NAME III Document
MD13/4(version 1)
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NAME III (v1.3) Validation: Simple Model Checks/Tests

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Introduction

This note briefly records the results from certain simple NAME III (v. 1.3) model checks. These 'tests' were intended to highlight any inconsistencies within the model rather to to determine model 'accuracy'.

Results

NWP Met

Figures 1 to 4 illustrate results from the model using NWP met. The four runs that produced the figures differ only in the met they use i.e., global or regional (cut down global) and in using particles or puffs to represent the release material. Appendix A contains an illustrative input file. The output plane is centred at $z = 50$ m with a depth $\Delta z = 100$ m. This is deliberately set below the release height of 200 m as the particle and puff output calculation methods differ significantly and can result in large differences reported at and very near to the source. In all cases the results agree as they should.

Table 1 presents run time results comparing NAME III in puff and particle mode with NAME. In particle mode NAME III is substantially slower then NAME. This however does not agree, for currently unknown reasons, with timings made for the Hekla eruption (MD13/3) where the two models perform almost identically in time. In puff mode NAME III is faster than either of the particle runs. Of course particle runs with fewer particles could be run but it should be noted that even the larger particle run carried out here offers much lower quality results than the puff run. Also it is possible to control the number of puffs through variable A1 with lower values of A1 resulting in fewer puffs. In the model run presented here A1 = 200 which I believe can be reduced to approximately 50 while still maintaining the superior results observed here.

Model	Run Time (seconds) (240000 particles)	Run Time (seconds) (480000 particles)
NAME	149	292
NAME III (particle)	213	428
NAME III (puff)	128	

Table 1: Model run time comparison.

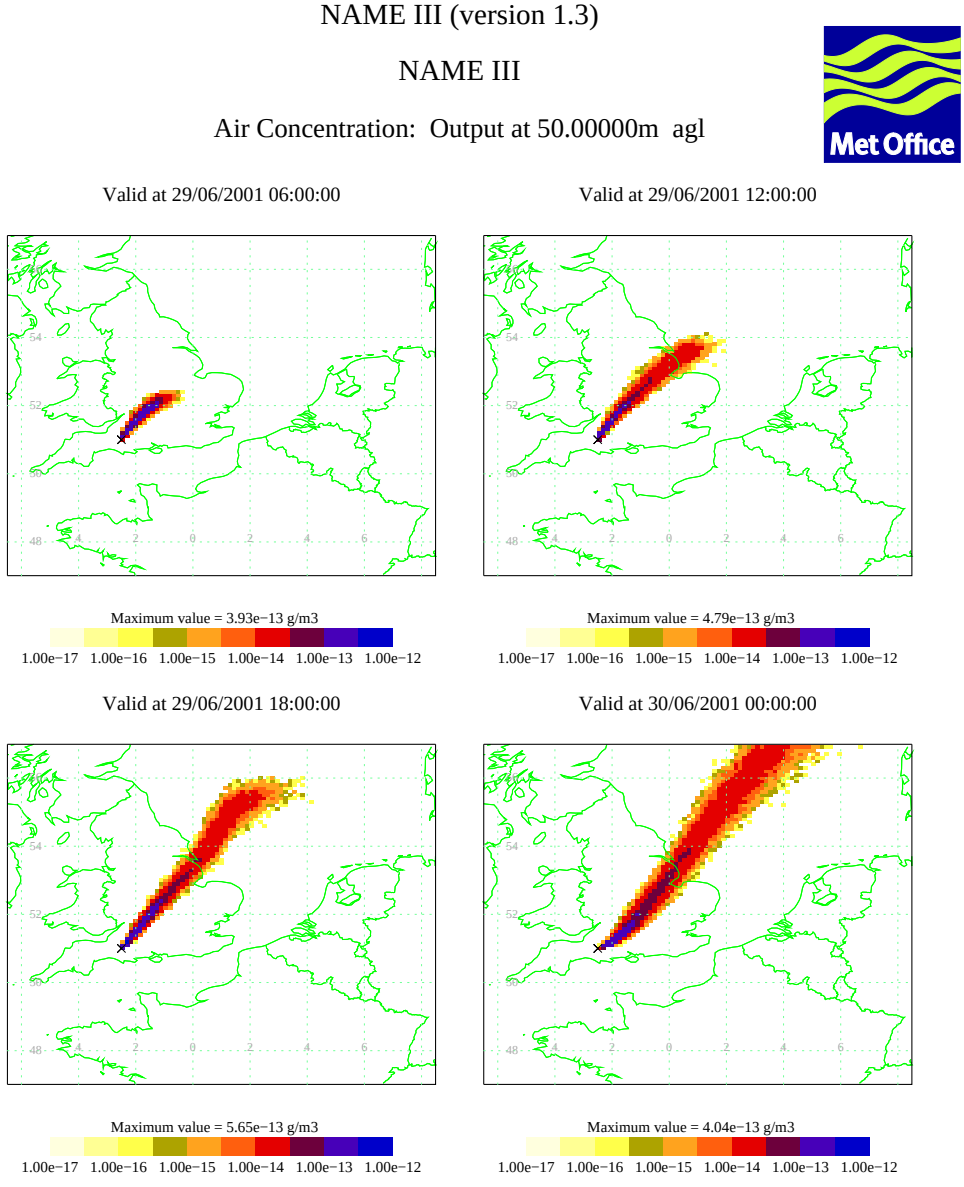

Figure 1: NAME III output. Continuous particle release using global met.

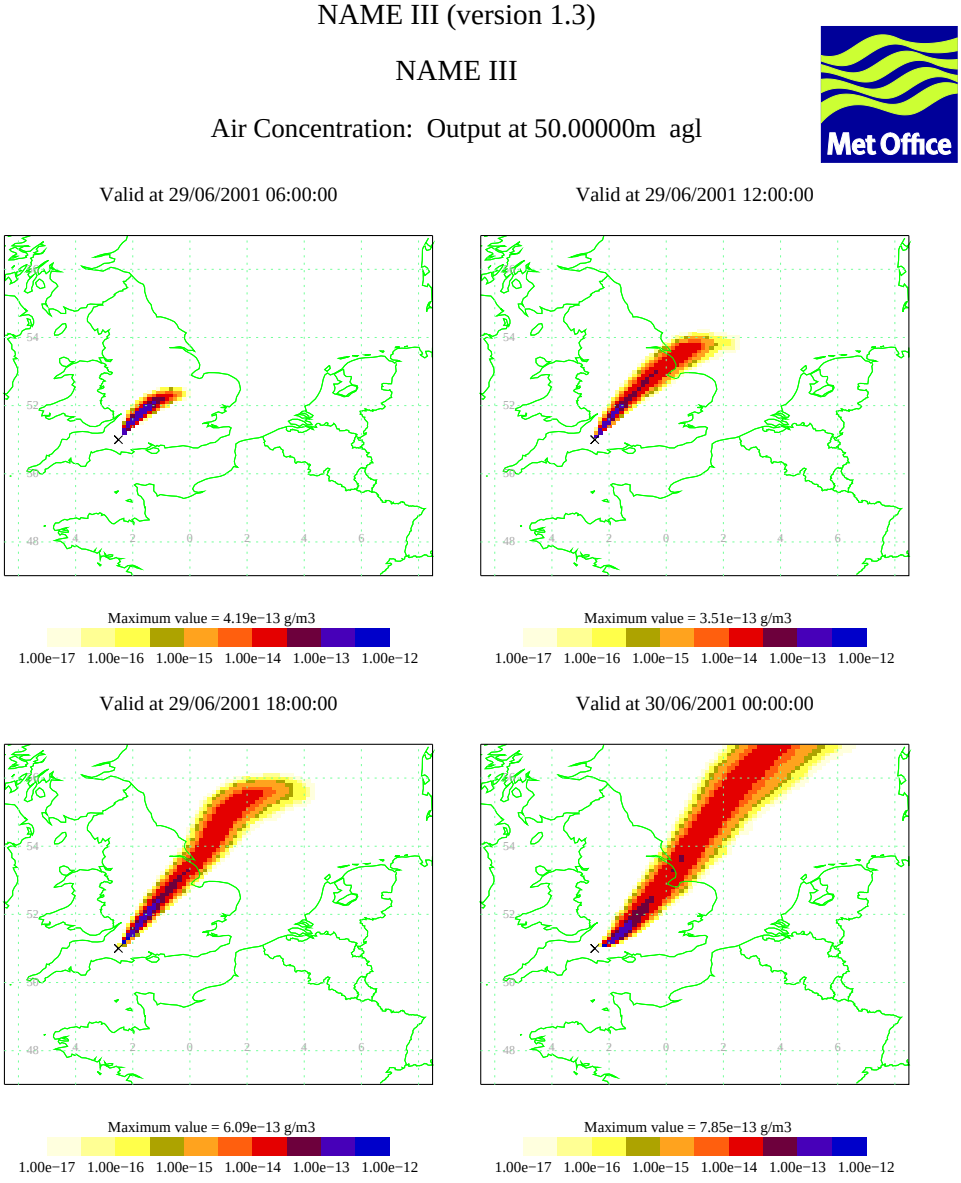

Figure 2: NAME III output. Continuous puff release using global met.

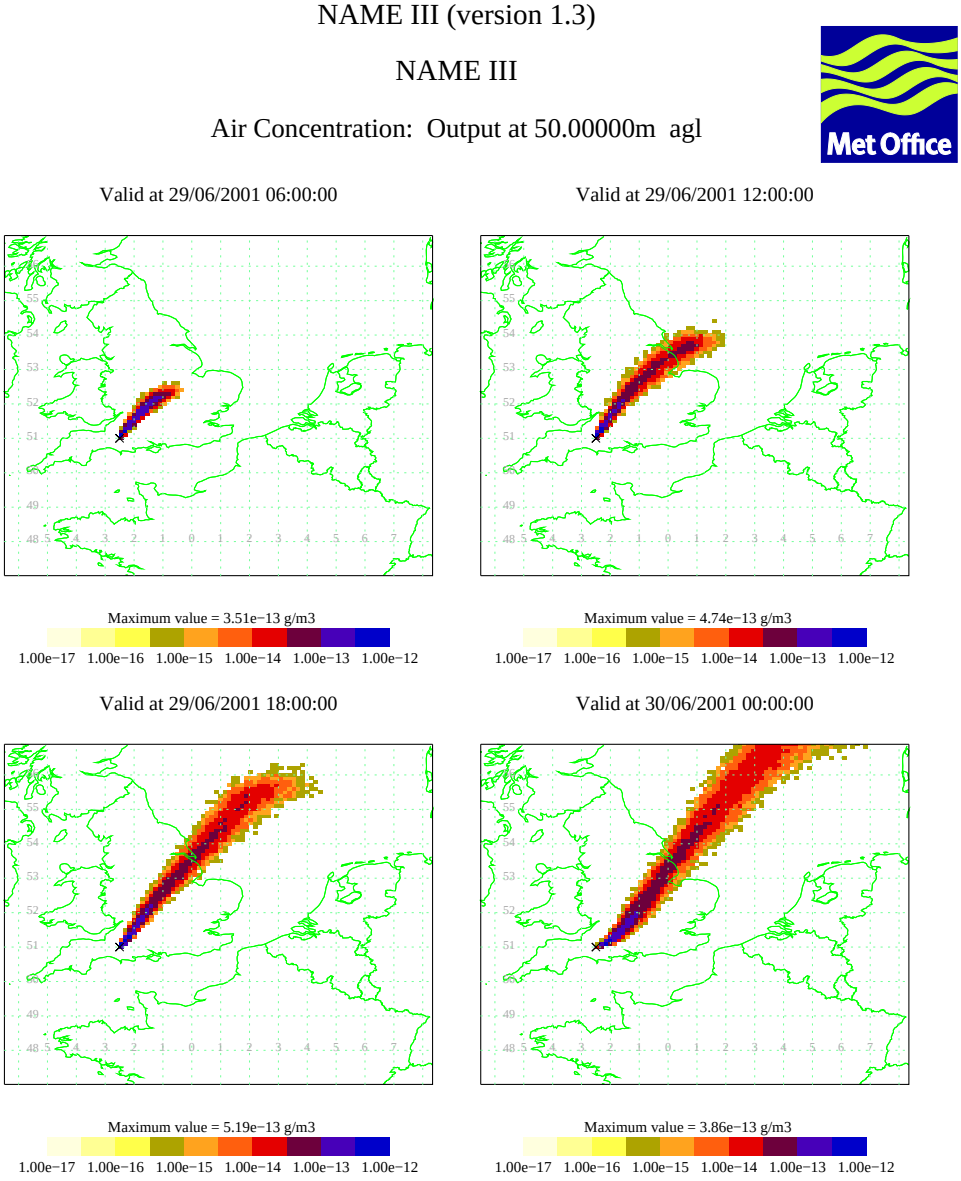

Figure 3: NAME III output. Continuous particle release using regional met.

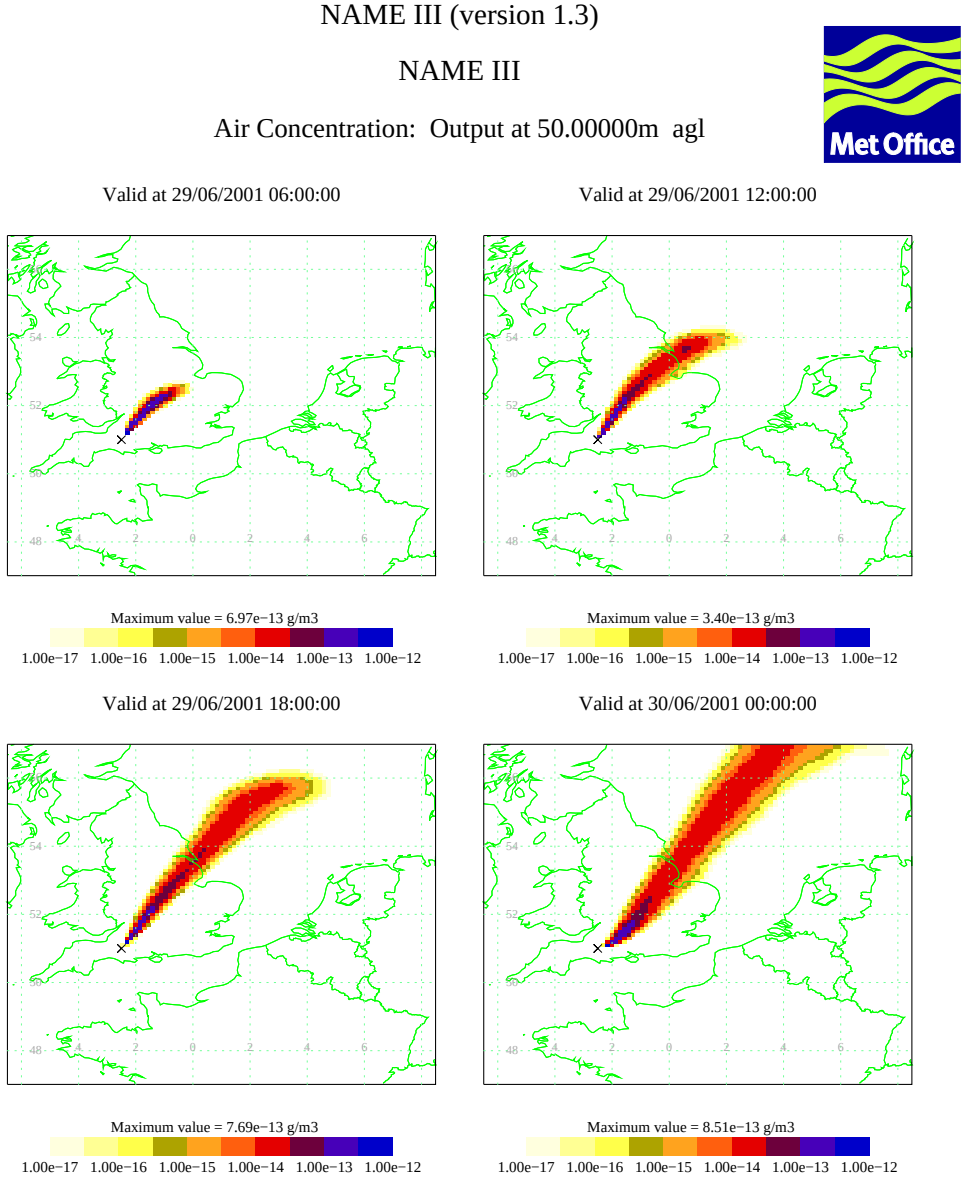

Figure 4: NAME III output. Continuous puff release using regional met.

Single Site Met

Figures 5 and 6 present results from NAME III using time varying (hourly) single site met, included in Appendix C. The input file for this run can be found in Appendix B. The release is continuous from a point source at $z = 200$ m while the output grid is centred at $z = 500$ m with a depth $\Delta z = 100$ m. Here we can see the improved results that are possible when using puffs for short range problems. Both runs however clearly produce the very similar results.

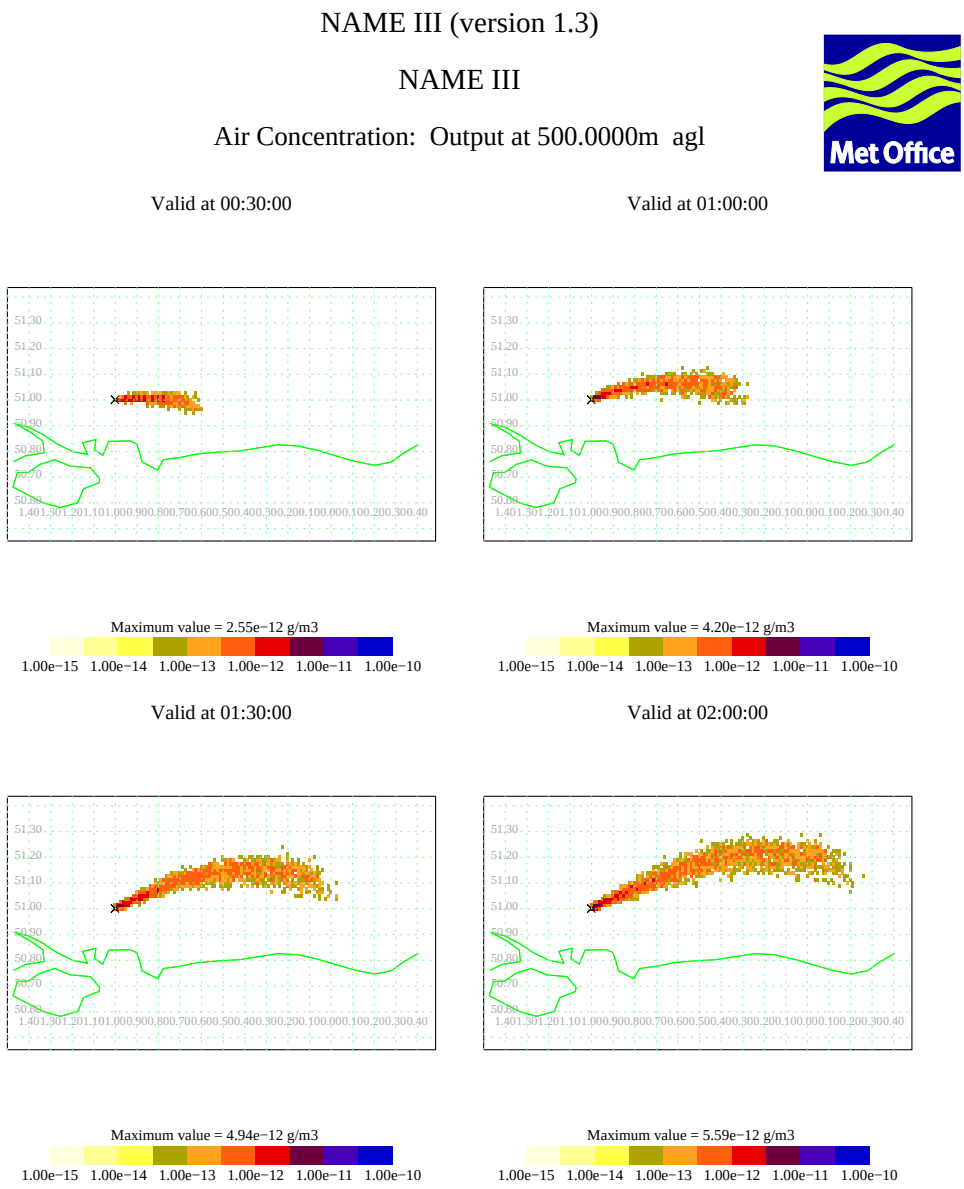

Figure 5: NAME III output. Continuous particle release using single site hourly varying met.

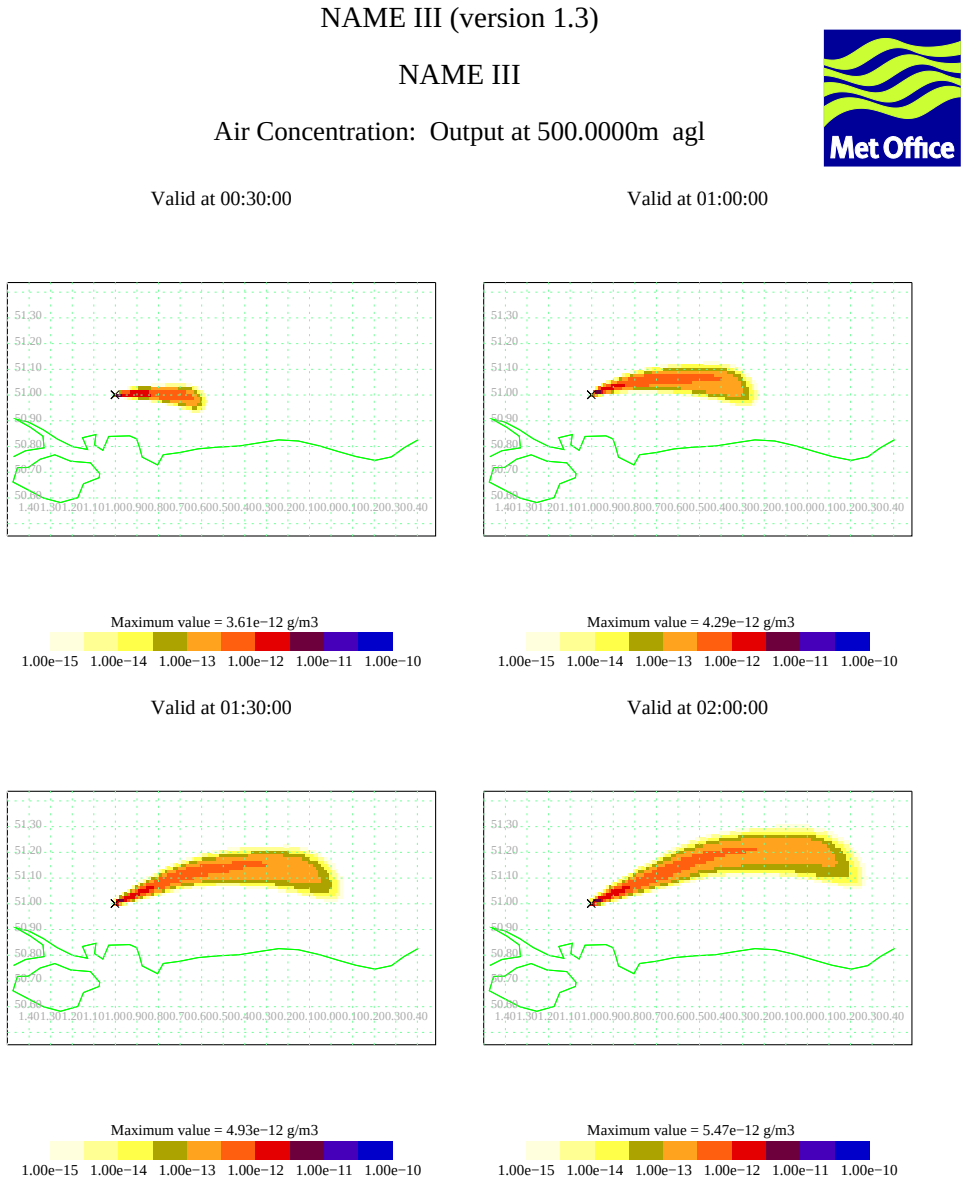

Figure 6: NAME III output. Continuous puff release using single site hourly varying met.

Appendix A: NWP example input file

```
Main Options:
Absolute or relative time?, Fixed met?, Time of fixed met, Flat Earth?
                  absolute,         No,                  ,          No

Multiple Case Options:
Multiple Cases?, Multiple Sets of Dispersion Options?,
No,                                      No,

Output Options:
Folder
.\Out_reg\

Input Files:
File names
..\..\Met\UMMetDefnRH2001.txt

Array: ZGridArray
Array Values
250.0
500.0
750.0

Horizontal Coordinate Systems:
Name,    Type, Pole Lat, Pole Long, Angle, x-Origin, y-Origin, x-unit, y-unit
HCoord1,    1,     90.0,       0.0,   0.0,      0.0,      0.0,    1.0, 1.0

Vertical Coordinate Systems:
Name,    Type, Unit
ZCoord1,    1,  1.0

Horizontal Grids:
Name,   H-Coord,  nX,  ny,     dx,   dy,   x0,  y0
HGrid4, HCoord1, 100, 100,    0.15,  0.1, -6.5,  47.0

Vertical Grids:
Name,   Z-Coord,  nz,   dz,  z0
ZGrid2, ZCoord1,  66, 25.0, 0.0
ZGrid4, ZCoord1,  1, 100.0, 50.0

Temporal Grids:
Name,       nt,        dt,                  t0
TGrid4.1,    4, 06:00:000, 29/06/2001 06:00:000

Domains:
Name, H-Coord,     X Min,    X Max,     Y Min,    Y Max, H Unbounded?, Z-Coord,   Z Max,
D1,   HCoord1,      -1.0,      1.0,      -1.0,      1.0,          Yes, ZCoord1, 10000.0,
D2,   HCoord1, -100000.0, 100000.0, -100000.0, 100000.0,           No, ZCoord1, 10000.0,

            Z Unbounded?,      Start Time,        End Time, Max Travel Time
                      No, 29/06/2001 00:00,        infinity,        24:00:01
                      No, 29/06/2001 00:00,        infinity,        infinity
```

```
Species:
Name, Type, Half Life, Molecular Weight, Diameter, Density, Resistance Rc
SO2,   Gas,    Stable,              28,         ,     1.0,           1.0

Sources:
Name,       Shape, H-Coord, Z-Coord,     X,     Y,     Z, Diameter,    Source Strength,
Drax,    Circular, HCoord1, ZCoord1,  -2.5,  51.0, 200.0,     10.0, SO2     1.0      g,

          Time Dependency, Plume Rise?, Temperature, Volume Flow Rate, Flow Velocity,
                        ,          No,         0.0,              0.0,              ,

              NParticles, Max Age, Top Hat,      Start Time, Stop Time
                  200000, 10000.0,      No, 29/06/2001 00:00, 30/06/2001 00:00



Output Requirements - Fields:
Name,        Species, Source, Group, H-Grid, Z-Grid,   T-Grid, BL Average, T Average, Sync?,
Conc,              ,       ,      ,       , ZGrid2, TGrid4.1,         No,        No,    No,
Conc,              ,       ,      , HGrid4, ZGrid4, TGrid4.1,         No,        No,    No,
PuffCentres,       ,       ,      ,       , ZGrid2, TGrid4.1,         No,        No,    No,

             Graph?, Screen?, Disk?, Stat?, Plot Scale, Separate File, Output Group
                Yes,      No,    No,    No,       0.01,             T,        F1
                 No,      No,   Yes,    No,       0.01,             T,        F2
                Yes,      No,    No,    No,       0.01,             T,        F1

Output Requirements - Fields:
Name,       Species, Source, Group,   T-Grid, H-Coord, Z-Coord, T Average, Sync?,
NParticles,        ,       ,      , TGrid4.1, HCoord1, ZCoord1,        No,   Yes,
NPuffs,            ,       ,      , TGrid4.1, HCoord1, ZCoord1,        No,   Yes,
Sigma Z,           ,       ,      , TGrid4.1, HCoord1, ZCoord1,        No,   Yes,
#particle steps,   ,       ,      , TGrid4.1,        ,        ,        No,   Yes,
#puff steps,       ,       ,      , TGrid4.1,        ,        ,        No,   Yes,

             Graph?, Screen?, Disk?, Stat?, Output Group
                 No,     Yes,    No,    No, F3
                 No,     Yes,    No,    No, F3
                 No,     Yes,    No,    No, F3
                 No,     Yes,    No,    No, F3
                 No,     Yes,    No,    No, F3


Output Requirements - Sets of Particle/Puff Details:
 Name, Particles?, Puffs?, First Particle, Last Particle, First Puff, Last Puff, T-Grid,
Set 1,        No,     Yes,              1,             1,          1,         1,       ,

         H-Coord, Z-Coord, Sync?, Graph?, Screen?, Disk?
         HCoord1, ZCoord1,    No,     No,      No,   Yes

Sets of Dispersion Options:
Skew Time, Velocity Memory Time, Inhomogeneous Time, DeltaOpt, Puff Time, Sync Time,
    00:00,               00:00,              00:00,        1,     00:00,  00:15:00,

          Computational Domain, Puff Interval,Deep Convection?, Radioactive Decay?,
                            D1,         00:15,              No,                 No,
```

```
                Dry Deposition?, Wet Deposition?, Meander?
                             No,        No      ,       Yes

NWP Met Module Instances:
Name,     Min B L Depth, Max B L Depth, Use NWP BL Depth, RESTOREMET, DELETEMET,
Regional,          80.0,        4000.0,               No,         No,        No,

             Met Folder, Met Definition Name
              ..\..\Met,            Regional


NWP Flow Module Instances:
Name,     Met Module,      Met, Domain
Regional,    NWP Met, Regional,     D2

Flow Order: Update
Flow Module, Flow
NWP Flow,    Regional

Flow Order: Convert
Flow Module, Flow
NWP Flow,    Regional

Flow Order: Flow
Flow Module, Flow
NWP Flow,    Regional

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

Appendix B: Single site example input file

```
Main Options:
Absolute or relative time?, Fixed met?, Time of fixed met, Flat Earth?
                  relative,         No,                  ,          No

Multiple Case Options:
Multiple Cases?, Multiple Sets of Dispersion Options?,
No,                                      No,

Output Options:
Folder
.\SingleSite_puff\

Horizontal Coordinate Systems:
Name,    Type, Pole Lat, Pole Long, Angle, x-Origin, y-Origin, x-unit, y-unit
HCoord1,    1,     90.0,       0.0,   0.0,      0.0,      0.0,    1.0, 1.0

Vertical Coordinate Systems:
Name,    Type, Unit
ZCoord1,    1,  1.0

Horizontal Grids:
Name,   H-Coord, nX,  ny,      dx,     dy,   x0,  y0
HGrid2, HCoord1, 160,  80,  0.0125, 0.0125, -1.5,  50.45

Vertical Grids:
Name,   Z-Coord,  nz,   dz,  z0
ZGrid2, ZCoord1,  200, 25.0, 12.5
ZGrid4, ZCoord1,  1, 100.0, 500.0
ZGrid5, ZCoord1,  1, 100.0, 1000.0
ZGrid6, ZCoord1,  1, 100.0, 1500.0

Temporal Grids:
Name,       nt,        dt,        t0
TGrid2.1,    4,  00:30:00,  00:30:00

Domains:
Name, H-Coord,     X Min,    X Max,     Y Min,    Y Max, H Unbounded?, Z-Coord,   Z Max,
D1,   HCoord1,      -1.0,      1.0,      -1.0,      1.0,          Yes, ZCoord1, 20000.0,
D2,   HCoord1, -100000.0, 100000.0, -100000.0, 100000.0,           No, ZCoord1, 20000.0,

            Z Unbounded?,      Start Time,        End Time, Max Travel Time
                      No,           00:00,        infinity,       06:00:01
                      No,      - infinity,        infinity,       infinity

Species:
Name, Type, Half Life, Molecular Weight, Diameter, Density, Resistance Rc
SO2,   Gas,    Stable,               28,         ,     1.0,           1.0

Sources:
Name,    Shape, H-Coord, Z-Coord,    X,    Y,     Z, Diameter, Source Strength,
Drax, Circular, HCoord1, ZCoord1, -1.0, 51.0, 200.0,    5.0  ,   SO2  1.0 g   ,

        Time Dependency,  Plume Rise?, Temperature,  Flow Velocity,   NParticles,
```

```
                      ,          yes,       416.0,          15.0 ,       100000,

                Max Age, Top Hat, Start Time, Stop Time
                10000.0,      No,   00:00:00,   06:00:00


Output Requirements - Fields:
Name,        Species, Source, Group, H-Grid, Z-Grid,   T-Grid, BL Average, T Average,
Conc,              ,       ,      ,       , ZGrid2, TGrid2.1,         No,         No,
Conc,              ,       ,      , HGrid2, ZGrid4, TGrid2.1,         No,         No,
PuffCentres,       ,       ,      ,       , ZGrid2, TGrid2.1,         No,         No,

              Sync?, Graph?, Screen?, Disk?, Stat?, Plot Scale, Separate File, Output Group
                 No,    Yes,      No,    No,    No,      0.001,             T,        F1
                 No,     No,      No,   Yes,    No,       0.01,             T,        F2
                 No,    Yes,      No,    No,    No,       0.01,             T,        F1


Output Requirements - Fields:
Name,       Species, Source, Group,   T-Grid, H-Coord, Z-Coord, T Average, Sync?, Graph?,
NParticles,        ,       ,      , TGrid2.1, HCoord1, ZCoord1,        No,   Yes,     No,
NPuffs,            ,       ,      , TGrid2.1, HCoord1, ZCoord1,        No,   Yes,     No,
Sigma Z,           ,       ,      , TGrid2.1, HCoord1, ZCoord1,        No,   Yes,     No,
#particle steps,   ,       ,      , TGrid2.1,        ,        ,        No,   Yes,     No,
#puff steps,       ,       ,      , TGrid2.1,        ,        ,        No,   Yes,     No,

            Screen?, Disk?, Stat?, Output Group
                Yes,    No,    No, F3
                Yes,    No,    No, F3
                Yes,    No,    No, F3
                Yes,    No,    No, F3
                Yes,    No,    No, F3


Sets of Dispersion Options:
Skew Time, Velocity Memory Time, Inhomogeneous Time, DeltaOpt, Puff Time, Sync Time,
    00:00,                00:00,           infinity,        1,  infinity,  00:01:00,

          Computational Domain, Puff Interval, Deep Convection?, Radioactive Decay?,
                            D1,         00:05,               No,                 No,

               Dry Deposition?, Wet Deposition?, Meander?
                            No,              No,       No


Single Site Met Module Instances:
Name,     H-Coord, Long,  Lat, Height,  z0, z0d, Representative?,
Heathrow, HCoord1, -1.0, 51.0,   10.0, 0.1, 0.1,             Yes,

      Met File         , Ignore Fixed Met Time?
  ..\..\Met\MetDemo.met,                     No


Single Site Flow Module Instances:
Name,          Met Module,      Met, Domain
Heathrow, Single Site Met, Heathrow, D2
```

```
Flow Order: Update
Flow Module,      Flow
Single Site Flow, Heathrow

Flow Order: Convert
Flow Module,      Flow
Single Site Flow, Heathrow

Flow Order: Flow
Flow Module,   Flow
Single Site Flow, Heathrow

Flow Subset: BuildUpdateFlow
Flow Module,      Flow
Single Site Flow, Heathrow

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

Appendix C: Single site example met input file

```
VARIABLES:
5
Wind Speed
Heat Flux
Wind Dirn
Bl Depth
Precip


DATA:
10.0, 100.0,  270.0, 1000.0, 2.0
8.0, 100.0,  230.0, 1000.0, 2.0
5.0, 100.0,  230.0, 1000.0, 2.0
8.0, 100.0,  200.0, 1000.0, 2.0
```