An integrated approach based on process analysis, observations and modelling for south Asian megacities

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Air pollution has been widely recognized as a major global health risk. Given that 1 in every 10 total deaths can be attributed to air pollution (WHO 2016), there are major implications for the megacities of the world. Given the magnitude of the challenge, the question arises whether strategies of a process based investigations that have proved useful elsewhere can be adapted for South Asian megacities like Delhi?

The aim of the present study is three-folds. Firstly, to access the predictive skill of HadGEM3-ES2 global circulation model (GCM) and identify forecast windows of opportunity. Secondly, to reproduce the information of the GCM at higher spatial resolution using dynamical downscaling approach where WRF-CMAQ is nested with HadGEM3-ES2. Thirdly, to implement the new process based understanding by combing a coupled modelling system and available observations including those from an International filed campaign carried out under the NERC/MOES funded PROMOTE project. The PROMOTE project is also recognised as a Research Highlight project by WMO/GURME.

We examine plausible reasons of model performance and areas of disagreements with observations. Uncertainties involved and how process based investigation and its implementation will help to understand the air pollution regime affecting cities such as Delhi and its surrounding region are examined. In particular, we have examined the role of boundary processes in determining the long range contribution of particulate matter and their precursors from the northern states of India into Delhi and the surrounding areas.

Implication of the study for local and regional mitigation strategies are discussed.