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REGULATORY MODELLING FOR ASSESSING AIR QUALITY IN STREET CANYONS IN THE U.K.

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HARMO-10 Crete 2005

Current Practice

- Air Quality Review & Assessment Process for UK Local Authorities
- Over 130 Air Quality Management Areas declared (NO_2 and PM_{10} roadside hotspots)
- Dispersion Manual for Roads and Bridges (DMRB) for screening assessment
- Advanced modelling and monitoring for detailed assessment

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Operational Models

- **WinOSPM** (NERI, Denmark)
- **AEOLIUS** Screen, Emission, and Full (Met Office, UK)
- **ADMS-Urban** 2.0 (CERC, UK)
- **CAR** International (TNO, Netherlands)
- **STREET** (Stratford Research Institute, USA)

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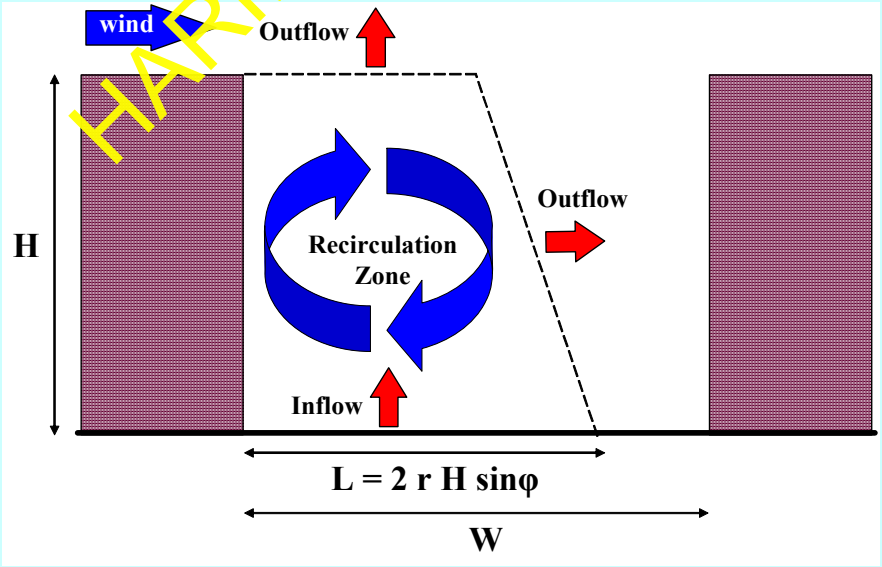
Model Parameterisation



Input Requirements

- Street dimensions and orientation
- Receptor location (height & distance)
- Met data (wind, temperature, cloud cover, global radiation, atmospheric pressure)
- Vehicle emission factors (EFT with cold starts)
- Vehicle fleet composition (small/large)
- Vehicle counts and average vehicle speed
- Background concentrations
- NO_x – NO_2 chemistry scheme

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Case Studies

Most modelling studies deal with ideal street canyons – but in reality urban canyons are very complex!

- **Stratford Road** (Birmingham)
  H/W = 0.5
  AADT = 29000

- **Marylebone Road** (London)
  H/W = 0.5
  AADT = 76000

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(1) Stratford Road

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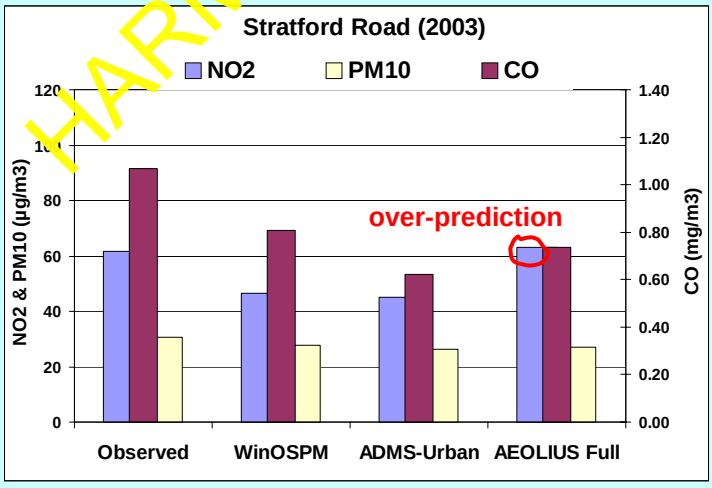
Annual mean concentrations – 1



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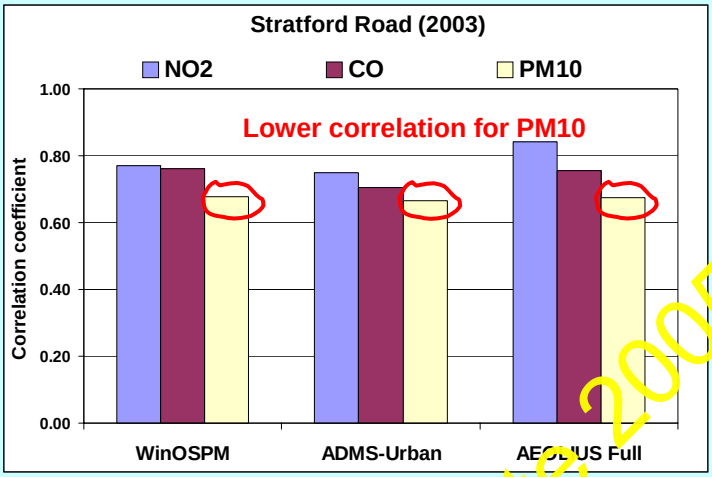
Correlation with measurements – 1



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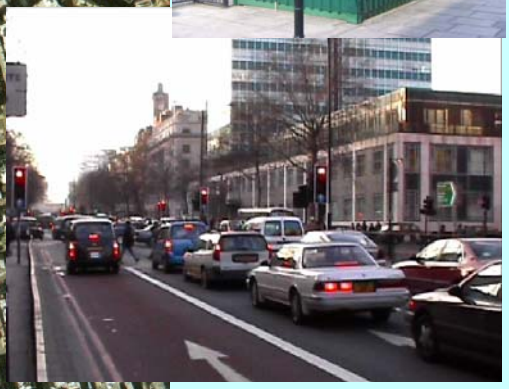
(2) Marylebone Road



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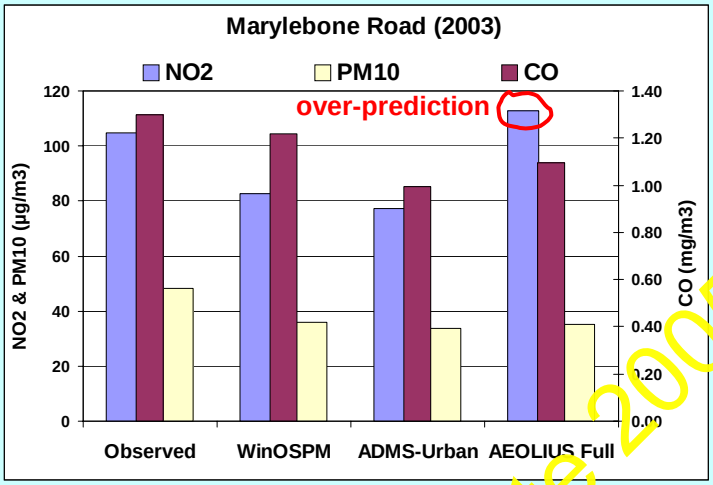
http://www.airpollution.org.uk/dapple/

Annual mean concentrations – 2



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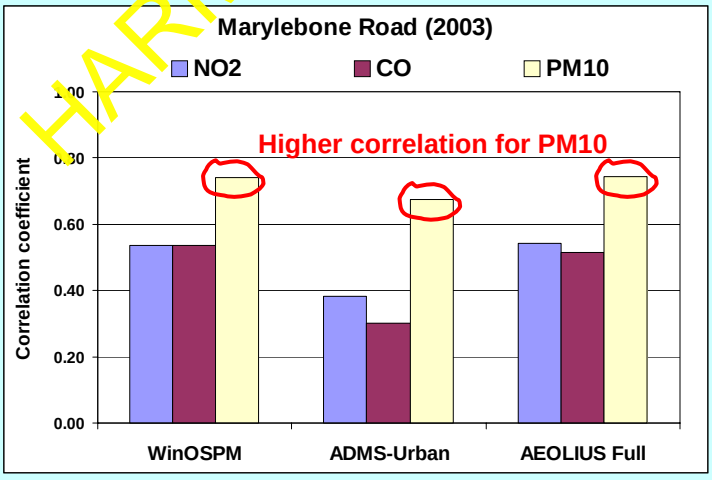
Correlation with measurements – 2



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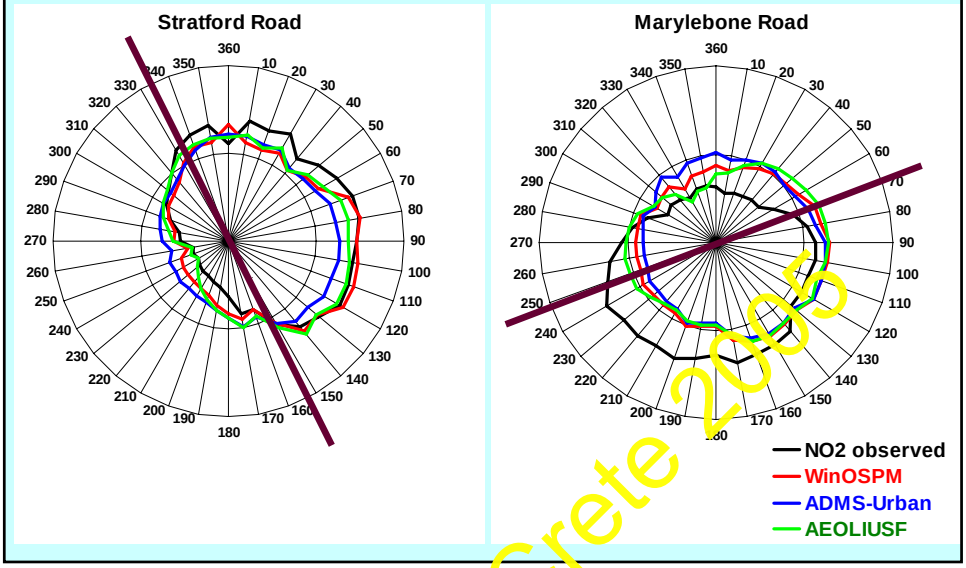
Wind Direction – NO_2



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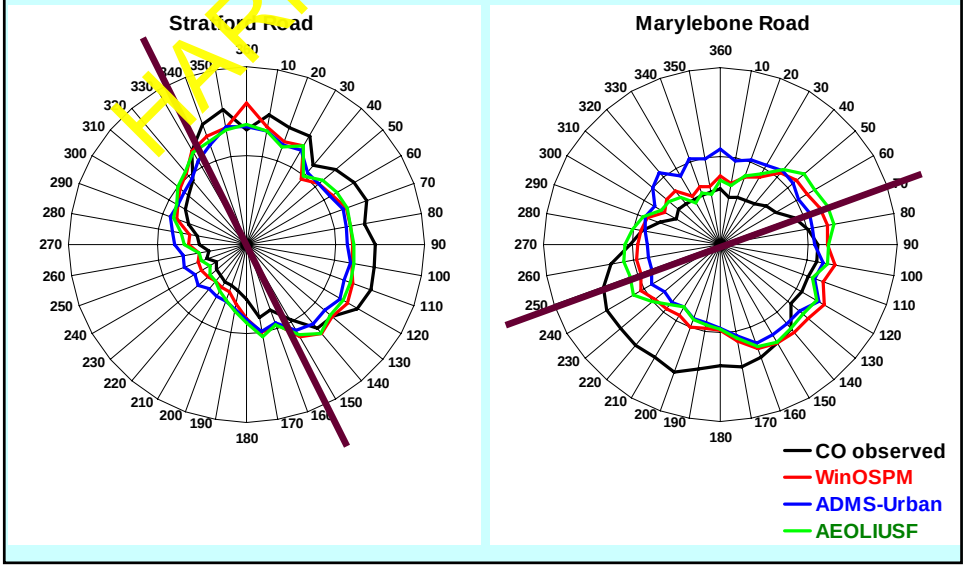
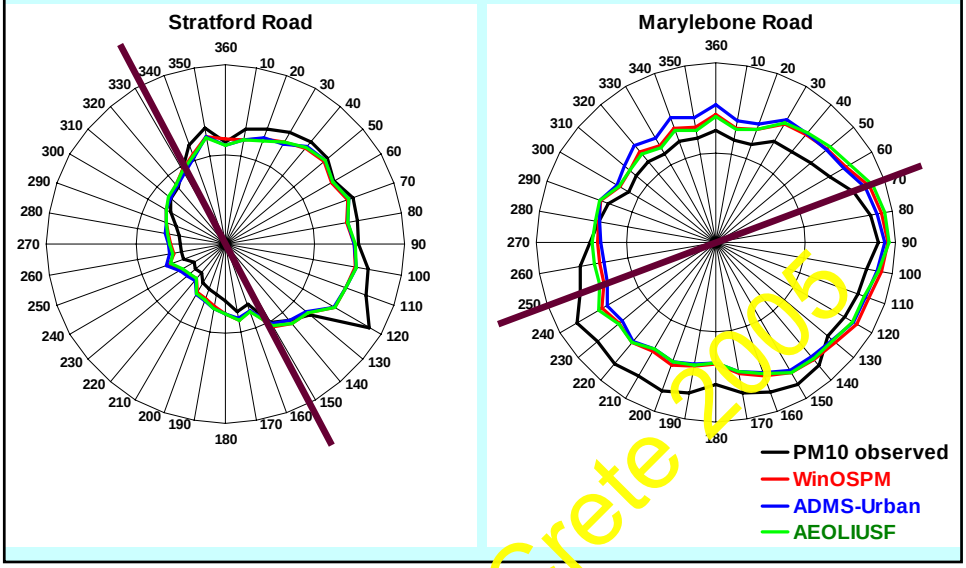
Wind Direction – CO



Wind Direction – PM_{10}



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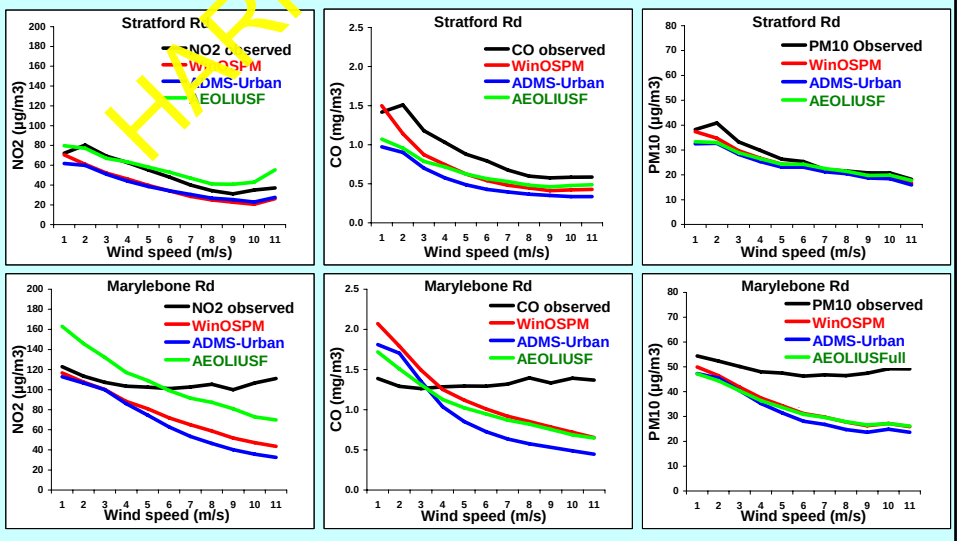
Wind Speed



Conclusions and future work

- Street canyons have been associated with exceedences of air quality objectives in UK
- Several screening and advanced models available (WinOSPM, ADMS-Urban, AEOLIUS Full)
- Tested models in reasonable agreement with measurements from two low-rise canyons, but...
- Modelling results as good as input data and corresponding assumptions
- Further work on pollutant dispersion in low-rise canyons and urban intersections (traffic-induced turbulence during congestion, particle re-suspension, etc.)

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Thank you!

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