

Coupled national and local scale air quality modelling

University of
Hertfordshire **UH**



CERC

Lancaster
University 



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BIRMINGHAM

Requirement

- “High resolution prediction capability to support personal exposure for health impacts, through national and local model developments” (objective of Work Package 2B within the SPF Clean Air Programme)

Science

- Development & evaluation of a coupled air quality modelling system spanning national to urban street scales
- Flexible modular system linking advanced widely used regional chemical transport & local models
- Accounts for physical & chemical processes occurring at all relevant spatial and temporal scales
- Includes a verification system for validation of model predictions

Community

- An open structure free at the point of use facilitating system development and modification by stakeholders
- Available to the UK research community via the SPF Clean Air Framework platform
- Compatibility with associated SPF projects “UK Emissions Modelling System” and “Air Quality Exposure Modelling”



 **Met Office**  **NPL**
National Physical Laboratory

 Department
for Environment
Food & Rural Affairs

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LOCAL MODEL COMPONENT

- Pollutant concentration estimates are needed at resolutions of a few metres at roadside locations in urban areas to assess population exposure accurately
- At short times, local-scale models capture fine details of dispersion and fast chemistry
- Open access road source tool: **ADMS-Local** (based on ADMS-Urban)

REGION MODEL COMPONENT

- Regional pollution levels contribute significantly to pollution levels in urban areas
- Eulerian chemical transport models (CTMs) model regional and global pollutant transport and complex atmospheric chemistry
- Range of RM options to include: **CMAQ, CAMx, EMEP, WRF-Chem & UKCA (tbc)**

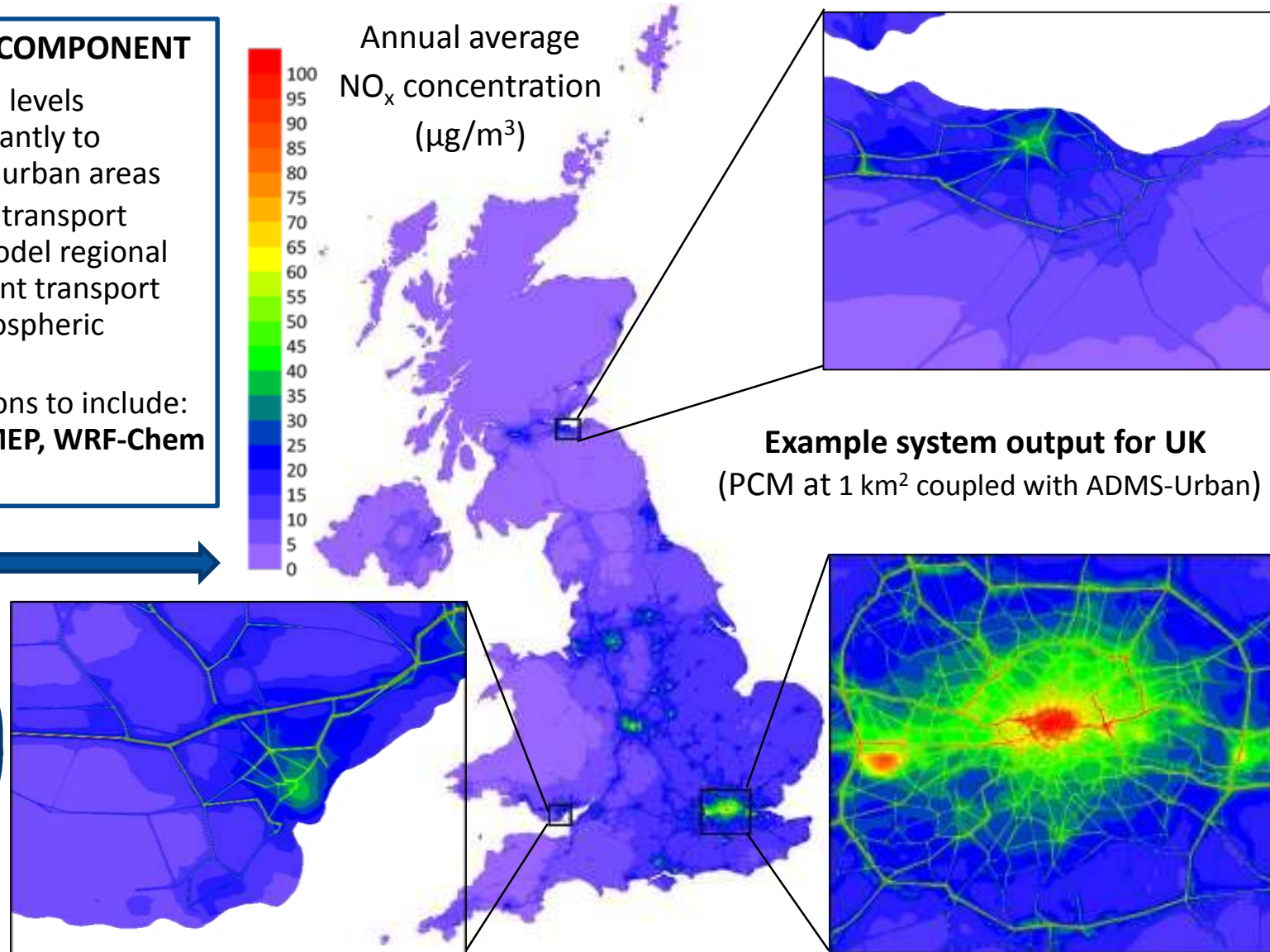
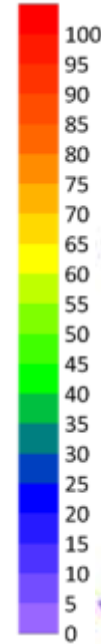
COUPLED SYSTEM

- Local-scale and regional models must be coupled within a single system
- Computational linkage complexities include avoidance of double counting emissions + chemistry

VERIFICATION SYSTEM

- Automated comparisons of modelled / measured

Annual average
NO_x concentration
(µg/m³)



Example system output for UK
(PCM at 1 km² coupled with ADMS-Urban)

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PROJECT OVERVIEW

- Close liaison with Met Office
- Stakeholder engagement
- Project team comprises CERC with expertise in software development, support and application of local dispersion models (ADMS), in addition to regional modelling experts from academia

Stakeholder engagement I

- Stakeholder requirements *Workshop 1*
- User requirements summary

System design & development

- Design derived from user requirements
- Local model, coupled system & verification tool

Testing phase

- Project partners test system components
- System modifications

Stakeholder engagement II

- System demonstration *Workshop 2*
- Stakeholders & project partners use model
- Results presented at *Workshop 3*
- System refinements & release
- Publications and reports