NAME III Document
MD13/10(version 1)
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NAME III modelling of the Nottingham sulphur dioxide pollution episode in September 1998

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1 Introduction

A significant sulphur dioxide pollution episode [1] occurred in the Nottingham area on September 2, 1998. Investigations at the time established that the incident was primarily attributable to emissions from large coal-burning power stations in the North Midlands region. Pollutant pooled during light wind conditions before wind strength increased and swept the pollutant south-westwards across the Midlands. Large concentrations of SO_2 were measured at Nottingham during the afternoon of September 2 and to a lesser extent at Birmingham some hours later.

The Nottingham pollution episode was initially investigated using the NAME II model, and it became one of the 'standard' test cases for evaluating developments in NAME II. The present report summarises testing of NAME III using the Nottingham incident. In Section 2, the main features of the NAME III modelling set-up for the Nottingham case are discussed. Section 3 then presents NAME III results, and compares them against both the measurement data and the previous NAME II predictions. A summary is given in the concluding section.

It is not the intention here to present a detailed discussion on modelling of the Nottingham pollution episode. Instead, the focus of this report is to show a comparison of the NAME II and NAME III results, which should be regarded as a 'real life' test case for the operation of NAME III. For this purpose, we have tried to minimise differences by setting up the NAME II and NAME III model runs to be as consistent as possible. There should be a reasonable level of agreement between the predictions of these two models (for instance, they are both driven using the same meteorological input), although differences in the formulation of the dispersion models mean that we should not expect precise agreement.

2 NAME III modelling of the Nottingham pollution episode

The present study of the Nottingham pollution event uses version 4.1 of NAME III (including subsequent changes up to 23/11/2006, the most notable of which was a bug fix for correcting erroneous dry deposition). Results are compared against those obtained using version 8.15 of NAME II. The main NAME III input file is included in Appendix A, and provides full details on the model set up. Some of the main features of this set up are presented below.

Two additional input files are referenced by the main input file. The first file provides the met definition for running NAME III using the type of mesoscale met data available

from the Met Office Unified Model for the time window of the episode. The second file is a sources file prescribing hourly emissions data (emission rates and stack operating characteristics) for major point-source polluters in the region. A total of 44 stack sources are considered. Stack characteristics (diameter, exit velocity and temperature) are used to model the plume rise behaviour. The NAME III sources file was obtained by a reformatting of the sources file used by NAME II, but otherwise contains the same information.

The dispersion is modelled using particles in this study, with sulphur dioxide SO_2 treated as a chemically inert, depositing species. That is, the influence of atmospheric chemistry is neglected but dry and wet deposition processes are considered. A surface resistance value $R_c = 100$ is used for dry deposition. A particle SO_2 mass limit of 2000 g is adopted to regulate the number of particles released in the simulation (total particle numbers in the model domain approach approximately one million by the end of the model run).

The NAME III run starts at 23 UTC on 01/09/1998 and ends 24 hours later at 23 UTC on 02/09/1998. (Here the one-hour offset from 00 UTC is because measurement data for the comparison was provided in BST for this date.) Output fields are requested hourly (commencing at 00 UTC on 02/09/1998) and are hourly-averaged values based on four contributions during each hour (i.e. the hourly average is calculated as the mean of the values at T-00:45, T-00:30, T-00:15 and T-00:00). This is consistent with the 15-minute synchronisation interval (main advection time step) used in the model run. The 'near-source' random-walk scheme is applied for one hour following the release of each particle (inhomogeneous turbulence and velocity memory are both active for one hour). We also model dry and wet deposition, and both turbulence and meander. However the effect of deep convection is not considered here because it was not modelled in the NAME II run (also deep convective mixing is unlikely to have a significant influence given the meteorological situation on this day). Boundary layer depth is diagnosed within NAME III (because of known problems with the Unified Model boundary layer depth predictions at that time), with imposed minimum and maximum limits of 80 m and 4000 m, respectively.

Dispersion and deposition are modelled over the domain (3W – 0W, 52N – 54N), with output fields calculated on two latitude-longitude grids with different spatial resolutions. Grid 1 is a low-resolution 60×40 grid with grid spacing 0.05° (an approximate spatial resolution of 5 km), whereas Grid 2 is a higher-resolution 120×80 grid at grid spacing 0.025° (approximately 2.5 km). Air concentrations are calculated on the lowest layer (i.e. 0 – 50 m) and as boundary-layer averages. Hourly output of deposition fields (dry, wet and total) and time-integrated deposition is also requested on both grids. Results from the high-resolution fields are presented in the next section.

Time series of air concentrations in the lowest layer (0 – 50 m) and as boundary-layer average concentrations are also requested, at 15-minute temporal resolution, at fourteen locations: Birmingham, Nottingham, Scunthorpe, Stoke on Trent, Wolverhampton, Sheffield, Leicester, Barnsley, Barnsley Gawber, Ladybower, Birmingham East, Sandwell, Leeds and Mansfield. Here concentration is calculated as an average over a box centred on each output location and of size 0.05° and 0.025° consistent with the resolution of the fields output. Time-series results using the coarser averaging are shown, in order to reduce statistical noise.

3 Discussion of results

Figures 1, 2, 3 and 4 show a comparison of the NAME III and NAME II predictions of boundary-layer average air concentration at 06 UTC, 12 UTC, 18 UTC and 23 UTC, respectively. We observe that there is generally very good agreement between the two sets of model results. It appears that NAME III concentrations tend to be slightly less than NAME II values, especially in the early stages of the simulation and again towards the end of the model run, but differences are small. There is also a hint that NAME III is slightly more diffusive (this would be consistent with the longer meander time-scale $\tau_{u_l} = 7200$ s used in NAME III, c.f. smaller value $\tau_{u_l} = 3600$ s used by NAME II), but again evidence is not really conclusive here. It is possible that such differences are emphasised due to the shallow boundary layer and light winds early in the episode period, although more study would be needed to examine this aspect further. (Boundary layer depth is initially less than 100 metres across the domain, until around 09 UTC when it rises to several hundred metres generally and up to 1000 metres at some locations, before falling again during the evening.) Peak concentrations near to some sources are slightly higher than in NAME II, especially during the afternoon period, but this is not characteristic of all sources (e.g. lower concentrations are predicted downwind of the northern-most stacks at 12 UTC and 23 UTC).

Figure 5 compares predictions of total deposition accumulated over the model run. Figure 6 shows a similar comparison for dry deposition only. Note that the wet deposition component is typically several orders of magnitude smaller than dry deposition for this case, except for some small non-trivial contributions across the southern part of the domain. The deposition predictions are generally in very good agreement, except again for peak values very close to sources (which tend to be higher in NAME III).

Figures 7 and 8 plot time series of the predicted boundary layer average SO_2 concentrations at various urban-background measurement sites for NAME III and NAME II, respectively, together with the actual observed concentrations at those sites. There is good inter-model agreement, as should be expected from the above comparison of the field results. The models also generally capture the broad-scale sequence of events (e.g. timing of peaks at Nottingham and Birmingham) but neither model does particularly well against the observations. When statistics of the time series are considered (shown on the plots), differences are typically quite small but the NAME III results are, on average, slightly poorer. At Nottingham itself, NAME III gives an improvement in the correlation coefficient (r) and is better at predicting values within a factor of two of the observations (fa2). However, normalised mean square error (nmse) and bias are both worse.

4 Summary

The report describes results from a modelling exercise using NAME III, v4.1 to study the Nottingham sulphur dioxide pollution episode in September 1998. The event has been used previously as a test case for NAME II, and comparisons are drawn with those NAME II predictions. The pollutant is modelled as a non-reactive, depositing species. The NAME III results are generally in good agreement with those of NAME II, v8.15.

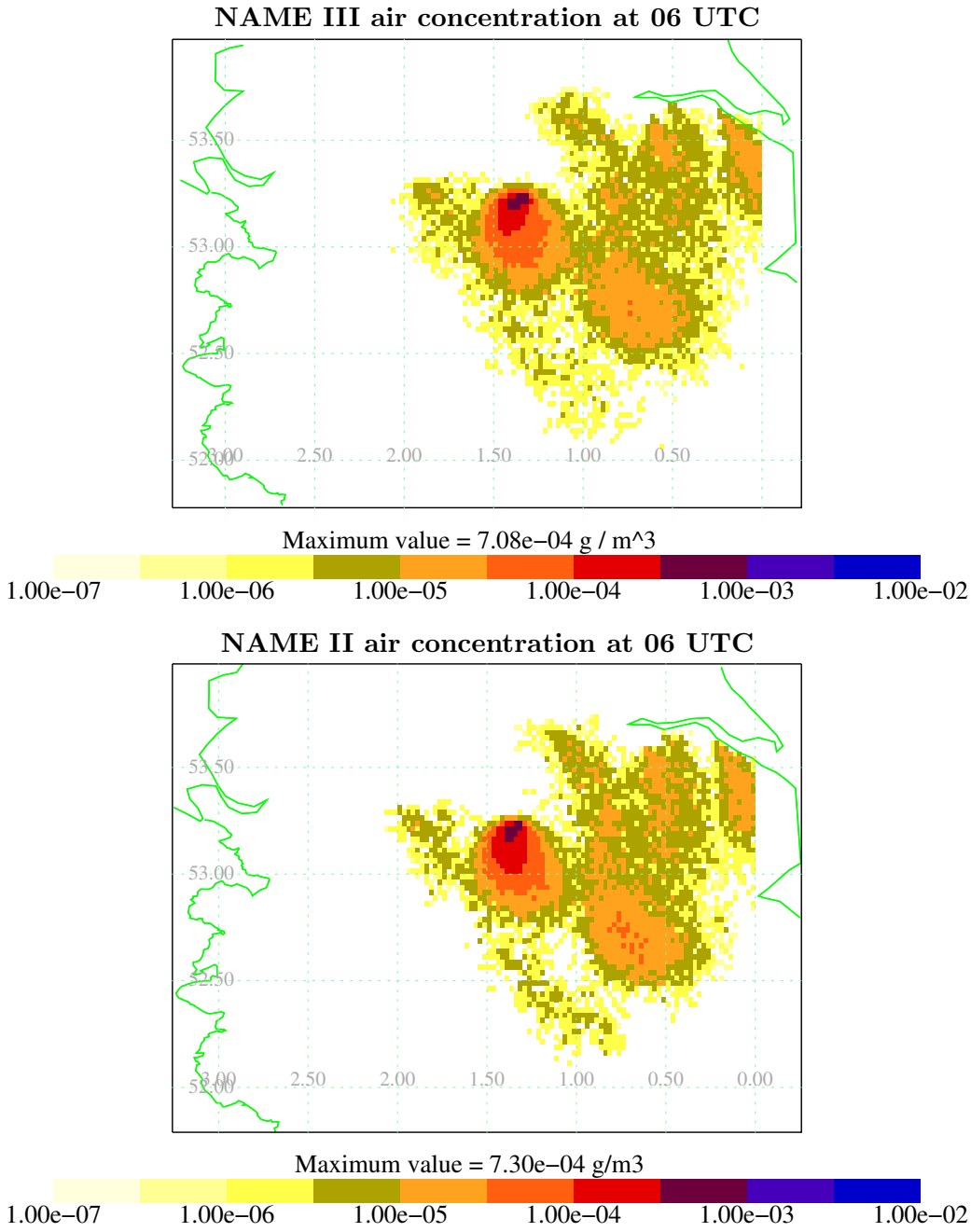

Figure 1: Comparison between the NAME III and NAME II predictions of boundary layer average air concentration at 06 UTC, 02/09/1998

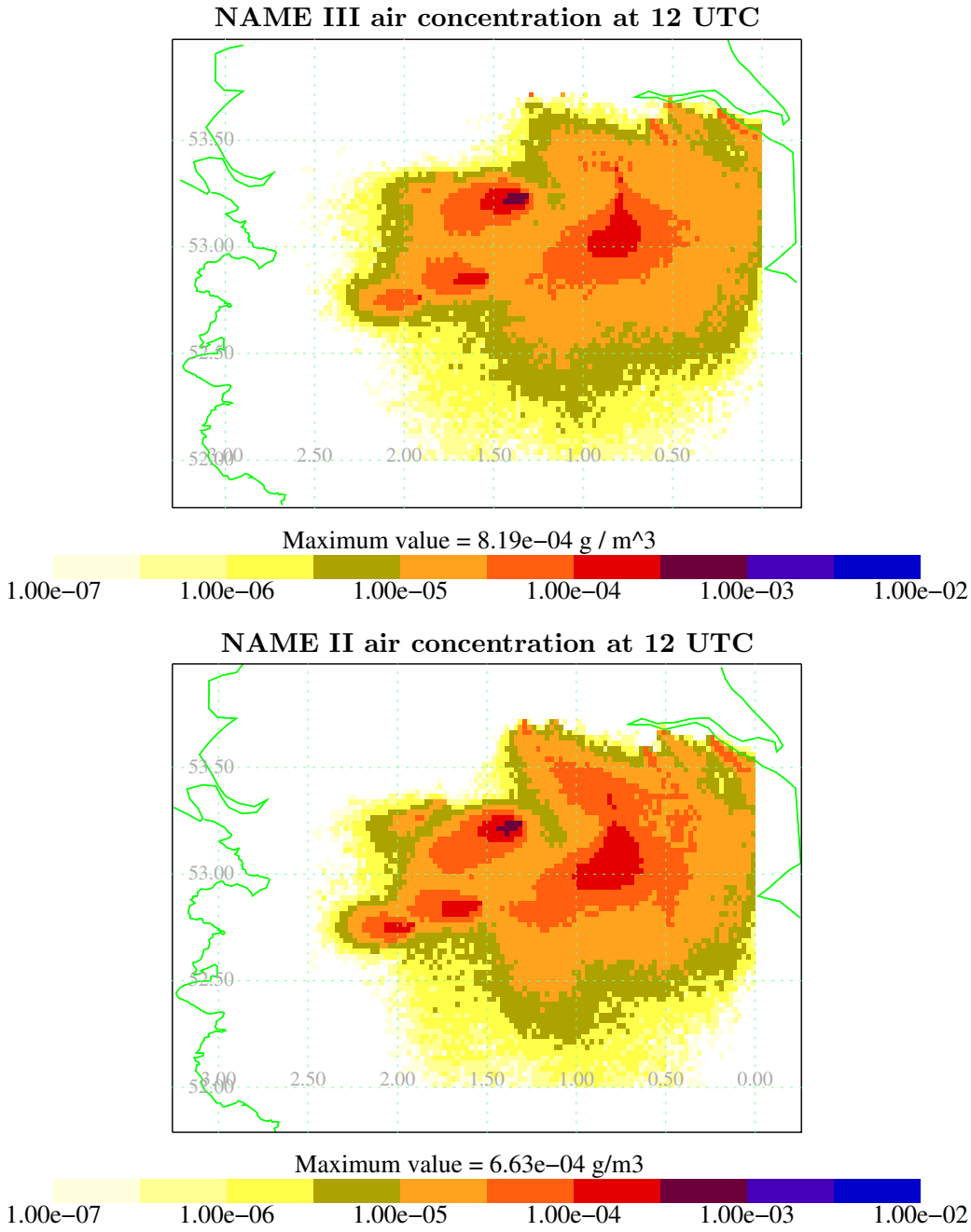

Figure 2: Comparison between the NAME III and NAME II predictions of boundary layer average air concentration at 12 UTC, 02/09/1998

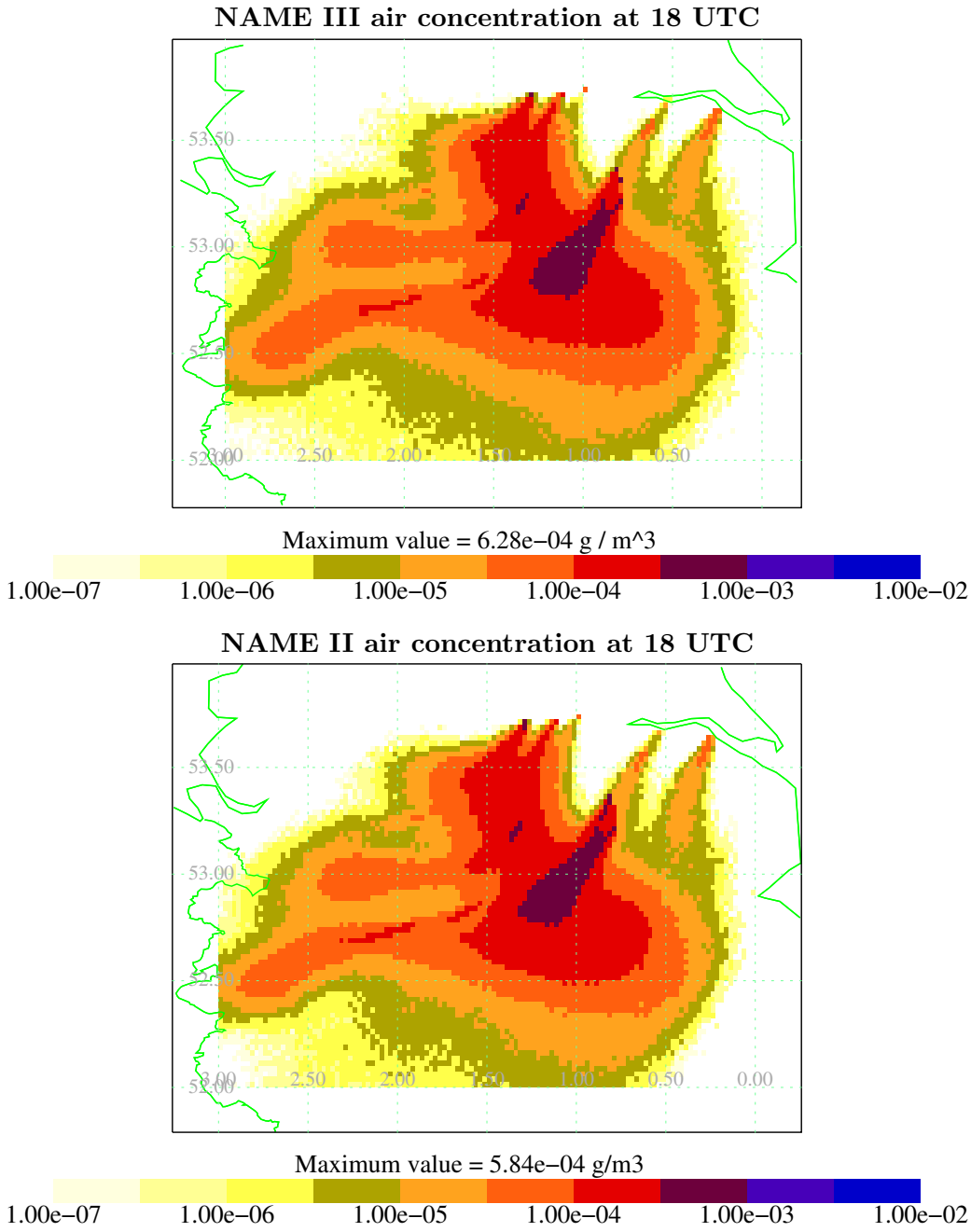

Figure 3: Comparison between the NAME III and NAME II predictions of boundary layer average air concentration at 18 UTC, 02/09/1998

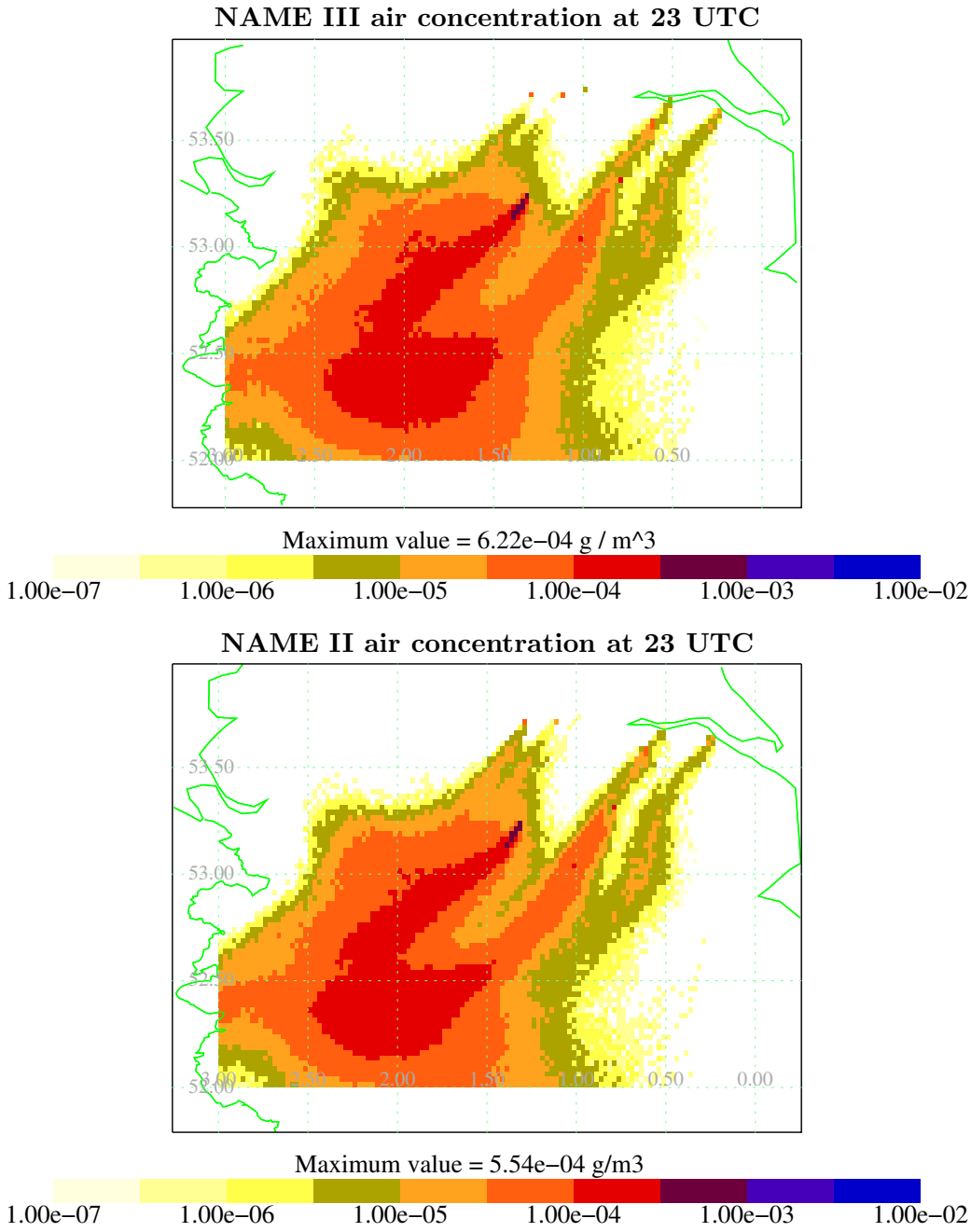

Figure 4: Comparison between the NAME III and NAME II predictions of boundary layer average air concentration at 23 UTC, 02/09/1998

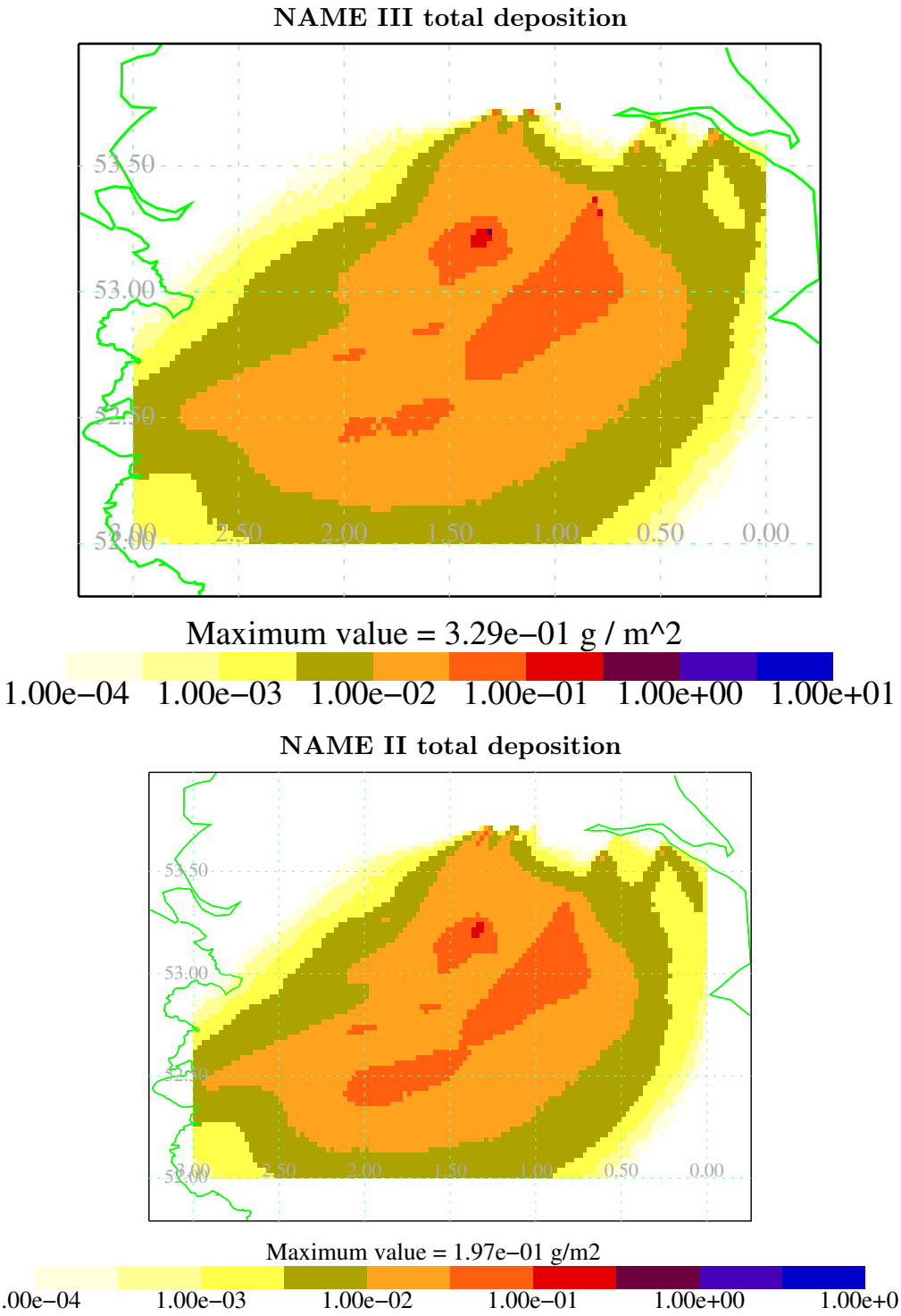

Figure 5: Comparison between the NAME III and NAME II predictions of total deposition accumulated over the period 23 UTC, 01/09/1998 – 23 UTC, 02/09/1998

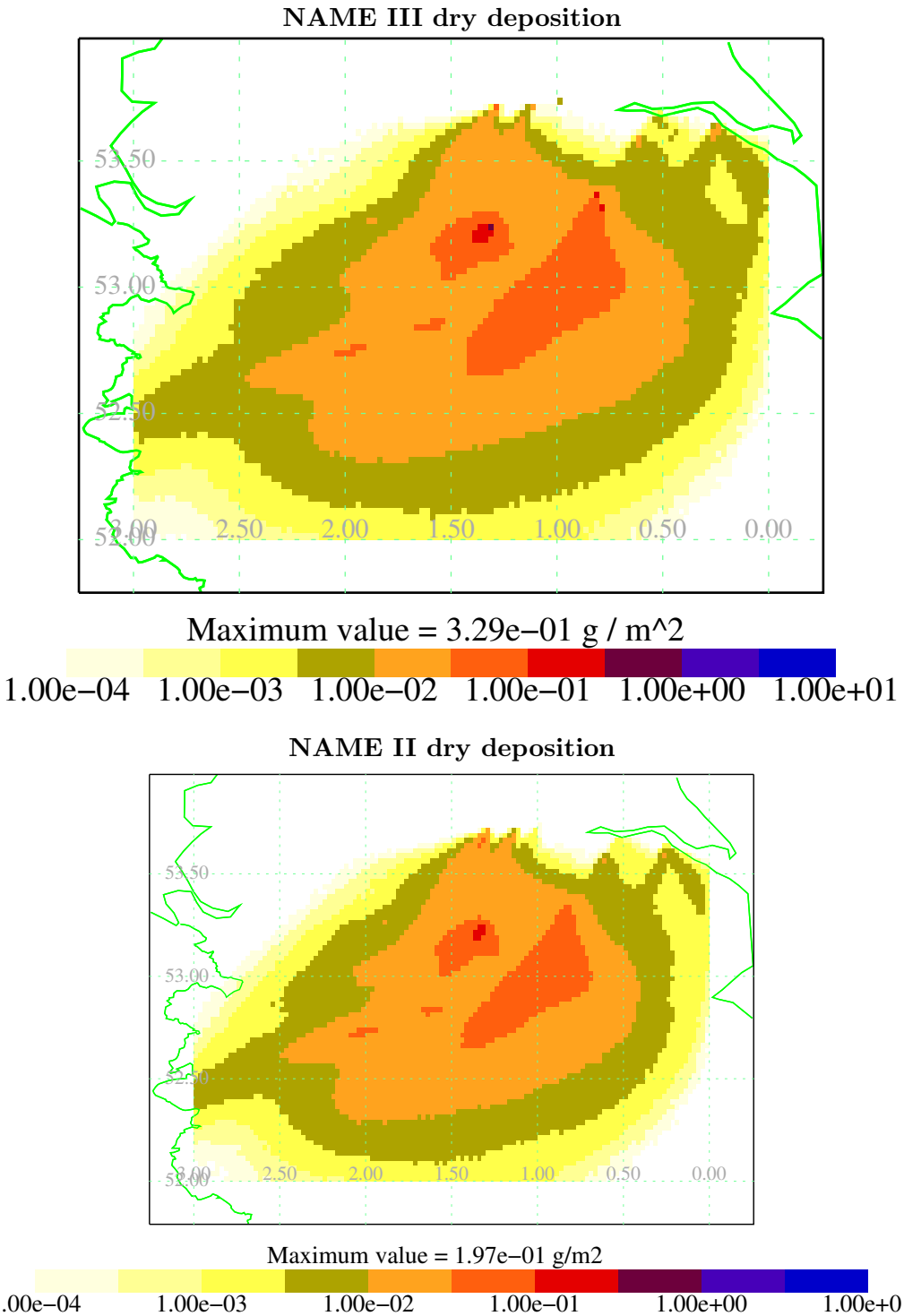

Figure 6: Comparison between the NAME III and NAME II predictions of dry deposition accumulated over the period 23 UTC, 01/09/1998 – 23 UTC, 02/09/1998

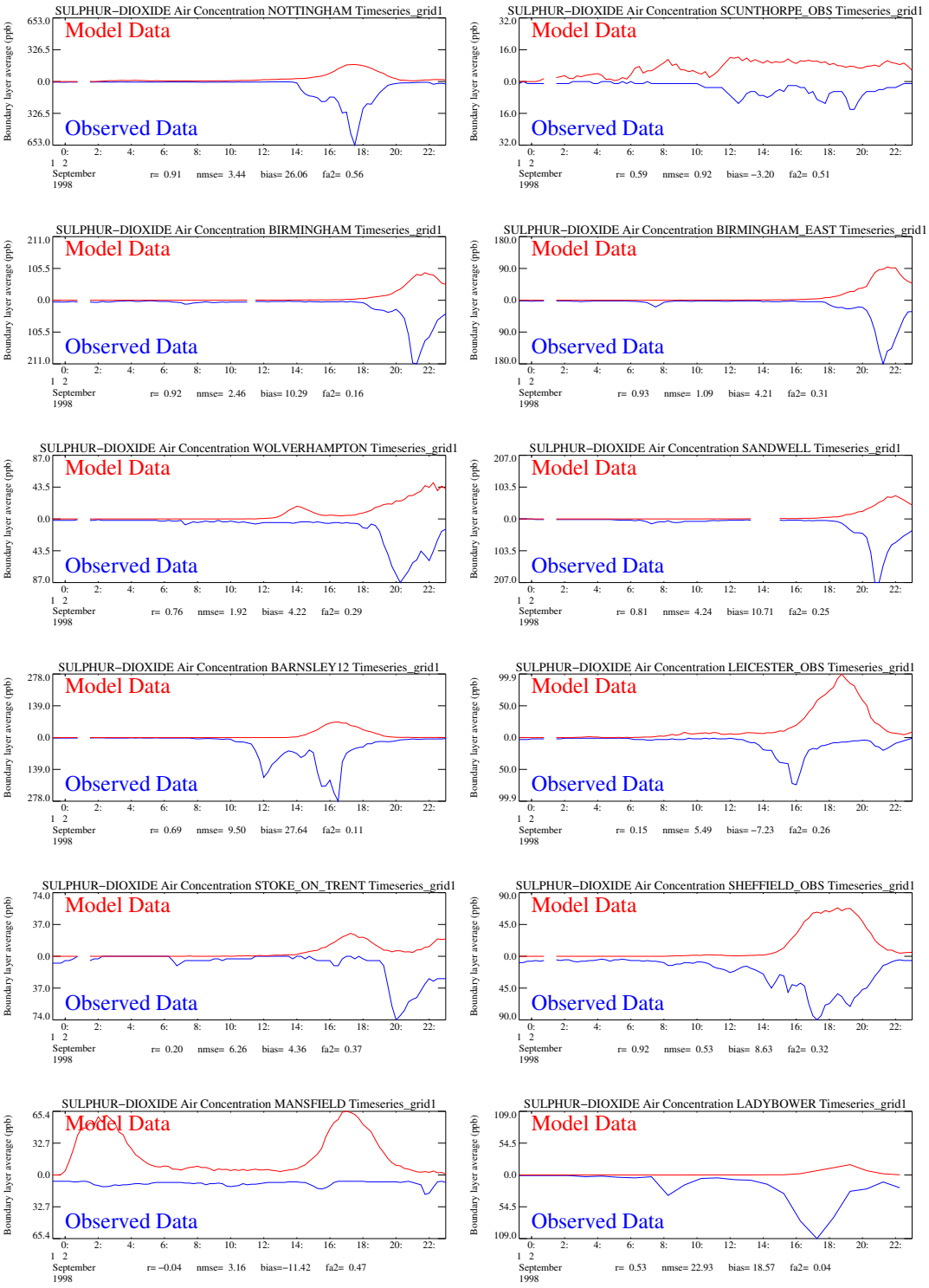

Figure 7: Comparison between NAME III predictions of air concentration at various locations and measurement data over the period 23 UTC, 01/09/1998 – 23 UTC, 02/09/1998

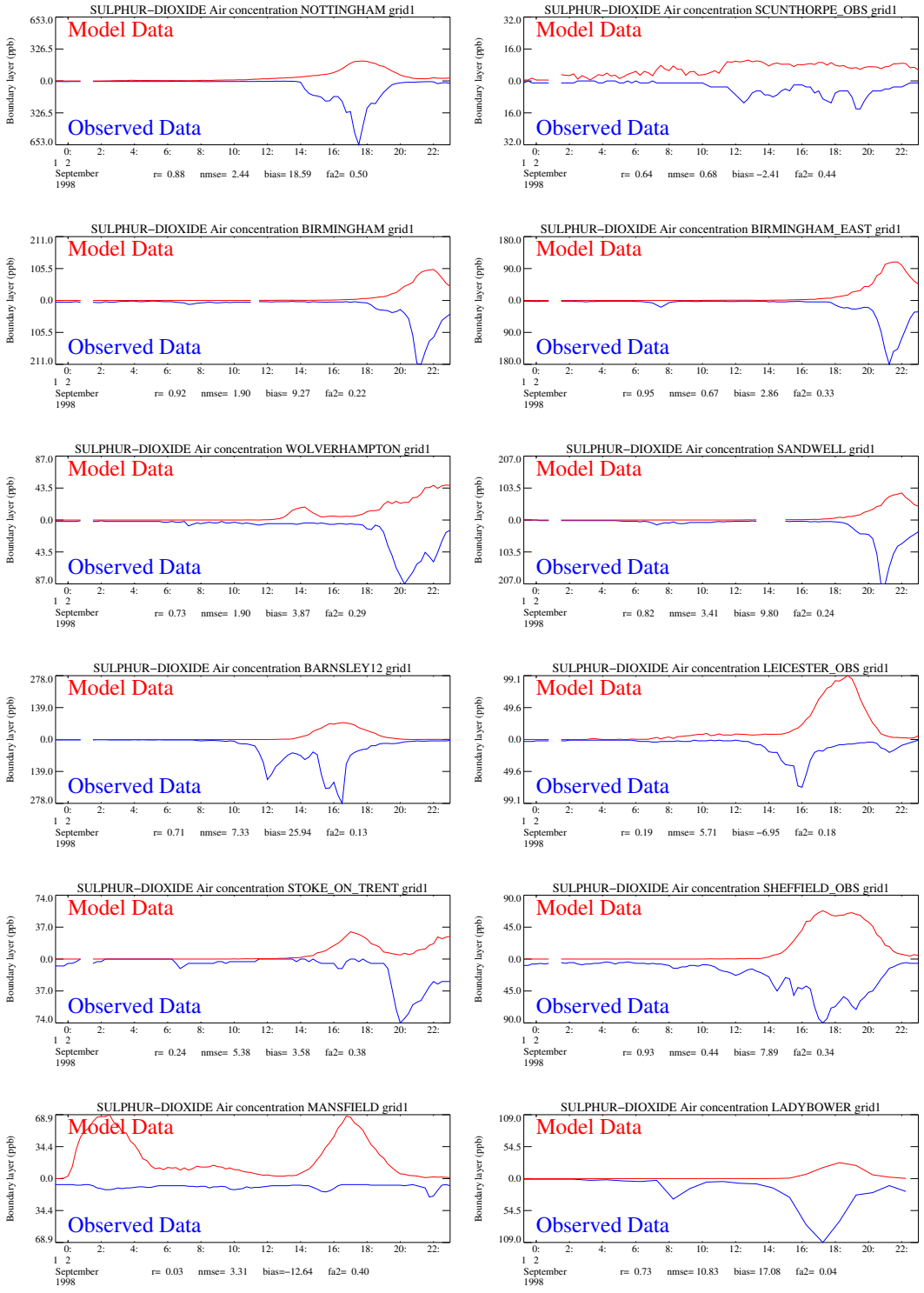

Figure 8: Comparison between NAME II predictions of air concentration at various locations and measurement data over the period 23 UTC, 01/09/1998 – 23 UTC, 02/09/1998

References

[1] Environment Agency (2000). Report into an Air Pollution Episode: Sulphur Dioxide, September 2nd 1998, Midlands and South Yorkshire.

Appendix A: Main input files for the modelling exercise

[Note that this is an edited version of the actual input file. The '--->' notation denotes where long input blocks have been split across multiple lines to improve readability.]

```
# Project: testing NAME III against the Nottingham sulphur-dioxide episode (September 1998)

# File: NAME III input file for Nottingham run

# Author: Andrew Jones, Atmospheric Dispersion

# Date: 22/11/2006

# For NAME III Version: 4.1

# Updated to add extra requests for air concentrations, particle numbers,
# b.l. depth and deposition fields

# ****************************************************************************

Main Options:
Absolute or Relative Time?, Fixed met?, Flat Earth?,               Run Name, Random Seed, Backwards?
                  Absolute,         No,          No, Nottingham SO2 Episode,       Fixed,         No

Restart File Options:
# Cases Between Writes, Time Between Writes, Delete Old Files?, Write On Suspend?,
                      ,                   ,                 ,                  ,

Multiple Case Options:
Dispersion Options Ensemble Size, Met Ensemble Size,
                               1,                 1,

Output Options:
Folder
/data/local/aprj/Nottingham/Output_run3

! Uses the Nottingham sources file (sources_NameIII) and met defn for V3 mesoscale met data
Input Files:
File Names
./sources_NameIII
/home/h03/apdg/NameIII/NameIIILibrary/Code/Version4_1/Resources/Defns/MetDefnUMV3M.txt

Horizontal Coordinate Systems:
Name
Lat-Long
UK National Grid (100m)

Vertical Coordinate Systems:
Name
m agl

Locations: Time Series Locations
Name,             H-Coord,        X,        Y
BIRMINGHAM,      Lat-Long,  -1.9056,  52.4771
NOTTINGHAM,      Lat-Long,  -1.1436,  52.9522
SCUNTHORPE_OBS,  Lat-Long,  -0.6296,  53.5830
STOKE_ON_TRENT,  Lat-Long,  -2.1748,  53.0163
WOLVERHAMPTON,   Lat-Long,  -2.1273,  52.5858
SHEFFIELD_OBS,   Lat-Long,  -1.4696,  53.3757
LEICESTER_OBS,   Lat-Long,  -1.1260,  52.6375
BARNSLEY12,      Lat-Long,  -1.4825,  53.5538
BARNSLEY_GAWBER, Lat-Long,  -1.5081,  53.5611
LADYBOWER,       Lat-Long,  -1.7528,  53.3973
BIRMINGHAM_EAST, Lat-Long,  -1.8287,  52.4958
SANDWELL,        Lat-Long,  -2.0163,  52.5023
LEEDS,           Lat-Long,  -1.5000,  53.8000
```

```
MANSFIELD,       Lat-Long,  -1.1937,  53.1414

! Fields output over the region (3.0W -> 0.0W, 52.0N -> 54.0N)
! Two grids (low-res at 0.05 deg resolution; high-res at 0.025 deg resolution)
Horizontal Grids:
Name,     H-Coord,  nX,  nY,     dX,     dY,   X Min,   Y Min
HGrid1,  Lat-Long,  60,  40,   0.05,  -0.05,  -2.975,  53.975
HGrid2,  Lat-Long, 120,  80,  0.025, -0.025, -2.9875, 53.9875

! Time series output at the obs locations (using same grid sizes as above)
Horizontal Grids:
Name,                  Set of Locations,    dX,    dY
HGrid1_Locations, Time Series Locations,  0.05,  0.05
HGrid2_Locations, Time Series Locations, 0.025, 0.025

! Vertical grid is layer 1 (= 0 - 50 m agl)
Vertical Grids:
Name,    Z-Coord,  nZ,    dZ,   Z0
Layer1,    m agl,   1,  50.0, 25.0
ZGrid1,    m agl,  20, 100.0, 50.0

! Fields are output every hour, time series are output every 15 minutes
Temporal Grids:
Name,             nT,       dT,                  T0
TGrid_Fields,     24, 01:00:00, 02/09/1998 00:00:00
TGrid_TimeSeries, 96, 00:15:00, 01/09/1998 23:15:00

! Domain covers the region (3.0W -> 0.0W, 52.0N -> 54.0N)
Domains:
Name,               H-Coord, X Min, X Max, Y Min, Y Max, H Unbounded?, Z-Coord,   Z Max,
Dispersion Domain, Lat-Long,  -3.0,   0.0,  52.0,  54.0,           No,   m agl, 15000.0,

---> Z Unbounded?,          Start Time,            End Time, T Unbounded?, Max Travel Time
--->           No, 01/09/1998 23:00:00, 02/09/1998 23:00:00,           No,        infinity

Species:
Name,                     Category, Half Life, UV Loss Rate, Surface Resistance,
SULPHUR-DIOXIDE, CHEMISTRY-SPECIES,    STABLE,     0.00E+00,           1.00E+02,

---> Deposition Velocity, Wet Type, Molecular Weight, Material Unit
--->                    ,        2,            64.00,             g

Particle Mass Limits:
Species Name,    Particle Mass Limit
SULPHUR-DIOXIDE,              2000.0

! Fields output
! One-hour average air concentration every hour: 0 - 50 m and b.l. average on grids 1 and 2
Output Requirements - Fields:
Name,                  Quantity,         Species, Source, H-Grid, Z-Grid,       T-Grid, BL Average,
Req F1 0-50m, Air Concentration, SULPHUR-DIOXIDE,       , HGrid1, Layer1, TGrid_Fields,         No,
Req F1 BL-Av, Air Concentration, SULPHUR-DIOXIDE,       , HGrid1,       , TGrid_Fields,        Yes,
Req F2 0-50m, Air Concentration, SULPHUR-DIOXIDE,       , HGrid2, Layer1, TGrid_Fields,         No,
Req F2 BL-Av, Air Concentration, SULPHUR-DIOXIDE,       , HGrid2,       , TGrid_Fields,        Yes,

---> T Av Or Int, Av Time, # Av Times, Fluctuations?, Sync?, Output Route, Across, Separate File,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,

---> Output Format, Output Group
--->            IA, Fields_grid1
--->            IA, Fields_grid1
--->            IA, Fields_grid2
--->            IA, Fields_grid2
```

```
! Fields output (extra)
! One-hour average particle numbers every hour: 0 - 50 m and b.l. average on grids 1 and 2
Output Requirements - Fields:
Name,                 Quantity,         Species, Source, H-Grid, Z-Grid,       T-Grid, BL Average,
Req N1 0-50m,       # Particles,                ,       , HGrid1, Layer1, TGrid_Fields,         No,
Req N1 BL-Av,       # Particles,                ,       , HGrid1,       , TGrid_Fields,        Yes,
Req N2 0-50m,       # Particles,                ,       , HGrid2, Layer1, TGrid_Fields,         No,
Req N2 BL-Av,       # Particles,                ,       , HGrid2,       , TGrid_Fields,        Yes,

---> T Av Or Int, Av Time, # Av Times, Fluctuations?, Sync?, Output Route, Across, Separate File,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,

---> Output Format, Output Group
--->            IA, Fields_grid1
--->            IA, Fields_grid1
--->            IA, Fields_grid2
--->            IA, Fields_grid2

! One-hour average air concentration/particle numbers every hour: vertical slices on grids 1 and 2
Output Requirements - Fields:
Name,                 Quantity,         Species, Source, H-Grid, Z-Grid,       T-Grid, BL Average,
Req C1 ZGrid, Air Concentration, SULPHUR-DIOXIDE,       , HGrid1, ZGrid1, TGrid_Fields,         No,
Req N1 ZGrid,       # Particles,                ,       , HGrid1, ZGrid1, TGrid_Fields,         No,
Req C2 ZGrid, Air Concentration, SULPHUR-DIOXIDE,       , HGrid2, ZGrid1, TGrid_Fields,         No,
Req N2 ZGrid,       # Particles,                ,       , HGrid2, ZGrid1, TGrid_Fields,         No,

---> T Av Or Int, Av Time, # Av Times, Fluctuations?, Sync?, Output Route, Across, Separate File,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,
--->          Av,   01:00,          4,            No,    No,            D,     TZ,             T,

---> Output Format, Output Group
--->            IA, Fields_grid1_extra
--->            IA, Fields_grid1_extra
--->            IA, Fields_grid2_extra
--->            IA, Fields_grid2_extra

! One-hour average deposition and integrated deposition every hour: grids 1 and 2
Output Requirements - Fields:
Name,                       Quantity,         Species, Source, H-Grid, Z-Grid,       T-Grid,
Req D1 Dry-Hrly, Dry Deposition Rate, SULPHUR-DIOXIDE,       , HGrid1,       , TGrid_Fields,
Req D1 Dry-Int,  Dry Deposition Rate, SULPHUR-DIOXIDE,       , HGrid1,       , TGrid_Fields,
Req D2 Dry-Hrly, Dry Deposition Rate, SULPHUR-DIOXIDE,       , HGrid2,       , TGrid_Fields,
Req D2 Dry-Int,  Dry Deposition Rate, SULPHUR-DIOXIDE,       , HGrid2,       , TGrid_Fields,
Req D1 Wet-Hrly, Wet Deposition Rate, SULPHUR-DIOXIDE,       , HGrid1,       , TGrid_Fields,
Req D1 Wet-Int,  Wet Deposition Rate, SULPHUR-DIOXIDE,       , HGrid1,       , TGrid_Fields,
Req D2 Wet-Hrly, Wet Deposition Rate, SULPHUR-DIOXIDE,       , HGrid2,       , TGrid_Fields,
Req D2 Wet-Int,  Wet Deposition Rate, SULPHUR-DIOXIDE,       , HGrid2,       , TGrid_Fields,
Req D1 Ttl-Hrly,     Deposition Rate, SULPHUR-DIOXIDE,       , HGrid1,       , TGrid_Fields,
Req D1 Ttl-Int,      Deposition Rate, SULPHUR-DIOXIDE,       , HGrid1,       , TGrid_Fields,
Req D2 Ttl-Hrly,     Deposition Rate, SULPHUR-DIOXIDE,       , HGrid2,       , TGrid_Fields,
Req D2 Ttl-Int,      Deposition Rate, SULPHUR-DIOXIDE,       , HGrid2,       , TGrid_Fields,

---> BL Average, T Av Or Int, Av Time, # Av Times, Fluctuations?, Sync?, Output Route, Across,
--->         No,          Av,   01:00,          4,            No,    No,            D,     TZ,
--->         No,         Int,   24:00,         96,            No,    No,            D,     TZ,
--->         No,          Av,   01:00,          4,            No,    No,            D,     TZ,
--->         No,         Int,   24:00,         96,            No,    No,            D,     TZ,
--->         No,          Av,   01:00,          4,            No,    No,            D,     TZ,
--->         No,         Int,   24:00,         96,            No,    No,            D,     TZ,
--->         No,          Av,   01:00,          4,            No,    No,            D,     TZ,
```

```
--->         No,         Int,   24:00,         96,            No,    No,            D,     TZ,
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--->         No,          Av,   01:00,          4,            No,    No,            D,     TZ,
--->         No,         Int,   24:00,         96,            No,    No,            D,     TZ,

---> Separate File, Output Format, Output Group
--->             T,            IA, Fields_grid1_dep
--->             T,            IA, Fields_grid1_dep
--->             T,            IA, Fields_grid2_dep
--->             T,            IA, Fields_grid2_dep
--->             T,            IA, Fields_grid1_dep
--->             T,            IA, Fields_grid1_dep
--->             T,            IA, Fields_grid2_dep
--->             T,            IA, Fields_grid2_dep
--->             T,            IA, Fields_grid1_dep
--->             T,            IA, Fields_grid1_dep
--->             T,            IA, Fields_grid2_dep
--->             T,            IA, Fields_grid2_dep

! Boundary layer depth calculated every hour: grid 2
Output Requirements - Fields:
Name,                       Quantity,         Species, Source, H-Grid, Z-Grid,       T-Grid,
Req M1 BLDepth, Boundary Layer Depth,                ,       , HGrid2, Layer1, TGrid_Fields,

---> BL Average, T Av Or Int, Av Time, # Av Times, Fluctuations?, Sync?, Output Route, Across,
--->         No,          No,        ,           ,            No,   Yes,            D,     TZ,

---> Separate File, Output Format, Output Group
--->             T,            IA, Fields_bldepth

! Time series output
! Instantaneous air concentration every 15 minutes: 0 - 50 m and b.l. average on grids 1 and 2
Output Requirements - Fields:
Name,                  Quantity,         Species, Source,           H-Grid, Z-Grid,           T-Grid,
Req T1 0-50m, Air Concentration, SULPHUR-DIOXIDE,       , HGrid1_Locations, Layer1, TGrid_TimeSeries,
Req T1 BL-Av, Air Concentration, SULPHUR-DIOXIDE,       , HGrid1_Locations,       , TGrid_TimeSeries,
Req T2 0-50m, Air Concentration, SULPHUR-DIOXIDE,       , HGrid2_Locations, Layer1, TGrid_TimeSeries,
Req T2 BL-Av, Air Concentration, SULPHUR-DIOXIDE,       , HGrid2_Locations,       , TGrid_TimeSeries,

---> BL Average, T Av Or Int, Av Time, # Av Times, Fluctuations?, Sync?, Output Route, Across,
--->         No,          No,        ,           ,            No,    No,            D,    XYZ,
--->        Yes,          No,        ,           ,            No,    No,            D,    XYZ,
--->         No,          No,        ,           ,            No,    No,            D,    XYZ,
--->        Yes,          No,        ,           ,            No,    No,            D,    XYZ,

---> Separate File, Output Format, Output Group
--->            XY,           AZ, Timeseries_grid1
--->            XY,           AZ, Timeseries_grid1
--->            XY,           AZ, Timeseries_grid2
--->            XY,           AZ, Timeseries_grid2

! Particle numbers, etc.
Output Requirements - Fields:
Name,           Quantity,  Species, Source,           T-Grid, T Av Or Int, Av Time, # Av Times,
Req N0,       Clock Time,         ,       , TGrid_TimeSeries,           ,        ,           ,
Req N1,      # Particles,         ,       , TGrid_TimeSeries,          No,        ,           ,
Req N2, # Particle Steps,         ,       , TGrid_TimeSeries,          No,        ,           ,
Req N3,          # Puffs,         ,       , TGrid_TimeSeries,          No,        ,           ,
Req N4,     # Puff Steps,         ,       , TGrid_TimeSeries,          No,        ,           ,

---> Sync?, Output Route, Output Format, Output Group
--->   Yes,            D,            AF, Numbers
--->   Yes,            D,            AF, Numbers
--->   Yes,            D,            AF, Numbers
--->   Yes,            D,            AF, Numbers
```

```
--->   Yes,            D,            AF, Numbers

Sets of Dispersion Options:
Max # Particles, Max # Full Particles, Max # Puffs, Max # Original Puffs, Skew Time,
        2000000,              2000000,          2,                   2,     00:00,

---> Velocity Memory Time, Meander Velocity Memory Time, Inhomogeneous Time, Sync Time,
--->               01:00,                        00:00,             01:00,  00:15:00,

---> Puff Time, Puff Interval, DeltaOpt, Computational Domain, Time of fixed met,
--->     00:00,      00:15:00,        1,    Dispersion Domain,                  ,

---> Deep Convection?, Radioactive Decay?, Agent Decay?, Dry Deposition?, Wet Deposition?,
--->              No,                 No,           No,             Yes,             Yes,

---> Turbulence?, Meander?, Chemistry?
--->         Yes,      Yes,         No

NWP Met Module Instances:
Name,     Min B L Depth, Max B L Depth, Use NWP BL Depth?, Restore Met Script, Delete Met?,
Mesoscale,         80.0,        4000.0,                No,                   ,          No,

--->                                    Met Folder,
---> /project/NAME/apnm/name_testing/met/nottingham,

--->                                      Topography Folder, Met Definition Name
---> /home/h03/apdg/NameIII/NameIIILibrary/Data/UMTopogData/,               UMV3M

NWP Flow Module Instances:
Name,      Met Module,       Met, Domain
Mesoscale,    NWP Met, Mesoscale, UMV3M Whole-4.5

Flow Order: Update
Flow Module, Flow
NWP Flow,    Mesoscale

Flow Order: Convert
Flow Module, Flow
NWP Flow,    Mesoscale

Flow Order: Flow
Flow Module, Flow
NWP Flow,    Mesoscale

Flow Order: Cloud
Flow Module, Flow
NWP Flow,    Mesoscale

Flow Order: Rain
Flow Module, Flow
NWP Flow,    Mesoscale

Flow Attributes:
Name,    Flow Order
Update,  Update
Convert, Convert
Flow,    Flow
Cloud,   Cloud
Rain,    Rain
```