A DISPERSION MODEL INTERCOMPARISON ARCHIVE

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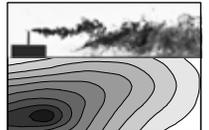Fay Dunkerley[2]
Richard Griffiths, Mike Bennett[3]

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Regulatory Modelling with Multiple Models

- Most dispersion models are used for regulatory purposes

- The regulator must work with the models available at any time.

- Regulatory modelling often controls major commercial investment and the environmental acceptability of large plant.

- It is vital for the regulator to understand the differences between models and how they arise.

- This is critical in the UK, where there is no prescription over the use of specific models and submissions for regulation.
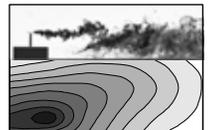
Dispersion Models in the UK

- Regulatory dispersion modelling in the UK may use any reasonable model. There is no prescription.

- Historically this has been the

    USEPA ISC or NRPB R91

    Pasquill/Gifford Models

- Currently this is mainly the

    USEPA AERMOD or CERC ADMS models

    Using the Monin-Obukhov stability parameter
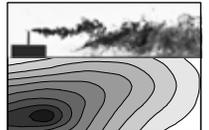
Intercomparison Study

- We compared these models for the UK Environment Agency against a standard set of test conditions (reported in HARMO7)

- To answer three questions:
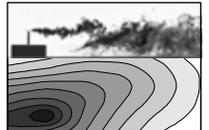
Regulatory Questions
From the UK Environment Agency

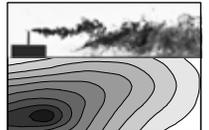- Will these models predict the same consequences against required air quality standards?

  In general, no.

- Is it possible to identify how these differences arise and to account for them in regulatory practice in some simple way?

  Not very easily.

- Is there a simple test procedure (or protocol) which would reveal such differences between models?

  Yes
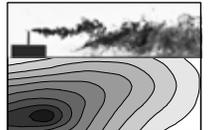
Intercomparison Protocol

- Basic rates of plume dispersion in
    - Neutral
    - Stable
    - Unstable   Flows.
- Plume rise.
- Buoyant plume interaction with the top of the boundary layer.
- Building entrainment.
- Effects of terrain on basic plume dispersion.
- Ground level concentration contours and exposure statistics for a single year's hourly meteorological data.

About 75 individual test cases
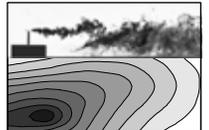
Intercomparison Protocol

- The intercomparison protocol provides systematic standard model test cases -

  designed to reveal differences between model calculations.

- It does not compare with experimental data -

  used for validating and verifying models.

- Field data scattered and not usually systematic -

  different models verified against the same field data can give different results in identical calculations
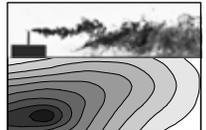
Intercomparison Archive

- Regulatory model intercomparison must be a continuous activity:

  - To provide an historical perspective of the changes in model behaviour
  - To check differences between new models and modified versions of older models

- To do this a standard model intercomparison archive is needed
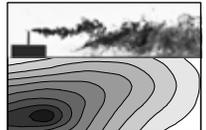
Intercomparison Archive

- There is now a model intercomparison archive based on our previous work.

- Provides all data and details required to continue this intercomparison work

- Publicly available for universal use
  - From HARMO web site
  - From Model Validation web site (Olesen).
  - Parts from UK Environment Agency web site
  - From Authors on CD-ROM

Intercomparison Archive

- Contains:
  - Reports of the original intercomparison study and other relevant papers.
  - Input and output files for all the model calculations
  - Meteorological data sets,

    in UK Met Office and Trinity Consultants formats (these are different).
  - The terrain data files.
  - ADMS model developer's (CERC) comments (Carruthers et al(2000)) and authors' reply (Hall et al(2003))
  - Discussion of dispersion models in regulatory practice.