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WRF-CAMX APPLICATION TO THE PEARL RIVER DELTA REGION

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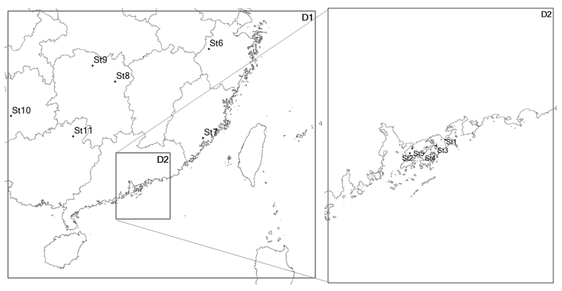
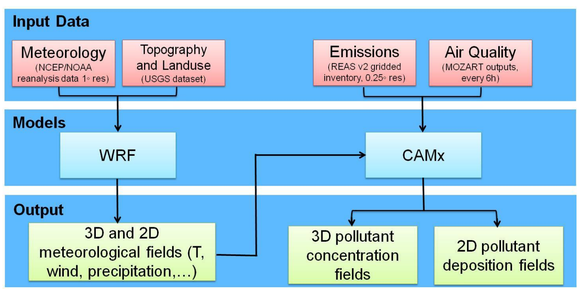
Introduction

The Pearl River Delta (PRD) is one of the largest industrialized regions in China. It is located in the southern coast and it comprises nine municipalities (Guangdong province) and two special administrative regions (Macao and Hong Kong). In the last decades, the region recorded a rapid development, resulting in the increase of the energy consumption, atmospheric emissions and degradation of the air quality. Chemical transport modelling could be an useful tool to provide scientific advice on emission reduction strategies and air quality management. In this work, the WRF-CAMx system was applied to the PRD region. Its performance was evaluated to one winter (20th-30th Jan 2014) and one summer (10th-20th July 2014) 11-day periods. The system capability to simulate the most concerned pollutants (NO_2 and O_3) in terms of air quality in the region was based on data from 11 air quality monitoring stations (St1 to St11).

Modelling Setup

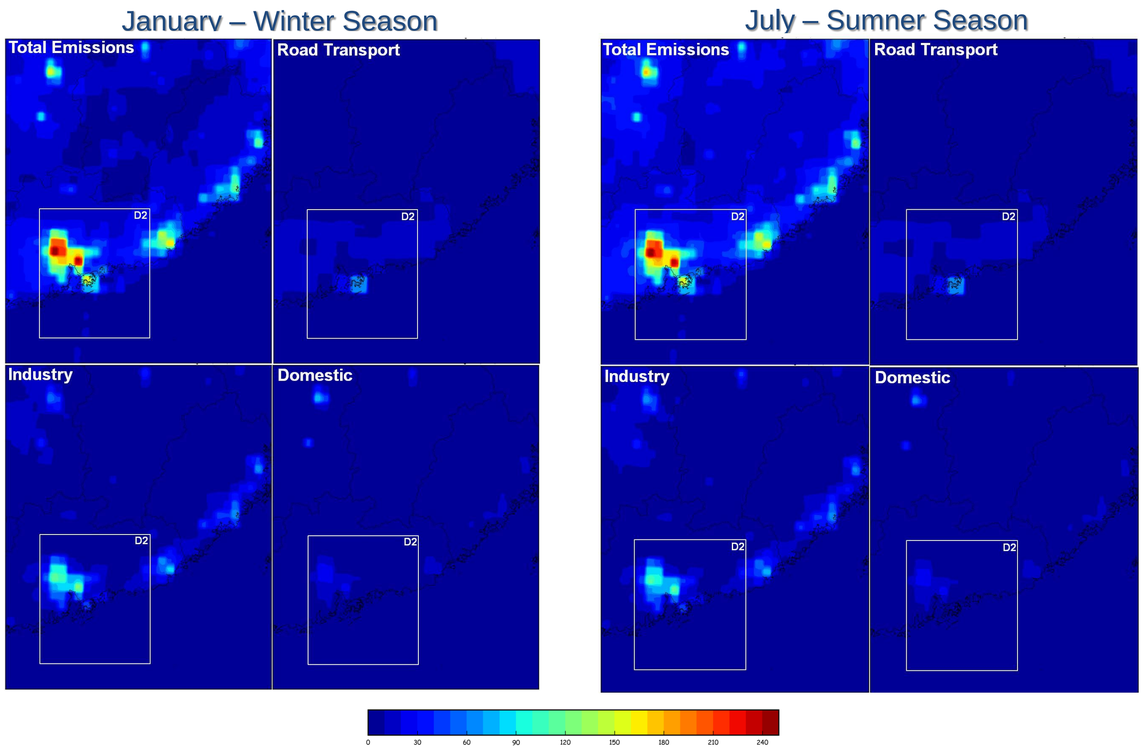
Simulation domains and WRF-CAMx system





The WRF-CAMx system was built over a coarse domain covering southeast coast of China (9 km^2 horizontal resolution) and a nested domain with 3 × 3 km^2 resolution (over the PRD region).

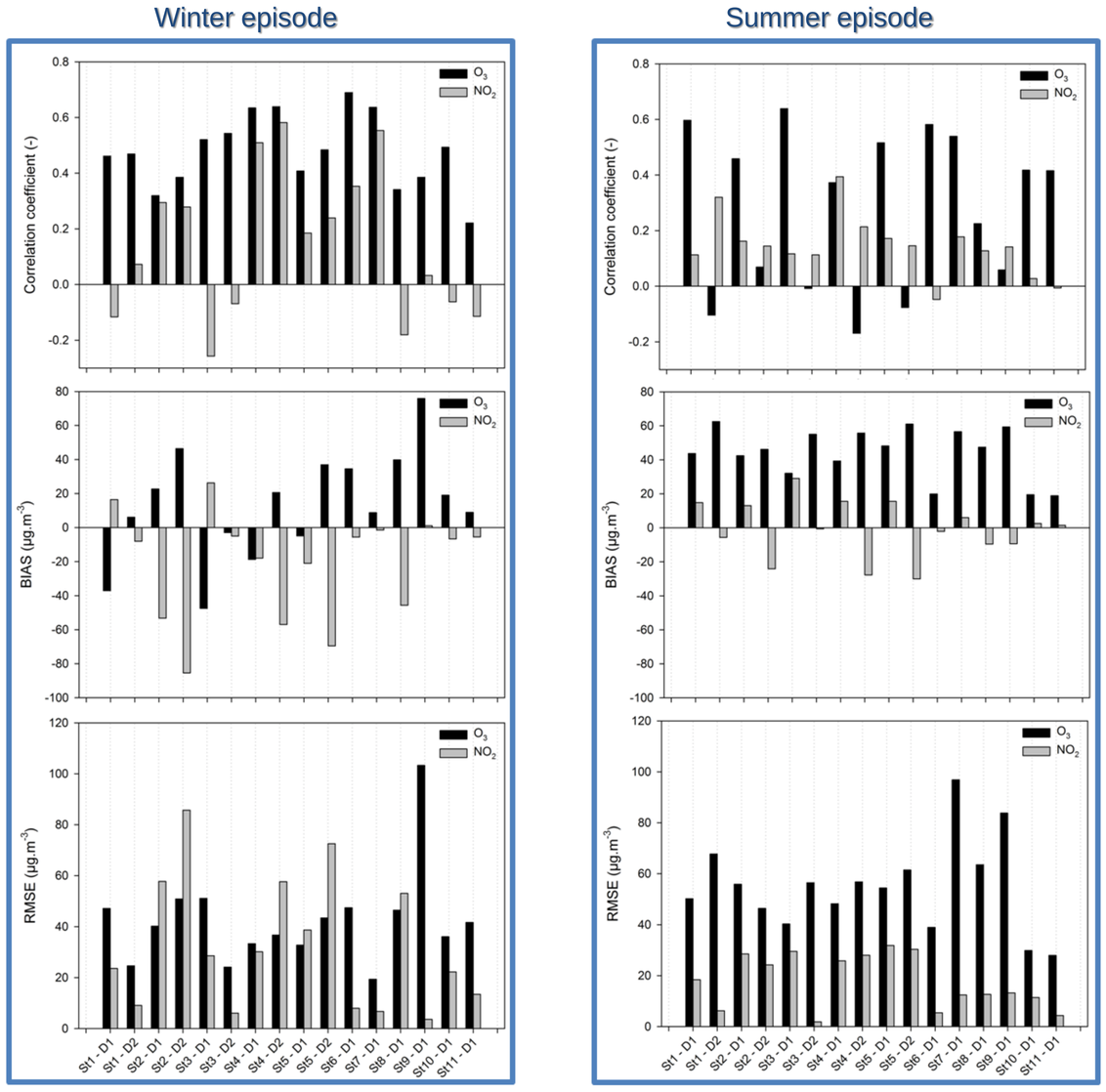
NOX emissions (in ton) by emission sector



The industry is the main contributor to the total emissions in the innermost domain.

Results

Statistical parameters obtained for O_3 and NO_2



The evaluation of the WRF-CAMx performance for NO_2 and O_3 was done by computing the following statistical parameters: correlation coefficient (r), BIAS and root mean squared error (RMSE) (Borrego *et al.*, 2008). Simulated concentrations for CAMx D1 (9 km resolution) and D2 (3 km resolution) were compared with observations from 11 monitoring stations.

Conclusions

- The O_3 simulated values are better for the winter episode and the system tends to overestimate the O_3 concentrations.
- For the NO_2, the WRF-CAMx results revealed an overall better performance for summer (lower biases and error) and the system tends to underestimate the NO_2 concentrations.
- The results pointed to the need to improve the NO_2 emission inventory, focusing on the temporal and spatial distribution of local sources.

Reference

Borrego, C., Monteiro, A., Ferreira, J., Miranda, A.I., Costa, A.M., Carvalho, A.C., Lopes, M., 2008: Procedures for estimation of modelling uncertainty in air quality assessment 34, 613–620. doi:10.1016/j.envint.2007.12.005

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