Numerical Prediction of the Earth system: putting it all together

Urban scale environmental prediction systems

With an ever increasing proportion of the world population living in cities urban environmental prediction is set to become even more important in the future. There is a need to improve prediction of both hazards from extreme events as well as more routine understanding of the environmental conditions and how these may change on longer timescales. As with other areas of environmental modelling the two key issues are the scales of prediction required and the complexity of the models. Both these issues are particularly challenging in the urban context due to the complexity of the urban surface. However, current advances in both computer power and modelling suggest that large improvements are likely in the next few decades. State of the art NWP models at km scales can already, crudely, represent effects of urban areas. From the other end very small scale (m scale) modelling of urban canyons and individual buildings is also a large subject of research. Despite this apparent convergence it is likely to be at least 40 years before whole cities can be represented at building scales. This implies that the finescale models are likely to be coupled to larger scale models or used to develop parameterisations depending on the application. In order to improve the representation of the atmospheric state and in order to assess impacts, traditional atmospheric models will need to be coupled to other models. Many NWP models already contain sophisticated urban surface models and these models will need to be further developed and coupled to urban hyrological models (e.g. including details of the drainage system), chemistry, aerosol and in many cases ocean models. Much research is already taking place on these components but the key issue will be the level of sophistication required in a coupled model for a particular application.