Specification of HTAP2 Simulation Experiments (WP2.2)

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Specification of HTAP2 Simulation Experiments (WP2.2)

1. Model experiments
2. Model outputs
3. Monitoring stations

Specification of HTAP2 Simulation Experiments
HTAP Wiki WP2.2

General link:
http://iek8wikis.iek.fz-juelich.de/HTAPWiki/WP2.2

Specific links (this presentation)
- HTAP2 experiments: .doc file
- HTAP2 regions: NetCDF files and documentation
- HTAP2 output variables: Excel file
- HTAP2 stations short lists: EXCEL file; Gas, Aerosol, and Profile ASCII files; .KMZ Google Earth file.
- HTAP2 all stations list: EXCEL file

More on HTAP2 model output files (see presentation by M. Schulz):
- Naming convention, NetCDF format, CF-compliance and submission: HTAP-2-data-submission

1. Model experiments

European Commission

The TF HTAP general objectives are to:

- Examine the transport of air pollution across the Northern Hemisphere from source to downwind regions
- Assess the emission and transport impacts on regional and global air quality, ecosystems, public health, and climate
- Provide information on potential emission mitigation options

HTAP Phase 2 specificities (compared to HTAP Phase 1)

- Harmonized emissions database
- More detailed intercontinental source-receptor calculations, including coupled regional-global modelling
- More detailed outputs, e.g. PM components and size, VOC speciation,..
- More model-observations comparison and model evaluation analyses
- Processes: inflow and outflow of air pollution, ..
- Statistical analysis- e.g. LRT versus diffusive transport

1. Model experiments

Years:

- 2008, 2009, 2010, with focus on 2010

Emissions:

- Anthropogenic (HTAP2 0.1°x0.1°emissions by sectors): Mandatory
  - 2008 and 2010 annual and monthly emissions

  Documentation and files are available under WP1.1
- Biomass burning: GFEDv3 daily Recommended
- Natural:
  - Dust and sea salt Model calculated
  - 2008-2010 Volcano emissions provided by Thomas Diehl. Recommended
  - DMS emissions (DMS from Lana et al. 2011) Recommended

Regions:

- Tier 1 = 17 regions including 13 land regions
- Tier 2 = 60 sub-regions
- The region masks are provided in NetCDF format under WP2.1

1. Model experiments

- **Base run: 2008**-2009-**2010** (+6 months spin-up for global models)
- **[CH_4] perturbation runs***
- **Emission perturbation runs (-20%):**

"Each modelling group should balance these priorities with their research interests"

Version March 2013

Global

Regional

13 regions
+ Oceans

Region of Emissions Perturbation		All anthropogenic			By pollutant			By sector		
		20% Δ All Anthr Emiss			-20% Δ By Pollutant (3)			-20% Δ By Sectors (~5)		
		2008	2009	2010	2008	2009	2010	2008	2009	2010
Global	GLO									
N America	NAM									
Europe	EUR									
East Asia	EAS									
South Asia	SAS									
Rus, Bel, Ukr	RBU									
Middle East	MDE									
SE Asia	SEA									
Central Asia	CAS									
N Afr/Sahara/Sahel	NAF									
Mex/C America	MCA									
Southern Africa	SAF									
South America	SAM									
Aust/NZ/Pacific	PAN									
Oceans	OCN									

Highest Priority
Next Priority
Lower Priority

Pollutants/Sectors *	
All Anthropogenic	AA
NOx	NX
VOC, CO, NOx	VC
Particles and Precursors	PM
Electricity/Power	EP
Industry	IN
Residential	RS
Transport	TR
Agricultural	AG
Wildfires	WF
Dust	DU

* See details and updates in next slide

1. Model experiments

Final version

updates

Priorities for HTAP2 Simulations

		2008	2009	2010
Base	BASE	1		1
Increase CH4 Conc	CH4INC			1
Decrease CH4 Conc	CH4DEC			

Highest Priority 1
Next Priority
Lower Priority

By pollutant

By sector

All	NOX	CO	VOC	SO2	NH3	PM	TRN	PIN	RES	OTH	FIR	DST
2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010	2008 2009 2010

Region of Emissions Perturbation

Global	GLO
N America	NAM
Europe	EUR
East Asia	EAS
South Asia	SAS
Rus, Bel, Ukr	RBU
Middle East	MDE
SE Asia	SEA
Central Asia	CAS
N Afr/Sahara/Sahel	NAF *
Mex/C America	MCA
Southern Africa	SAF
South America	SAM
Aust/NZ/Pacific	PAN
Oceans	OCN

Naming convention

Experiment

Region

<Experiment Name>

(*Region* + *Experiment*)

- Examples: GLO**ALL**, RBU**FIR**, NAF**DST**, OCN**CO**,..
- It is part of the model output filename (see talk by M. Schulz)

*(e.g., htap2_GEOSCHEM822_**GLOALL**_vmro3_ModelLevel_2010_monthly.nc)*

PM = Other Particulate Matter (BC, OC, PM10, PM2.5)
TRN = Ground Transport Sector; PIN = Power and Industry Sectors; RES = Residential Sector; OTH = Other Sectors (Ships, Aviation, Agriculture); FIR = Fire
DST = Dust * For dust, some models should divide the NAF source into separate source regions for the Sahara (091+092, in the Tier2 regions) and Sahel (093).

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List of HTAP2 output variables

- **The list of model outputs** requested was built on several iterations with modellers, on the basis of HTAP specific objectives and previous MIPs output diagnostics.
- Each requested output **variable** is to be provided in a separate file containing all time steps for a single **year**.
- The requested outputs are divided into **5 output types**, defined primarily by the vertical dimension of the data:
    1. Surface (original model grid)
    2. Column (original model grid)
    3. ModelLevel (original model grid)
    4. SurfaceAtStations (gas and aerosol monitoring stations provided separately)
    5. ModelLevelAtStations
- The **frequency** of the outputs includes: *timeinvariant*, *hourly*, *daily*, *monthly*, *sat1000, sat1330, sat2200, sat0130* (satellite overpass times).

Naming convention

The variable, the type, and the year and frequency are part of the model output file name (*example:htap2_GEOSCHEM822_BASE_**vmro3_ModelLevel_2010_hourly**.nc)*

2. Model Outputs

Output Variable Types

1. Surface

- Landcover and vegetation
- Meteo/Thermodynamics
- Emission fluxes
- Dry and Wet deposition fluxes
- Gases and aerosol mixing ratio
- Chemical rates, loss and production, ..(«budget»)

2. Column

- AOD

3. ModelLevel

- Meteo/Thermodynamics
- Emission fluxes
- Gases and aerosol mixing ratio
- Budget

4. SurfaceAtStations

(aerosol and gas separately)

- Meteo/Thermodynamics
- Gases (2, 5 and 10 m) and aerosol (2 m) mixing ratio
- AOD, gases column integrated

5. ModelLevelAtStations

- Meteo/Thermodynamics
- 3D gases and aerosol mixing ratio
- 3D aerosol extinction

2. Model Outputs

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Some statistics on HTAP2 output variables

N (first priority)	Surface	Column	ModelLevel	SurfaceAtStations (A + G)	ModelLevel AtStations	Total all output types
Time invariant	**19 (13)**	**-**	**-**	**-**	**-**	**19 (13)**
Hourly	**16 (9)**	**-**	**-**	**72 (58)**	**17 (16)**	**105 (83)**
Daily	**71 (55)**	**21 (21)**	**-**	**-**	**31 (20)**	**123 (96)**
Monthly	**128 (93)**	**-**	**100 (86)**	**-**	**-**	**228 (179)**
On satellite overpass	**-**	**-**	**19 (19)**	**-**	**-**	**19 (19)**
Total all frequencies	**234 (170)**	**21 (21)**	**119 (105)**	**72 (58)**	**48 (36)**	**494 (390)**

- *e.g., 494 netCDF files with 2x2°resolution grid and 30 levels: ?? size*
- **110 new CF Standard Names** have been submitted for approval
- **The HTAP2 CMOR Table** to be provided soon (see next talk by M. Schulz)

2. Model Outputs

Final version = HTAP2_variables_25102013.xlsx

First column = Output variables

Please read carefully the «Comments» for each variable

	A	B	C	D	E	F	G	H	I	J	K	L
1	HTAP Name	Variable Long Name (Description)	CF standard name (already existing) else proposed	Variable type	Unit	Minimum	Maximum	Dimensions	Frequency	PRIORITY	Comments	Obligatory CF comment in NetCDF variable file
2	Time and Coordinates = needed in each output file. See http://iek8wikis.iek.fz-juelich.de/HTAPWiki/HTAP-2-data-submission for details											
3	time	time	time	coordinate variables	days since 2001-01-01	-8000	8000	time		1		
4	time_bnds	Bounds coordinates for time	time	coordinate variables	days since 2001-01-01	-8000	8000	(time,2)		1		
5	lon	Center coordinates for longitudes	longitude	coordinate variables	degrees_east	-180	180	lon	timeinvariant	1		
6	lon_bnds	Bounds coordinates for longitude	longitude	coordinate variables	degrees_east	-180	180	lon,2	timeinvariant	1		
7	lat	Center coordinates for latitudes	latitude	coordinate variables	degrees_north	-90.	90.	lat	timeinvariant	1		
8	lat_bnds	Bounds coordinates for latitudes	latitude	coordinate variables	degrees_north	-90.	90.	lat,2	timeinvariant	1		
9												
10	HTAP Variable Name (one per output file)	Variable Long Name (Description)	CF standard name (already existing) else proposed	Variable type	Unit	Minimum	Maximum	Dimensions	Frequency	PRIORITY	Comments	Obligatory CF comment in NetCDF variable file
11	HTAP Variables = One File per Output Variable Per Year (note obligatory comments in last column to be included in file)											
12	Landcover and vegetation information											
13	growvegbnds	Growing season start and end date	time	LandVegetation	days since 2001-01-01	-8000	8000	lat, lon, 2	timeinvariant	1		
14	areacella	Grid-cell area	cell_area	LandVegetation	m2	100000	1E+12	lat, lon	timeinvariant	1		

Surface | Column | ModelLevel | SurfAtStations (Aerosol) | SurfAtStations (Gas) | ModelLevelAtStations | 3D_File_example | Sheet1

Ready

6 first sheets = 5 Output types

Example of NetCDF model file with mandatory fields ("3d_File_example"): one type/variable > one file.

European Commission

Netcdf Model Output file

- **Please carefully check** (see also all «Comments» in the spreadsheet) :

  - ✓ Vertical coordinates definition and formula terms
  - ✓ «Surface» (layer middle), «Near surface» (2m,5m,10m) definitions
  - ✓ Longitude range: -180°: +180°
  - ✓ Units (e.g., Pa also in level formula term(s), OA/OC,..)
  - ✓ Mandatory CF attributes (e.g., level formula, NOy species, CF global attribute)

- **See example of NetCDF model output file** (header) with the definition of the mandatory fields in the «3D_File_example» sheet of the HTAP2 variables EXCEL file.
- **See also the presentation** this morning by M. Schulz (MetNo).
- **Use the HTAP2 CMOR Table** that will be provided soon by MetNo.

3. Observation stations

HTAP2 stations lists

2 lists of 3 types of monitoring stations:

"Surface Gas (G), "Surface Aerosol" (A) , "Profile" (P)

1. **Complete list**.

   It has been compiled from the collection, merging, updating and correction of various datasets: AQMEII**, AeroCom, CALNEX*, GAW, EMEP, EANET, ABC, JMA, IAGOS, SHADOZ, IAGOS, ……

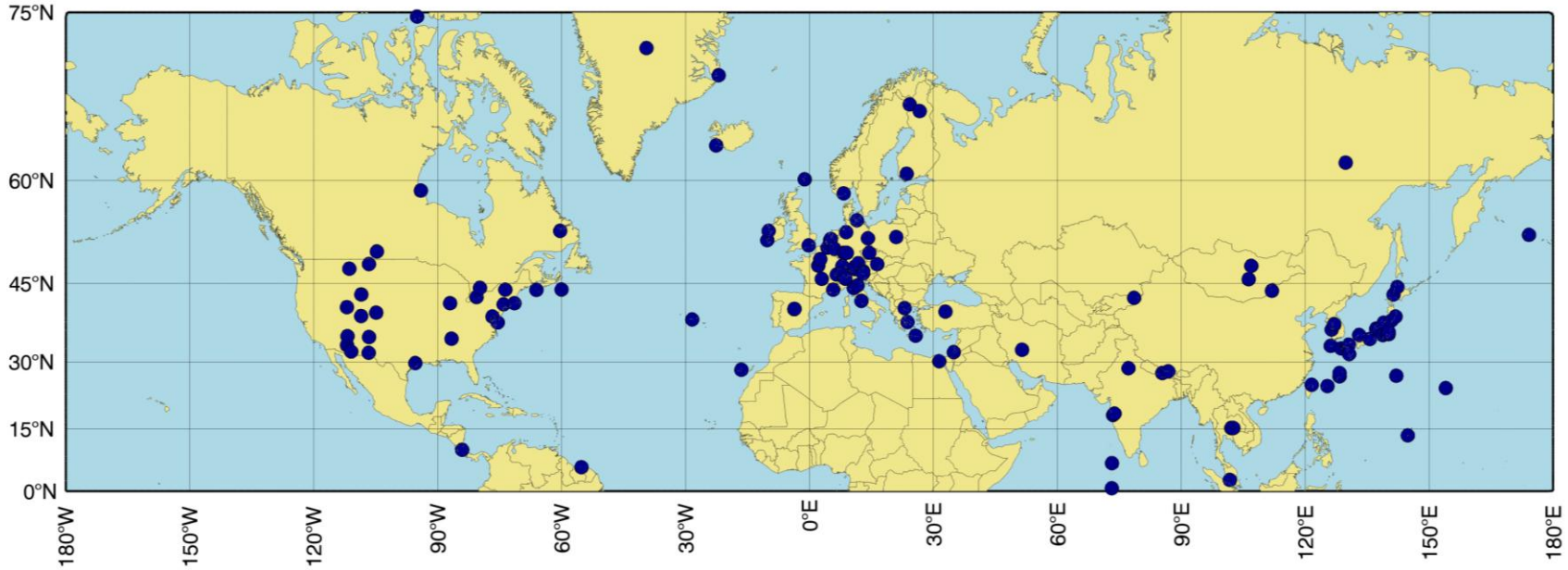
2. **Short list of stations where global model outputs are requested**

   It has been compiled from the HTAP2 complete list, by reducing the coverage density (mainly over USA and EU) of the "Surface Gas" and the "Surface Aerosol" monitoring networks.

* *Update of "AIRS" (EPA AQ) locations in AQMEII stations list (provided by Robert Vet)*
* *Correction of some EPA AQ elevations (provided by Owen Cooper)*

3. Observation stations

HTAP Stations: The Complete List

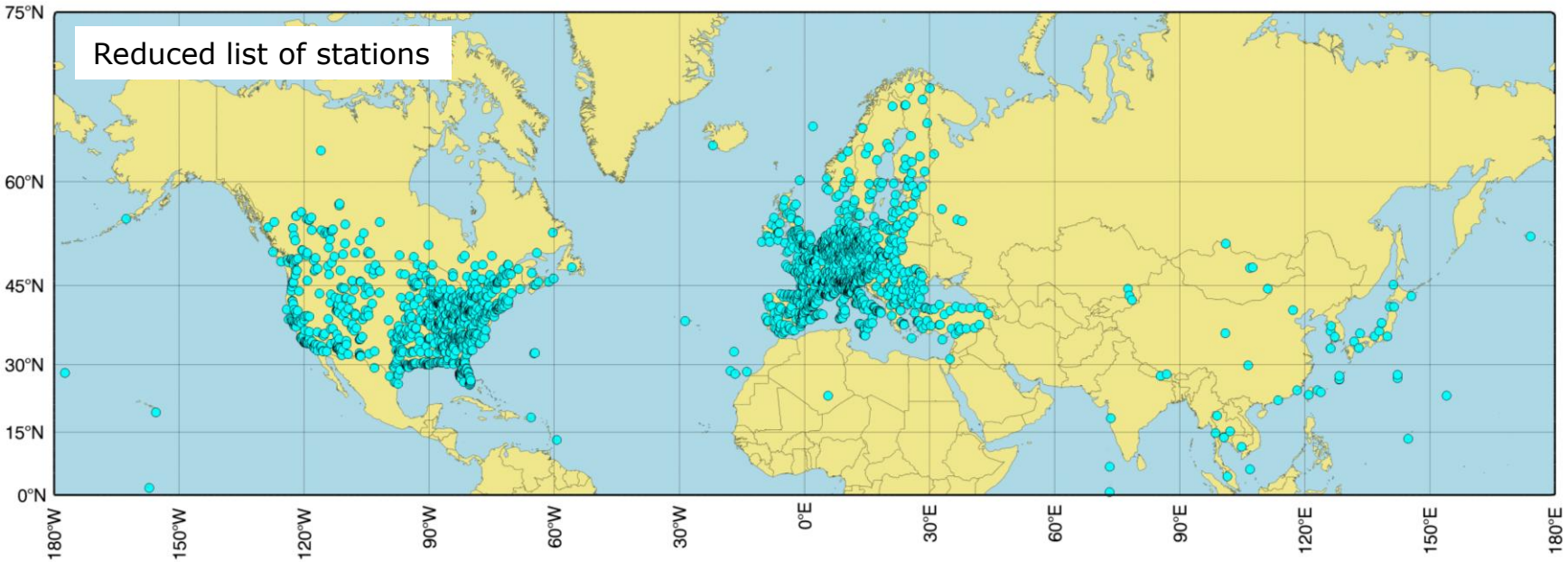


Gas (4110 stations), **Aerosol** (2052 stations), **Profile** (171 stations)

EXCEL File

3. Observation stations

HTAP Stations: Data thinning



Gas (2022 stations)

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HTAP Stations: The Short List

ASCII Files

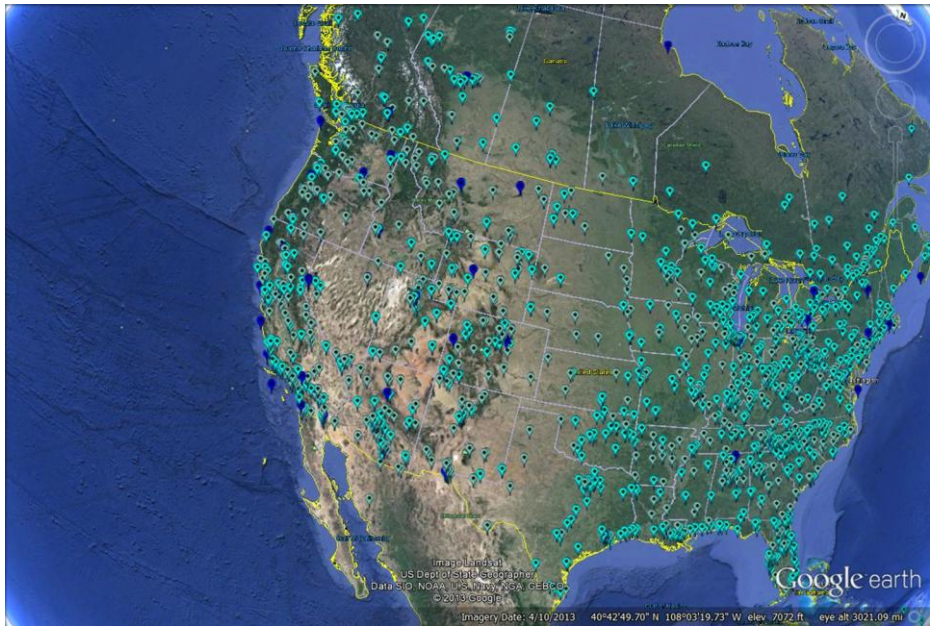
Gas : 2022 stations

Aerosol : 1031 stations

Profile :171 stations

EXCEL File

Google Earth file



3. Observation stations

Fields in HTAP2 stations files

	* Requested in the model output fields at stations
• **StationID***: HTAP2 station ID (with A, G and P suffixes)	"stationid"
• Long_Name: Long name of the station in the original file (1)	
• **Network_StationID***: Station ID in the original file	"network_stationid"
• **NetworkID***: Original network or dataset	"networkid"
• **Longitude*, Latitude*, Elevation***	"lon", "lat", "station_elevation"

- CALNEX-HTAP: CALNEX-HTAP station ID (from Owen Cooper)
- *Previous StationID* (2)
- *Update information* (2)

(1) *For EPA AQ stations, the 9 digits ID is used instead, in order to allow easier identification and cross path between AQMEII and CALNEX datasets.*

(2) *For the short lists only; provided in case some modellers would have used the preliminary list posted on HTAP WIKI on the 25/10/13.*

Reminder on HTAP Wiki

- **The HTAP wiki** http://iek8wikis.iek.fz-juelich.de/HTAPWiki/ is hosted by FZ Juelich. It is intended to facilitate the exchange of information between all TF HTAP participants.
- **Anyone can view the wiki and download files without an account**
- To edit, e.g., to add comment on the discussion pages, you need to **establish an account** on:
  http://www.htap.org/ > "About TF HTAP" > "Wiki Instructions".
  A short guide on how to use this Wiki is also provided there.