

ภาคผนวก จ

ข้อมูลแบบจำลองทางคณิตศาสตร์ ATMOS2

1. ตัวอย่างการสั่ง Run ATMOS2 Model

```
#!/bin/bash
```

```
# ATMOS-2 running script - Example  
# G. Calori, 24.2.99  
# 29/Jun/2002, A.FUKAYAMA  
# 29/Jan/2004, V.Surapipith
```

```
export DATADIR=./  
export OUTDIR=./atmos_out  
export EXEDIR=./bin
```

```
export SCENFILE=test.desc  
export EXECUTION_ID=TEST  
export GRIDDESC=raInS-asia.gridso  
export IOAPI_CHECK_HEADERS=yes  
export IOAPI_LOG_WRITE=yes
```

```
export INIFILE=atmos2.ini  
# export URBFILE=rural.dat  
export LANDFILE=landsea_asia.dat  
export WINDFILE=$DATADIR/lwind.2001.nc  
export HMIXFILE=$DATADIR/hmix.2001.nc  
export PRECFILE=$DATADIR/prate.2001.nc
```

```
export FIRSTREG=1  
export LASTREG=999  
export OUTFILE1=$OUTDIR/SO2_N1.nc  
export SRCFILE=SO2_LPS+area.txt
```

```
export LOGFILE=./atmos2_N1.log  
rm -f ./atmos2_N1.log  
$EXEDIR/atmos2
```

2. ตัวอย่างข้อมูล Initial file : atmos2.ini

```

!-----
! 4/Jan/2004,V.Surapipith
! ATMOS model initialization file
! Version 2.1
!
! MICS-Asia runs
!-----
! Simulation time interval & time steps
!-----
1 1 2001 0      ! start date+hour (day month year hour)
31 1 2001 18   ! stop date+hour (day month year hour)
120            ! trajectories duration (hr)
3              ! transport time step (hr)
744            ! output sampling duration (hr); 744 = month; 8928 = year
!-----
! Misc params
!-----
40000.         ! initial horiz. sigma for diffuse sources (m)
10000.         ! initial horiz. sigma for LPS (m)
0.1            ! puff SO2 and SO4 minimum mass (% of initial release)
!-----
! Control options
!-----
1              ! process emitting regions altogether (1 = yes; 0 = no)
0              ! urban simulation flag (1 = yes; 0 = no)

```

3. ข้อมูล rains-asia.gridso

```

! RAINS-ASIA grid systems
'LONLAT'      ! "the" lon-lat coord. system
1, 0.0D0, 0.0D0, 0.0D0, 0.0D0, 0.0D0
''            ! end coords
'ATMOS_MET'   ! ATMOS meteo grid
'LONLAT', 60.0D0, -20.0D0, 2.5D0, 2.5D0, 41, 31, 1
'ATMOS_OUT'   ! ATMOS output grid
'LONLAT', 75.0D0, -15.0D0, 1.0D0, 1.0D0, 80, 70, 1
''            ! end grids

```

4. ข้อมูล landsea_asia.dat

```

! RAINS-ASIA 1deg*1deg land/sea mask
!
! lon, lat, land/sea code (1 = land; 0 = sea)
! (coord. refer to grid cells lower-left corners (SW))
!
39    60    1
40    60    1
41    60    1
42    60    1
43    60    1
44    60    1
45    60    1
46    60    1
47    60    1
48    60    1

94    7     0
95    7     0
96    7     0
97    7     0
98    7     0
99    7     0
100   7     1
101   7     1
102   7     0
103   7     0
104   7     0
105   7     0
106   7     0

145   -20   1
146   -20   1
147   -20   1
148   -20   1
149   -20   0
150   -20   0
151   -20   0
152   -20   0
153   -20   0
154   -20   0

```

5. ข้อมูลแหล่ง Emission : SO2_LPS+area.txt

!Sector/ Longitude/ Latitude/ Emission (tons/year)/ Emissions type/ Puff release
 !Emissions type : 0 for area source, 1 for LPS and 2 for volcano

1, 116.170, 39.930, 87492.297, 1, 3,
 1, 116.170, 39.590, 25244.801, 1, 3,
 1, 106.540, 29.410, 135985.000, 1, 3,
 1, 119.510, 25.930, 20986.500, 1, 3,
 1, 113.800, 24.820, 81786.000, 1, 3,
 1, 108.830, 23.790, 306201.406, 1, 3,
 1, 113.750, 23.060, 42098.199, 1, 3,
 1, 113.740, 23.030, 93246.602, 1, 3,
 1, 106.450, 26.550, 171377.203, 1, 3,
 1, 118.190, 39.630, 166079.500, 1, 3,

2, 92.500, 7.500, 0.000, 0, 3,
 2, 93.500, 7.500, 0.000, 0, 3,
 2, 94.500, 7.500, 0.000, 0, 3,
 2, 95.500, 7.500, 0.000, 0, 3,
 2, 96.500, 7.500, 0.000, 0, 3,
 2, 97.500, 7.500, 0.000, 0, 3,
 2, 98.500, 7.500, 2158.717, 0, 3,
 2, 99.500, 7.500, 4881.985, 0, 3,
 2, 100.500, 7.500, 12692.464, 0, 3,
 2, 101.500, 7.500, 584.839, 0, 3,
 2, 102.500, 7.500, 584.839, 0, 3,
 2, 103.500, 7.500, 584.839, 0, 3,
 2, 104.500, 7.500, 584.839, 0, 3,
 2, 105.500, 7.500, 584.839, 0, 3,
 2, 106.500, 7.500, 584.839, 0, 3,
 2, 107.500, 7.500, 584.839, 0, 3,

2, 145.500, -12.500, 0.000, 0, 3,
 2, 146.500, -12.500, 0.000, 0, 3,
 2, 147.500, -12.500, 0.000, 0, 3,
 2, 148.500, -12.500, 0.000, 0, 3,
 2, 149.500, -12.500, 0.000, 0, 3,
 2, 150.500, -12.500, 0.000, 0, 3,
 2, 151.500, -12.500, 0.000, 0, 3,
 2, 152.500, -12.500, 0.000, 0, 3,
 2, 153.500, -12.500, 0.000, 0, 3,
 2, 154.500, -12.500, 0.000, 0, 3,
 2, 155.500, -12.500, 0.000, 0, 3,
 2, 156.500, -12.500, 0.000, 0, 3,
 2, 157.500, -12.500, 0.000, 0, 3,

6. ตัวอย่างผลการตกสะสมกรดลงสู่พื้นโลก

!Sector/ Longitude/ Latitude/ Deposition (mg/m²)

1	75	54	0.000	0.000	0.000
1	76	54	0.000	0.000	0.000
1	77	54	0.000	0.000	0.000
1	78	54	0.000	0.000	0.000
1	79	54	0.000	0.000	0.000
1	80	54	0.000	0.000	0.000
1	81	54	0.000	0.000	0.000
1	82	54	0.000	0.000	0.000
1	83	54	0.000	0.000	0.000
1	84	54	0.000	0.000	0.000
1	92	7	4.743	4.743	0.000
1	93	7	4.790	4.790	0.000
1	94	7	4.986	4.986	0.000
1	95	7	5.222	5.222	0.000
1	96	7	5.995	5.995	0.000
1	97	7	7.842	7.842	0.000
1	98	7	12.367	12.367	0.000
1	99	7	18.390	18.390	0.000
1	100	7	27.744	27.744	0.000
1	101	7	22.029	22.029	0.000
1	102	7	12.965	12.965	0.000
1	103	7	5.161	5.161	0.000
1	104	7	3.127	3.127	0.000
1	105	7	2.512	2.512	0.000
1	106	7	2.319	2.319	0.000
1	107	7	2.563	2.563	0.000
1	108	7	3.506	3.506	0.000
1	145	-15	0.000	0.000	0.000
1	146	-15	0.000	0.000	0.000
1	147	-15	0.000	0.000	0.000
1	148	-15	0.000	0.000	0.000
1	149	-15	0.000	0.000	0.000
1	150	-15	0.000	0.000	0.000
1	151	-15	0.000	0.000	0.000
1	152	-15	0.000	0.000	0.000
1	153	-15	0.000	0.000	0.000
1	154	-15	0.000	0.000	0.000

7. ตัวอย่างการ Run ATMOS2 Model โดยใช้ข้อมูล Emission ของทั้งทวีปเอเชีย

=== ATMOS 2.2 ===

RAINS-Asia Lagrangian multi-layer model

This program uses the EPA-AREAL/MCNC-Environmental Programs Models-3 I/O Applications Programming Interface, which is built on top of the netCDF I/O library (Copyright 1993, 1996 University Corporation for Atmospheric Research/Unidata Program). Portions copyright (C) 1992-1999 MCNC. See URL "<http://envpro.ncsc.org/products/loapi/H.NOTICE.html>" for conditions of use.

\$Id: @(#) ioapi library version 2.0.2 \$

--- Run started at 30-03-2004 12:33:34

--- Setup phase

Value for INIFILE: 'atmos2.ini'

Value for WINDFILE: './lwind.2001.nc'

Value for HMIXFILE: './hmix.2001.nc'

Value for PRECFILE: './prate.2001.nc'

Value for LANDFILE: 'landsea_asia.dat'

Value for SRCFILE: 'SO2_LPS+area.txt'

Initialization file: atmos2.ini

Wind file : ./lwind.2001.nc

Hmix file : ./hmix.2001.nc

Precip. file : ./prate.2001.nc

Land-sea mask : landsea_asia.dat

Sources file : SO2_LPS+area.txt

Value for G2G not defined; returning default: 0

Value for FIRSTREG: 1

Value for LASTREG: 999

Emitting regions selected: from 1 to 999

All regions simulated together.

Value for IOAPI_CHECK_HEADERS: yes returning TRUE

Wind archive:

x - min coord., grid step size, # of points: 60.000 2.500 41

y - min coord., grid step size, # of points: -20.000 2.500 31

Hmix archive:

x - min coord., grid step size, # of points: 60.000 2.500 41

y - min coord., grid step size, # of points: -20.000 2.500 31

Precipitations archive:

x - min coord., grid step size, # of points: 60.000 2.500 41
y - min coord., grid step size, # of points: -20.000 2.500 31

Output conc./dep. archive:

x - min coord., grid step size, # of points: 75.000 1.000 80
y - min coord., grid step size, # of points: -15.000 1.000 70

Simulation time interval:

from 01-01-2001 00
to 31-01-2001 18

Trajectories duration (hr): 120

Transport time step (hr): 3

output sampling duration (hr): 744

--- Computational phase

--- All regions together : 3069 diff. sources, 115 LPS, 0 volcanoes; total emission =
0.339385E+08 ton/yr

Value for OUTFILE1: './atmos_out/mth1.nc'

Value for IOAPI_CHECK_HEADERS: yes returning TRUE

Value for OUTFILE1: './atmos_out/mth1.nc'

Warning: last output interval (hr) = 738

Value for IOAPI_LOG_WRITE: yes returning TRUE

concSO2 written to OUTFILE1 for 2001032:000000

concSO4 written to OUTFILE1 for 2001032:000000

drySO2 written to OUTFILE1 for 2001032:000000

drySO4 written to OUTFILE1 for 2001032:000000

wetSO2 written to OUTFILE1 for 2001032:000000

wetSO4 written to OUTFILE1 for 2001032:000000

--- Run finished at 30-03-2004 15:14:45

--- Elapsed time: 0 d, 02 h, 41 m, 11 s

8. ตัวอย่างการ Run ATMOS2 Model โดยใช้ข้อมูล Emission ในระยะรัศมีประมาณ 500 km จากบริเวณพื้นที่ศึกษา

=== ATMOS 2.2 ===

RAINS-Asia Lagrangian multi-layer model

This program uses the EPA-AREAL/MCNC-Environmental Programs Models-3 I/O Applications Programming Interface, which is built on top of the netCDF I/O library (Copyright 1993, 1996 University Corporation for Atmospheric Research/Unidata Program). Portions copyright (C) 1992-1999 MCNC. See URL "<http://envpro.ncsc.org/products/ioapi/H.NOTICE.html>" for conditions of use.

\$Id: @(#) ioapi library version 2.0.2 \$

--- Run started at 15-05-2004 03:55:03

--- Setup phase

Value for INIFILE: 'atmos2j.ini'

Value for WINDFILE: './lwind.2001.nc'

Value for HMIXFILE: './hmix.2001.nc'

Value for PRECFILE: './prate.2001.nc'

Value for LANDFILE: 'landsea_asia.dat'

Value for SRCFILE: 'SO2_south.txt'

Initialization file: atmos2j.ini

Wind file : ./lwind.2001.nc

Hmix file : ./hmix.2001.nc

Precip. file : ./prate.2001.nc

Land-sea mask : landsea_asia.

Sources file : SO2_south.txt

Value for G2G not defined; returning default: 0

Value for FIRSTREG: 1

Value for LASTREG: 999

Emitting regions selected: from 1 to 999

All regions simulated together.

Value for IOAPI_CHECK_HEADERS: yes returning TRUE

Wind archive:

x - min coord., grid step size, # of points: 60.000 2.500 41

y - min coord., grid step size, # of points: -20.000 2.500 31

Hmix archive:

x - min coord., grid step size, # of points: 60.000 2.500 41
 y - min coord., grid step size, # of points: -20.000 2.500 31

Precipitations archive:

x - min coord., grid step size, # of points: 60.000 2.500 41
 y - min coord., grid step size, # of points: -20.000 2.500 31

Output conc./dep. archive:

x - min coord., grid step size, # of points: 75.000 1.000 80
 y - min coord., grid step size, # of points: -15.000 1.000 70

Simulation time interval:

from 01-01-2001 00
 to 31-01-2001 18

Trajectories duration (hr): 120
 Transport time step (hr): 3
 output sampling duration (hr): 744

--- Computational phase

--- All regions together : 122 diff. sources, 1 LPS, 0 volcanoes; total emission =
 0.698900E+06 ton/yr

Value for OUTFILE1: './atmos_out/st1.nc'

Value for IOAPI_CHECK_HEADERS: yes returning TRUE

Value for OUTFILE1: './atmos_out/st1.nc'

Warning: last output interval (hr) = 738

Value for IOAPI_LOG_WRITE: yes returning TRUE

concSO2 written to OUTFILE1 for 2001032:000000

concSO4 written to OUTFILE1 for 2001032:000000

drySO2 written to OUTFILE1 for 2001032:000000

drySO4 written to OUTFILE1 for 2001032:000000

wetSO2 written to OUTFILE1 for 2001032:000000

wetSO4 written to OUTFILE1 for 2001032:000000

--- Run finished at 15-05-2004 03:57:52

--- Elapsed time: 0 d, 00 h, 02 m, 49 s