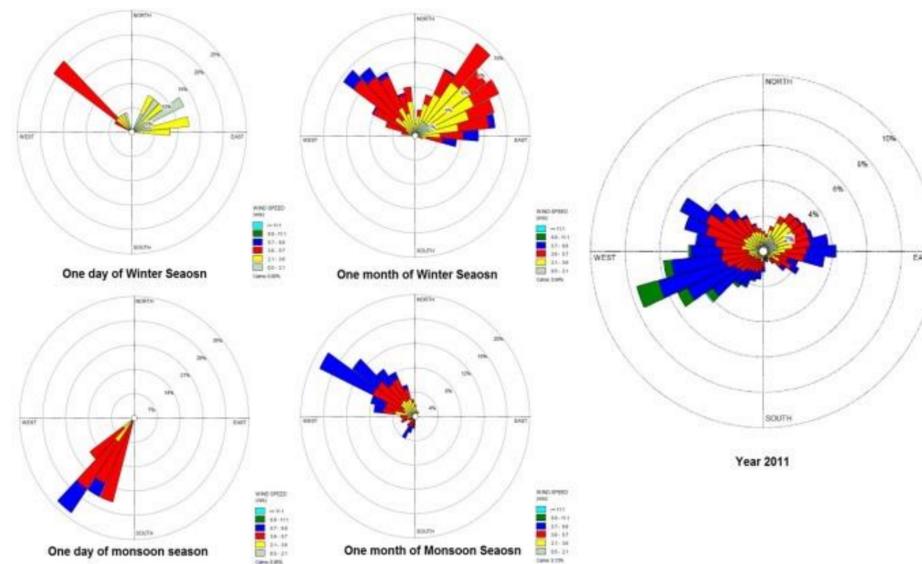


Annual Wind Rose Simulated by WRF Annual Wind Rose Observed by RCF industry

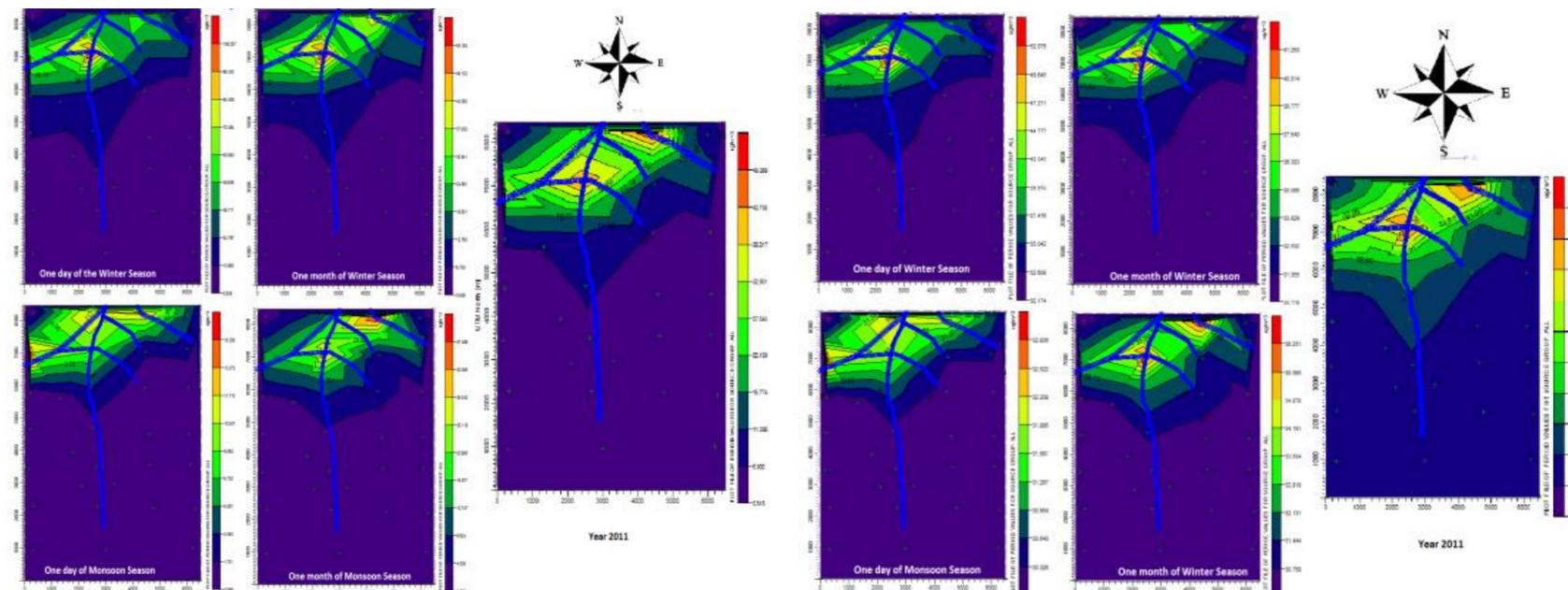
### Comparison of AERMOD results

The estimation of background concentration and the validation of the model has been done in an earlier paper (Kumar et al 2014).

## Wind Roses

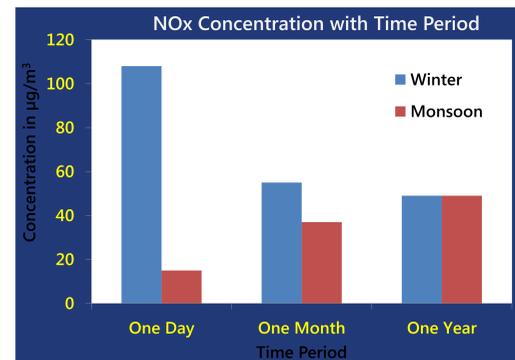


## Wind Roses

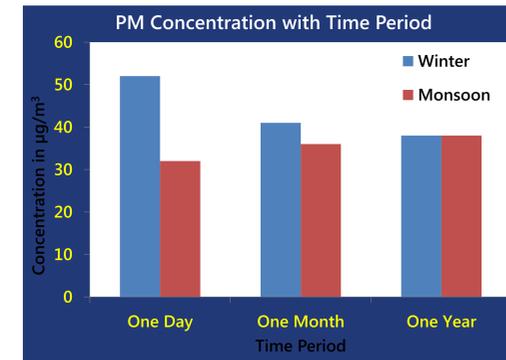


NOx Concentrations by Vehicles in Chembur

PM Concentrations by Vehicles in Chembur



NOx and PM Concentration with Various Time Period and Season



## Summary and Conclusions

- The aim of the study was to generate on site meteorological profiles for using them in vehicular pollution modelling.
- This was fed in AERMET pre-processor of dispersion model AERMOD.
- The integrated model was applied one day for all vehicular sources. An emission inventory was compiled using number of vehicles with emission factor for the study area.
- There is a general understanding in air quality modelling that concentration decrease when averaging time increases.
- But this study is making a very important observation about effect of averaging period of time on concentration that it is dependent upon season of the period.
- The concentration is decreasing with increasing of averaging time in winter season while concentration is increasing with increasing of averaging time period in monsoon season.
- This study shows the use of WRF model can save considerable resource and it creates onsite meteorological data to give more accurate results as compared to the obtaining data from a meteorological station.

## Acknowledgements

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THANKYOU